

2007 AND 2008 REPORT

**SCHOOL OF COMPUTING**  
THE UNIVERSITY OF UTAH









# CONTENTS

3	Message from the Director	24	Computing Degrees
4	About the School	26	New Undergraduate Program Entertainment Arts & Engineering
5	Measures of Excellence	28	Outreach
6	Arrivals	29	Industry Interactions
7	Departures	30	MS & PhD Graduates
8	Centers & Institutes	31	Courses
12	New Programs	32	Research Awards
14	Research	36	Faculty Bios
22	Undergraduate Programs		
23	Graduate Programs		

[WWW.CS.UTAH.EDU](http://WWW.CS.UTAH.EDU)

SCHOOL OF COMPUTING  
THE UNIVERSITY OF UTAH  
50 S. CENTRAL CAMPUS DRIVE RM 3190  
SALT LAKE CITY, UTAH 84112  
801.581.8224 • FAX 801.581.5843









# MESSAGE FROM THE DIRECTOR

Dear Colleagues and Friends,

Welcome to the 2007 and 2008 School of Computing report. We hope that you will enjoy reading about how the School of Computing continues to excel in many areas, including education, graduate recruiting, faculty recruiting, new degree programs, research programs and funding in what are challenging times for all of us.

## Arrivals and Departures

In the last two years we have successfully recruited eight new faculty members: Adam Bargteil, Thomas Fletcher, Guido Gerig, Mary Hall, Matthew Might, Valerio Pascucci, Erin Parker and Peter Jensen. These new faculty members have helped strengthen many core areas including animation, graphics, image analysis, compilers, security and the school's educational program.

At the same time we also said goodbye to a few of our long-standing faculty members. Pete Shirley, Steve Parker and John Carter, left to pursue work in industry; all three still retain adjunct appointments in the school. Pete and Steve both continue to teach and advise in their research specialties, while working for NVIDIA and contributing to the Nvidia CUDA Center described in the next section.

This past September, Jay Lepreau, a research professor in the school passed away due to complications from cancer. Jay was an enthusiastic researcher and one of the true research stars of the College of Engineering. All those who knew him, both within the computer science community and elsewhere, have felt his loss. The School along with Jay's wife, Caroline Kueneman will honor Jay by offering a professorship in his name; we are currently searching for candidates for this position.

## Research

The School continues to expand its research endeavors. The faculty produced over 350 publications in two years and a research spend of about \$10M per year between the School of Computing and SCI Institute. Our faculty is working hard to increase awareness of the significant research that is going on here in Utah.

This year NVIDIA announced that the University of Utah would be recognized as a CUDA Center of Excellence. Utah is the second school to be recognized as a CUDA Center. The School of Computing along with the SCI Institute and the Center for the Simulation of Accidental Fires and Explosions (C-SAFE) will be using the CUDA technology. In conjunction with the CUDA Center, NVIDIA has also opened an office here in Salt Lake. (see page 7 for more information)

The Utah Science Technology and Research (USTAR) initiative is underway. The program is designed to help bolster Utah's economy and has made significant progress in the last 2 years. The School has hired two new faculty members as part of the program: Guido Gerig and Thomas Fletcher. The School of Computing has worked with the College of Fine Arts to create a new Digital Media program that will be a part of the USTAR initiative, and we hope to recruit at least one new faculty into this cluster.

## Education

We continue to increase our emphasis on the creation of multi-disciplinary graduate programs as part of our computing degree. We have added new tracks in computer engineering, data management, and information technology. These new tracks will encourage students to pursue area specific coursework and advance research at an early stage of their graduate study. The school has also created a new undergraduate program, the Entertainment Arts and Engineering Program. The new interdisciplinary program is a joint effort between the School of Computing and the Division of Film Studies in the College of Fine Arts. The program is designed for students interested in pursuing careers in the digital entertainment industry. In the last two years the School has continued to produce excellent graduates, we have graduated over 120 bachelor degrees and 71 Masters and PhD's.

## Looking Ahead

With a new year ahead we are looking forward to the groundbreaking of the new USTAR Innovation Center. The new center will house over 10 different research clusters and will include labs, research facilities, conference center facilities, and offices. Construction on the USTAR Neuroscience Biomedical Technology Building begins April 22<sup>nd</sup>.

In a time of great economic uncertainty the School of Computing has been fortunate to accomplish so much. I hope that you find this report to be of interest and I will be delighted to receive comments regarding the School.

Martin Berzins  
Director, School of Computing  
director@cs.utah.edu



# ABOUT THE SCHOOL

## Timeline

Department of Computer Science founded 1965  
School of Computing created in 2000

## Research Expenditures

2007 – \$9.0M  
2008 – \$9.5M

## Faculty

33 regular faculty  
2 research faculty  
15 adjunct faculty

## Research Areas

Algorithms & Computational Geometry  
Architecture & VLSI  
Artificial Intelligence, Machine Learning  
and Natural Language Processing  
Computer Systems and Networks  
Databases and Information Management  
Educational Software Environments  
Formal Verification Methods  
Graphics, Visualization & Animation  
Image Analysis  
Programming Languages & Compilers  
Robotics  
Scientific Computation  
Virtual Environments

## Undergraduate Population

300 enrolled in computer science major  
110 enrolled in computer engineering major

## Graduate Population

64 in master's program  
104 in Ph.D. program

## Undergraduate Degrees

Bachelor's of Science in Computer Science  
Bachelor's of Science in Computer Engineering  
Bachelor's/Master's  
Entertainment Arts & Engineering Track

## Graduate Degrees

Master's in Computer Science  
Non-Thesis Master's in Computer Science  
Master's in Computing

- Robotics
- Graphics and Visualization
- Data Management & Analysis
- Computer Engineering
- Information Technology

Ph.D. in Computer Science  
Ph.D. in Computing

- Robotics
- Graphics and Visualization
- Scientific Computing
- Data Management & Analysis
- Computer Engineering



# MEASURES OF EXCELLENCE

- Claudio Silva received a 2007 IBM Faculty Award
- Suresh Venkatasubramanian was appointed the John E. and Marva M. Warnock Endowed Chair
- Juliana Freire received a 2008 IBM Faculty Award
- Juliana Freire received a 2008 NSF CAREER Award
- John Regehr was selected by the Pentagon's Defense Advanced Research Projects Agency (DARPA) to be a member of the 2008 DARPA Computer Science Study Group.
- Mike Kirby was awarded the Leverhulme Visiting Professorship, Department of Aeronautics, Imperial College London (UK)

## Best Paper Awards

### **"Semantics Driven Dynamic Partial-Order Reduction of MPI-based Parallel Programs"**

*Robert Palmer, Ganesh Gopalakrishnan and Robert M. Kirby*  
Parallel and Distributed Systems: Testing and Debugging 2007

### **"An Approach to Formalization and Analysis of Message Passing Libraries"**

*Robert Palmer, Michael DeLisi, Ganesh Gopalakrishnan and Robert M. Kirby*  
12th International Workshop on Formal Methods for Industrial Critical Systems 2007

### **"Transaction Based Modeling and Verification of Hardware Protocols"**

*Xiaofang Chen, Steven M. German and Ganesh Gopalakrishnan*  
TECHCON 2007

### **"Querying and Creating Visualizations by Analogy"**

*Carlos Scheidegger, Huy Vo, David Koop, Juliana Freire, and Claudio Silva*  
IEEE Transactions on Visualization and Computer Graphics 2007

### **"Architecting Efficient Interconnects for Large Caches with CACTI 6.0"**

*Naveen Muralimanohar, Rajeev Balasubramonian, and \* Norm Jouppi*  
IEEE Micro's Special Issue on Top Picks from 2007 Computer Architecture Conferences

\* Norm Jouppi, HP Labs

### **"Population Shape Regression From Random Design Data"**

*Elizabeth Bullitt\*, Brad Davis\*, Sarang Joshi and Tom Fletcher*  
IEEE International Conference on Computer Vision 2008  
David Marr Prize

\* Elizabeth Bullitt & Brad Davis, University of North Carolina - Chapel Hill

### **"Optimal Bandwidth Selection for MLS Surfaces"**

*Hao Wang, Carlos Scheidegger and Claudio Silva*  
IEEE International Conference on Shape Modeling and Applications, 2008

### **"Volumetric Parameterization and Trivariate B-spline Fitting using Harmonic Functions"**

*Tobias Martin, Elaine Cohen and Mike Kirby*  
ACM Solid and Physical Modeling International Conference 2008

### **"TRaX: A Multi-Threaded Architecture for Real-Time Ray Tracing"**

*Josef Spjut, Danny Kopta, Solomon Boulos\*, Spencer Kellis and Erik Brunvand*  
IEEE International Symposium on Application Specific Processors 2008

\* Solomon Boulos, Stanford University

### **"Sensor Node Localization Methods based on Local Observations of Distributed Natural Phenomena"**

*Felix Sawo\*, Thomas C. Henderson, Christopher Sikorski, and Uwe D. Hanebeck\**  
IEEE Conference on Multisensor Fusion and Integration 2008

\* Felix Sawo & Uwe D. Hanebeck, Universitaet Karlsruhe, Germany

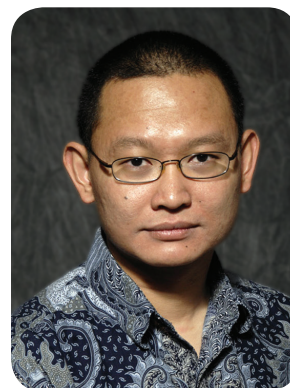
# ARRIVALS - NEW FACULTY



**Erin Parker**  
Assistant Professor, Clinical



**Peter Jensen**  
Assistant Professor, Clinical



**Marcel Prastawa**  
Research Assistant Professor



**Adam Bargteil**  
Assistant Professor



**Thomas Fletcher**  
Assistant Professor



**Guido Gerig**  
Professor



**Mary Hall**  
Associate Professor



**Matthew Might**  
Assistant Professor



**Valerio Pascucci**  
Associate Professor



# DEPARTURES



**Jay Lepreau**  
1952 - 2008

Jay Lepreau passed away September 15, 2008 due to pneumonia, a complication resulting from his battle with cancer.

Jay was an enthusiastic and productive researcher, a dedicated mentor of students and staff, and an avid participant in outdoor activities such as camping and bicycle racing. His loss will be felt by all who

knew him, both within the computer science community and elsewhere. See page 79 for more information.



**John Carter**

John Carter left the School of Computing in June 2008 to work at IBM in Austin, Texas. John holds has an Adjunct Professor appointment in the School.

## School of Computing professors take positions with company acquired by Nvidia

In May 2008, NVIDIA announced that they had acquired RayScale, a Salt Lake company that specializes in interactive ray-tracing technology. The start-up company is the product of decade long ray-tracing research done at the University of Utah.



In June 2008, Pete Shirley and Steve Parker left their professor positions in the School of Computing to serve as Chief Technology Officer and Chief Architect for the company. Both professors were instrumental in starting the company and have been highly involved in ray tracing research.

Pete and Steve continue to work with the School, both hold appointments as Adjunct Professors, they teach and advise students and are involved with the NVIDIA CUDA Center.

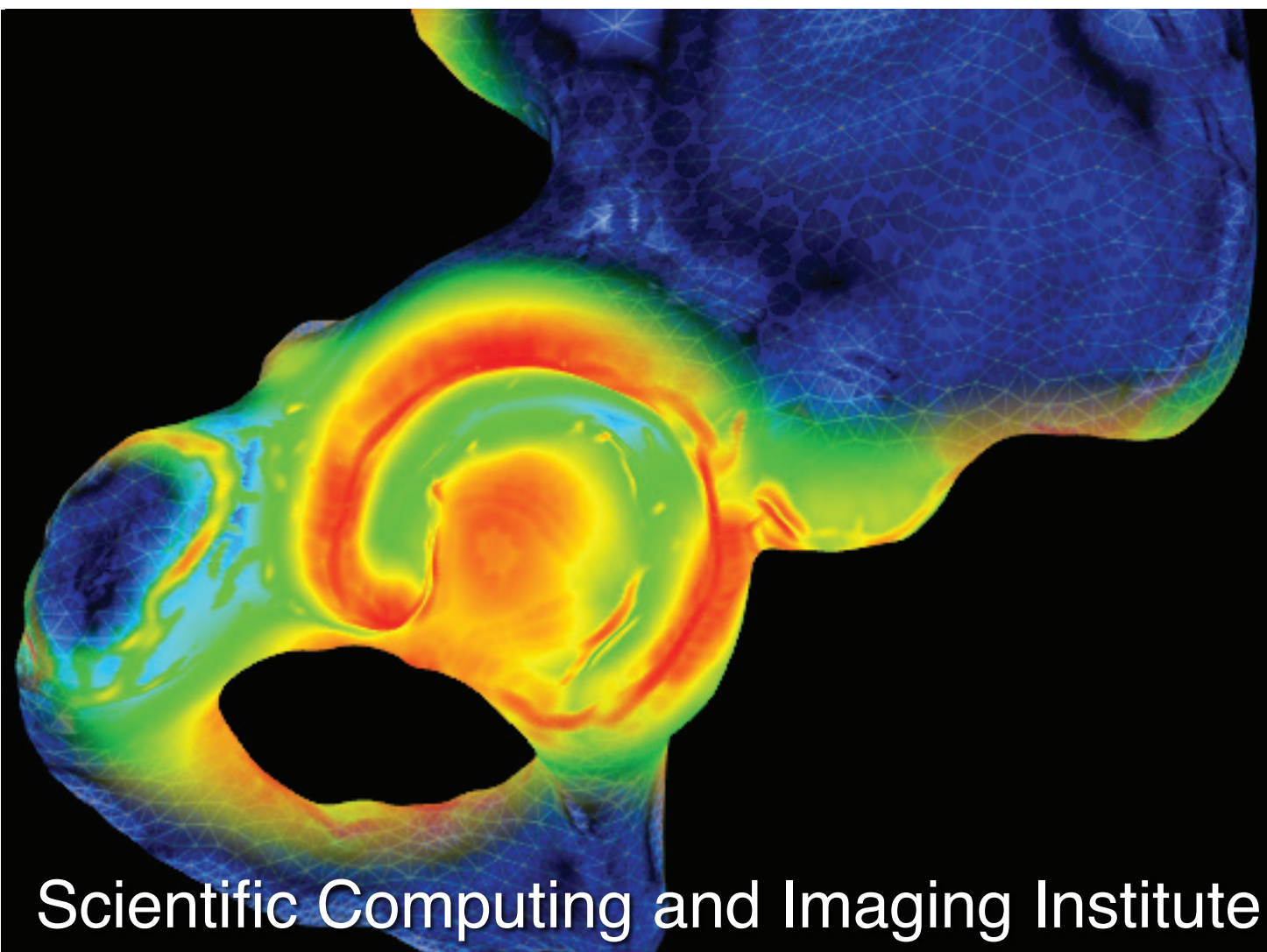


**Steve Parker**

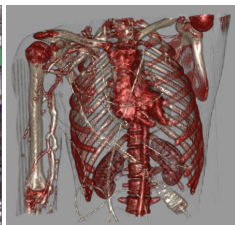
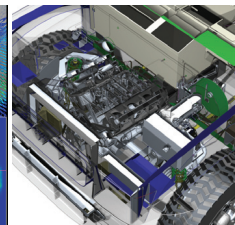
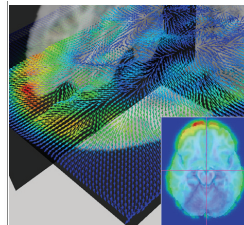
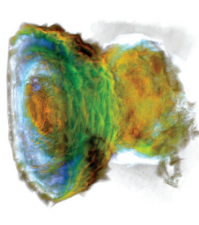
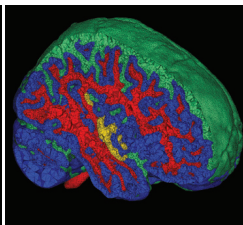
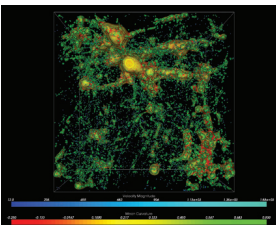


**Pete Shirley**

Ray Tracing is a technique for rendering three-dimensional graphics with extremely complex light interactions, allowing the creation of transparent surfaces and shadows, for example, with stunning photorealistic results.



## Scientific Computing and Imaging Institute



The Scientific Computing and Imaging (SCI) Institute is a permanent research institute at the University of Utah. Founded and Directed by Distinguished Professor Chris Johnson, the Institute is now home to over 145 faculty, students, and staff. The faculty, drawn from the School of Computing, Department of Bioengineering, Electrical and Computer Engineering Department, and Department of Radiology is noted for its breadth of collaborations locally, nationally, and internationally.

The SCI Institute has established itself as an internationally recognized leader in visualization, scientific computing, and image analysis. The overarching research objective is to create new scientific computing techniques, tools, and systems that enable solutions to problems affecting various aspects of human life. A core focus of the Institute has been biomedicine, but SCI Institute researchers also solve

challenging computational and imaging problems in such disciplines as geophysics, combustion, molecular dynamics, fluid dynamics, and atmospheric dispersion.

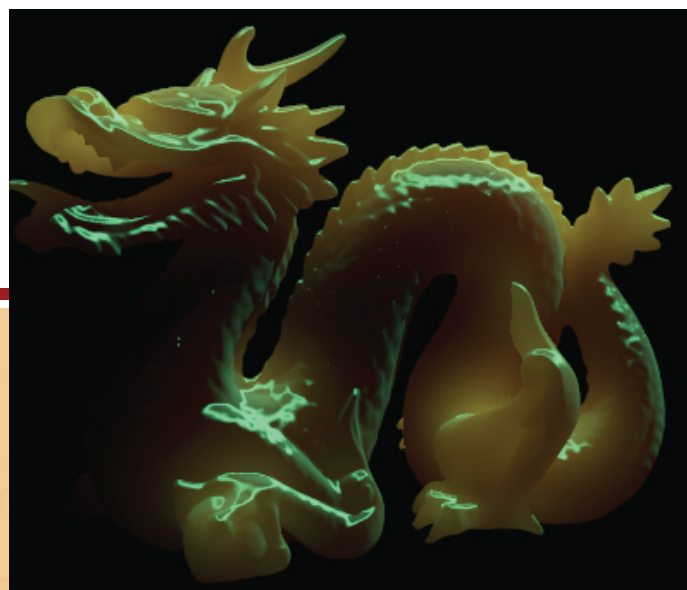
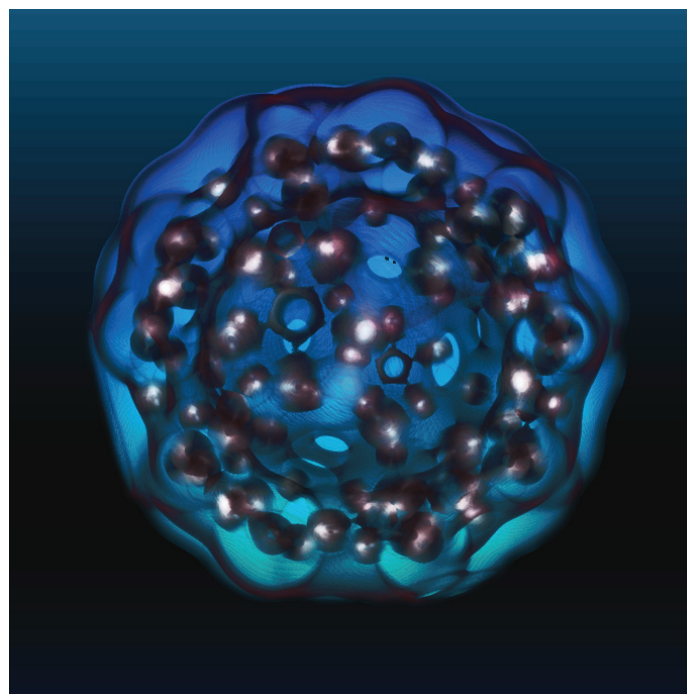
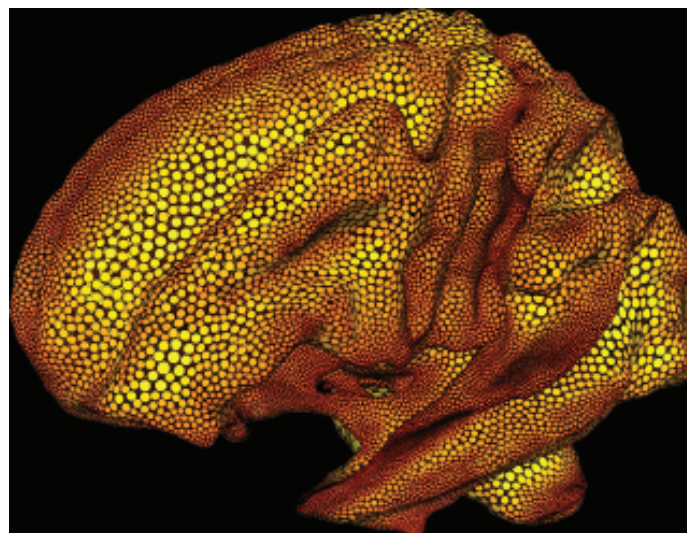
SCI Institute research interests generally fall within four core tracks. The first track involves research into new techniques for scientific visualization and the development of visual analysis tools to facilitate understanding of increasingly complex and rich scientific data. The second track focuses on technical research into computational and numerical methods requisite for scientific computing. The third track involves creating new image analysis techniques and tools. The final track emphasizes research and development of scientific software environments. SCI Institute researchers also apply many of the above computational techniques within their own particular specialties, including fluid dynamics, atmospheric dynamics, biomechanics, electrocardiography, bioelectric fields, adaptive techniques, parallel computing, inverse problems, and medical imaging.



The SCI Institute currently houses the NIH Center for Integrative Biomedical Computing (CIBC), the USTAR Utah Center for Neuroimage Analysis (UCNIA), and the Utah Center for Computational Earth Sciences. The Institute is also associated with several additional national research centers, including the DoE Center for the Simulation of Accidental Fires and Explosions (C-SAFE), the DoE Visualization and Analytics Center for Enabling Technologies (VACET), the DoE Scientific Data Management Center, the DoE Center for Technology for Advanced Scientific Component Software (TASCs), the NIH National Alliance for Medical Image Computing (NA-MIC), and the NIH Center for Computational Biology. The SCI Institute has also housed three Utah Centers of Excellence including the Center of Scientific Computing and Imaging; the Center for Interactive Ray-Tracing and Photo-Realistic Visualization; and the Center for Management of Provenance and Exploratory Workflows.

A particular aim and hallmark of SCI Institute research is the development of innovative and robust software packages, including the SCIRun scientific problem solving environment, Seg3D, BioTensor, map3d, and VisTrails and make them broadly available to the scientific community under open source licensing.

In addition to its academic mission the SCI Institute is also fully engaged in entrepreneurial efforts, in fact, SCI technology has served as the origin of several Utah companies including: Visual Influence, Inc., RayScale, Inc., Numira Biosciences, Inc. and the most recently created SCI Institute company, VisTrails, Inc.



[www.sci.utah.edu](http://www.sci.utah.edu)

# The Flux Research Group

Researchers in the area of systems software work with the computing infrastructure that most people take for granted. This includes operating systems, virtual machines, compilers, and middleware. All this software must be reliable and secure because it is the foundation that supports all of a computer's applications. However, building reliable systems software is an extremely challenging endeavor. It is challenging because systems software must deal with the complexity and hazards of the real world: complex hardware, limited resources, concurrent activities, real-time deadlines, machine and network failures, network attacks, and on and on. At the same time, systems software is expected to provide rich features to application programmers and computer users.

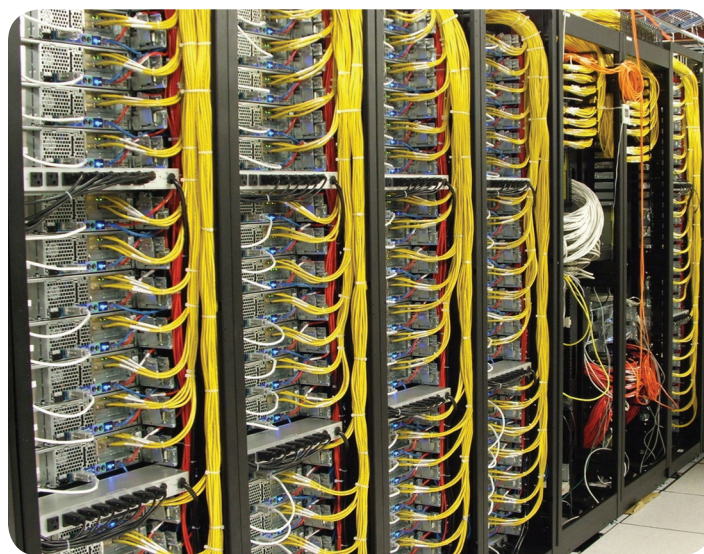
The School of Computing's Flux Research Group is attacking the challenge head-on. Founded by Prof. Jay Lepreau in the mid-1990s, the Flux Group invents and tests visionary ideas that make systems software more reliable, more flexible, easier to build, and easier to use. The group includes faculty, research staff, graduate students, and undergraduates who work together to tackle the problems of modern systems design and implementation. Their approach is to test new solutions in the context of the real world. This means working with large-scale and distributed systems, with legacy software and programming languages, and with real users. The result is that Flux research leads to real-world impact, both in delivered software and in proven ideas.

Sadly, Prof. Jay Lepreau passed away on September 15, 2008 due to complications of cancer. His loss is felt by all who knew him, both within the computer science community and elsewhere. To honor his many contributions to the systems field, the School of Computing is establishing a new faculty position, the Jay Lepreau Professorship of Computer Science.

The Flux Group is now led by several of the systems faculty and staff that Jay helped bring together at Utah. With both ongoing and new projects, they are continuing and growing the group's legacy of success in many areas of systems research.

**Languages, Components, System Structure, and Security.** The Flux Group has a long history of advancing language and component technology, especially in the context of operat-

ing systems. Their advances include the OSKit component collection, the Knit composition language, and multiple contributions to operating systems based on safe languages. For example, the Flux Group used Java to create the KaffeOS and Janos operating systems: this work directly shaped JSR-121,



Emulab network testbed

the Java Application Isolation API Specification. More recently, members of Flux used safe dialects of C to create operating systems that are both reliable and extensible. The STP system lets machines use untrusted mobile code, written in safe C, to remotely upgrade each other's network protocols while protecting both the hosts and network. The Safe TinyOS system uses a safe dialect of C in conjunction with static program analysis to increase the reliability of software that runs on embedded and networked sensors. Utah's Safe TinyOS software was incorporated into the primary TinyOS software distribution, which is used by hundreds of sensor-network projects worldwide.

The Flux Group also does "pure" OS work with impact. For example, well before virtual machines resurged in popularity, Flux pushed the limits of VM-based operating systems by developing a fully recursive OS called Fluke. Motivated by Fluke's strong protections, the National Security Agency worked closely with Flux to refine a flexible security architecture and integrate it with Fluke. This architecture broke new ground in terms of policy flexibility. It is also the security architecture in today's leading secure Linux, SELinux, now supported by the mainline Linux kernel.

**Network Testbeds and Experimental Environments.** Today, the Flux Group is perhaps best known for inventing



Jay Lepreau



and operating Emulab. Emulab is not only a highly successful and general-purpose testbed facility but also a cutting-edge software platform: an “operating system” for network and distributed-system experimentation. Emulab established the automated cluster testbed as a new way to perform experimental research, addressing the resource allocation, virtualization, security, management, and performance challenges of such testbeds. Emulab’s architecture supports over a dozen device types while abstracting over them in interfaces and software. Devices range from PCs to software radios, from specialized network processors to wireless links—all integrated in a common framework and presented through common interfaces.

Today, Emulab is a central resource for the systems research community. Utah’s testbed supports over 2,200 users from more than 340 institutions, who run over 14,000 experiments a year. More than two dozen other Emulab facilities around the world support many more users; these testbeds also support ongoing collaborations between the Flux Group and many university and industrial partners. The Utah Emulab Web site lists more than 250 publications that describe experiments performed on Emulab-based testbeds.

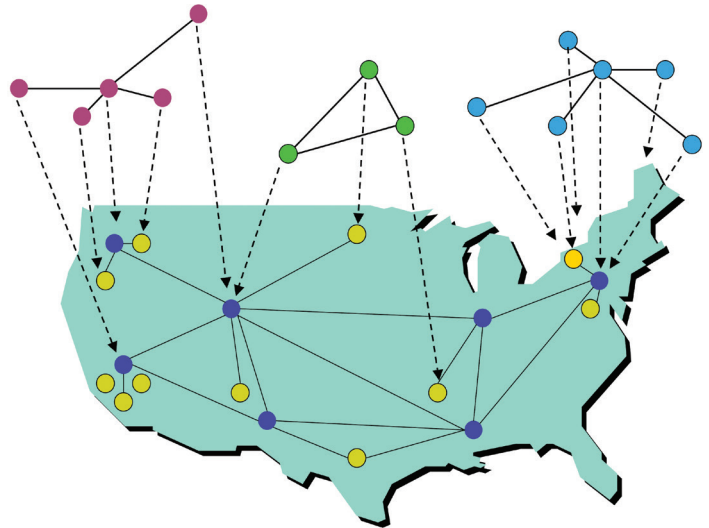
The Flux Group uses Emulab both for its own innovative research and for deploying the resulting solutions. For example, Emulab is one of the bases of a new Flux project called ProtoGENI.

ProtoGENI is the first network funded by the NSF to prototype the NSF’s Global Environment for Network Innovation (GENI) architecture. Currently being designed and deployed, ProtoGENI will be a highly distributed network with PCs, programmable networking devices, wireless equipment, and sensor-network nodes spread across 100+ sites in the USA. Many of these sites will be connected by a dedicated 10 Gbps nationwide backbone, allowing ProtoGENI to be a first-of-its-kind “network embedding service” for cutting-edge research. It will provide experimenters with a wealth of resources—both dedicated and shared—and almost complete top-to-bottom control over those resources. With initial availability in 2009, ProtoGENI will be a platform for designing and testing radical new ideas in large-scale networks and distributed systems. These new ideas will drive the complete GENI facility and, possibly, a next-generation Internet.

**Improving the Scientific Process.** Finally, the Flux Group is looking at ways to improve the entire scientific process in experimental computer science research—and eventually, perhaps in other scientific domains.

The Flux Group is evolving Emulab into an experimentation

workbench that helps users manage their activities and data, using concepts from scientific workflow. The idea is to change the way that researchers approach their work in Emulab: to graduate from running isolated experiments and move toward the notion of managing entire courses of study. The ultimate goals of the project are to change how systems research is done and to advance science within the systems community.



ProtoGENI’s network embedding service

Emulab provides a unique environment in which this kind of scientific workflow management can succeed.

Testbeds like Emulab changed systems research by enabling realistic research at scale. Now, the workbench seeks to change the scope of activities that can be managed by testbeds and similar facilities. The Flux Group envisions that tomorrow’s Emulab-derived software could be central in managing all aspects of systems experimentation. It is another example of the Flux Group’s approach to performing leading-edge systems research: visionary goals for future computer systems, combined with the group’s deep and broad technical experience, and driven by a pragmatic, incremental, and user-focused philosophy.

**In summary,** the Flux Research Group catalyzes the transition from today’s systems research to tomorrow’s systems practices. From languages to operating systems, from testbeds to scientific workflow, the Flux Group brings a wide range of new ideas to bear on real-world problems. It makes new solutions available to users through continual publications, software distributions, online services, and academic and industrial collaborations. In short, Flux has impact.

# NVIDIA CUDA CENTER OF EXCELLENCE

## Nvidia Recognizes the University of Utah as a CUDA Center of Excellence

On July 31, 2008, NVIDIA Corporation, the worldwide leader in visual computing technologies, announced that the University of Utah had been recognized as a CUDA Center of Excellence.

NVIDIA® CUDA™ technology is a parallel computing architecture, accessible to software developers through industry standard programming languages.

The University of Utah is the second school to be recognized as a CUDA Center of Excellence along with the University of Illinois at Urbana-Champaign. Over 50 other schools and universities now include CUDA technology as part of their Computer Science curriculum or in their research.

Together, NVIDIA and the University of Utah will continue this industry-changing work and deliver technologies that harness the processing power of the GPU (graphics processing units) and the award-winning CUDA programming environment.

As a CUDA Center of Excellence, the University of Utah will be using CUDA technology extensively across three faculties:



### Scientific Computing and Imaging (SCI) Institute

The SCI Institute has established itself as an internationally recognized leader in visualization, scientific computing, and image analysis. The overarching research objective of the SCI Institute is to create new scientific computing techniques, tools, and systems that enable solutions to important problems in biomedicine, science, and engineering. For more information: [www.sci.utah.edu](http://www.sci.utah.edu)



### School of Computing

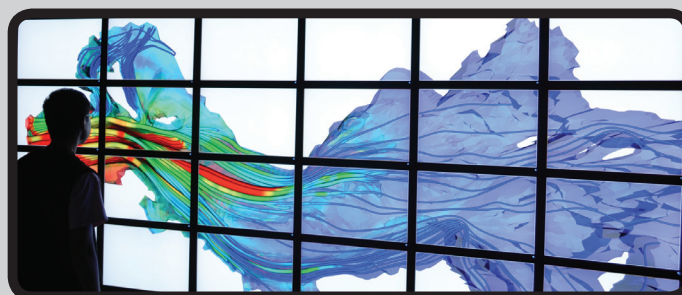
The School of Computing has a long history of distinguished faculty and alumni who have made substantial contributions to research and industry. For more information: [www.cs.utah.edu/school/history](http://www.cs.utah.edu/school/history). The CUDA Center will play a key role in the School's new Digital Media Initiative linking Computing with Fine Art and Film and funded by the USTAR Initiative



### Center for the Simulation of Accidental Fires and Explosions (C-SAFE)

As one of the Department of Energy's five Advanced Simulation and Computing (ASC) centers, Utah runs detailed simulations of high energy devices and hydro-carbon fires, designed to increase the safety of dangerous material transportation and storage.

The SCI Institute and School of Computing and the University of Utah are building a large GPU computing cluster that consists of 32 NVIDIA S1070 systems (128 GPUs). The GPUs are connected to 64 high-end CPU workstations by a high-speed Infiniband network, purchased with grants from NSF, NIH, and USTAR. The new high performance computing system will have a peak performance of over 128 Teraflops. This supercomputer will enable innovative computational research ranging from the computation of brain anatomical atlas construction from MRI images to the development of new algorithms for the visualization of extremely large datasets. The system also includes state-of-the-art display capabilities, including a 100 megapixel display wall (shown).



Using VisTrails, researchers can create large visualizations from complex data sets relatively easily and inexpensively. Here a simulation from the NSF Center for Coastal Margin Observation & Prediction (CMOP) shows an oceanographic simulation of a river, with streamlines colored according to fluid vorticity.



# NEW PROGRAMS

## NSF IGERT grant in Biocentric Robotics

The robotics group from the School of Computing and the Department of Mechanical Engineering was awarded an NSF Integrative Graduate Education and Research Traineeship (IGERT) grant (John Hollerbach, PI). This five year program totalling \$2.4M provides fellowships and specialized training in Biocentric Robotics. The fellowships support ten students a year with a generous \$30,000 stipend and should boost the visibility of the SoC's new Robotics Track degree program and amplify the natural synergies that exist between the SoC and ME robotics faculty.



The theme of Biocentric Robotics comprises (1) robots that physically interact with people for medical and quality of life purposes (medical robots, rehabilitation robots, physical assistance robots), and (2) robots designed according to biological principles to achieve advanced capabilities. To support the Biocentric Robotics theme, a comprehensive educational program has been designed. New courses will be offered to impart relevant knowledge of biological systems (physiological modeling and bioinstrumentation), and to train students in the componentry (sensors, actuators, mechatronic design) needed

to build advanced robot systems. Two new laboratory spaces for teaching and research (a small workspace lab for subsystem design and a large workspace lab for robots to move around in) are planned. New trainees will start their fellowships with research lab rotations the summer before classes start and go through a specific interdisciplinary program of study during the year.

An additional aspect of the IGERT is a substantial outreach effort. A number of LEGO robotic competition clubs are planned at different school levels, using both faculty and trainee involvement. The goal is to use robotics as a hook to entice K-12 students into interest in a college technical degree, a purpose that robotics is uniquely positioned for. Information programs for undergraduate women and minorities already at the University of Utah are planned. The minority institutions Montana State University (American Indians) and North Carolina Agricultural and Technical State University (African Americans) will participate in exchange visits.



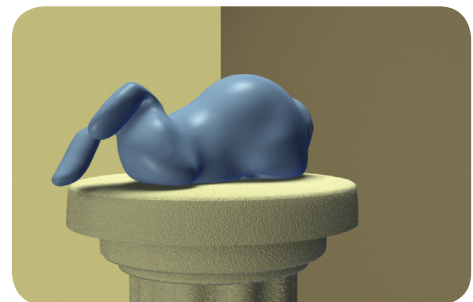
For more information go to <http://robotics.eng.utah.edu/IGERT>

## New Digital Media Program

The School of Computing along with the College of Fine Arts has introduced a new Digital Media Program as part of the Utah Science Technology and Research initiative (USTAR).

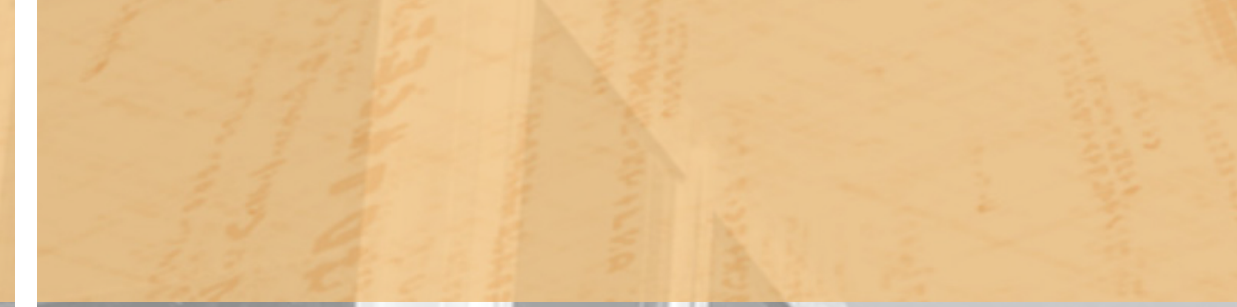
Digital media is at the confluence of computer science (graphics, animation, human-computer interfaces, computer games), the fine arts (drawing, animation, story telling, cinematography), and architecture (design, modeling). This new program will build on existing strengths in graphics, animation and art already present here at the university.

The program will target a senior hire in computer science and a senior hire in film studies with the potential of helping build major research programs and creating new technology that can ultimately lead to commercial products and/or new industries for Utah.



This image is from an animation that demonstrates a finite element method for animating large viscoplastic flow. After a fall down some stairs portions of the bunny become soft and droop due to work softening.

# RESEARCH @ THE SCHOOL OF COMPUTING



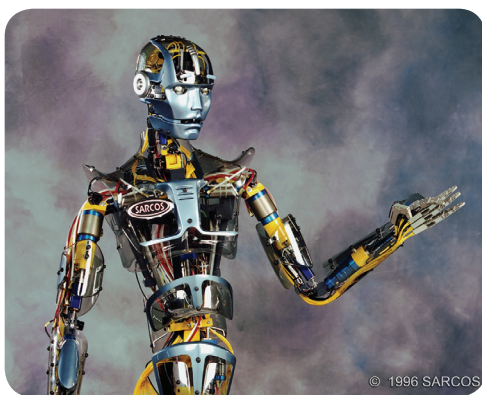


# ARTIFICIAL INTELLIGENCE

## Robotics

The robotics group conducts research on a wide variety of topics, particularly mobile robots, haptic interfaces, novel sensor and actuator systems, and intelligent sensor networks.

A variety of move mobility platforms are being developed for traversing varied terrain. For rough terrain, approaches include bipedal and quadrupedal legged robots, compliant-framed wheeled robots, and hybrid robots with legs that tuck into a ball for rolling downhill. Climbing robots include insect-like robots that utilize claws and spines to adhere to small features even in nearly smooth walls, and robot snakes that can crawl through pipes. Ornathopters (flying robots) are also being developed using flapping wings for lift.



Haptic interfaces are robot devices that physically interact with humans, and include both manual interfaces and locomotion interfaces. The virtual prototyping project seeks to add a sense of touch to the mechanical design process. Aside from feeling the force of contact, the tactile feel of contact is also being provided by pressing on the fingertip with a moving indenter that simulates the point of contact. A method of measuring human grasp force is being developed, utilizing imaging coloration changes in a fingernail with a camera. The Sarcos Treadport Locomotion Interface seeks to provide a multi-sensory experience of walking, including visual, mechanical, auditory, and wind displays.

Wet robots are being developed that embed Shape Memory Alloy “muscles” within a network of biologically inspired “robotic blood vessels” that fluidically distributes thermal energy to and from any actuators in the array using only a small number of valves. Smart sensor networks are being developed that are capable of computation, communication and sensing for many distributed sensors.

## Natural Language Processing

The goal of natural language processing (NLP) research is to create computational models for understanding natural languages, such as English. The natural language processing group at Utah works in several application areas, including Information Extraction, Opinion Analysis, and Summarization. Information Extraction systems identify important facts associated with events, such as the perpetrators and targets of a terrorist attack or the disease names and victims associated with an infectious disease outbreak. Opinion Analysis systems determine whether a sentence or document is expressing an opinion or judgment, which is useful for classifying reviews, analyzing product reputations, and answering questions. Summarization systems automatically identify and condense the aspects of collections of source materials that are relevant to a user into a summary. The NLP group at Utah also specializes in techniques that can automatically learn dictionaries and linguistic knowledge from raw text. Our group has developed a variety of learning techniques and bootstrapping algorithms for learning extraction patterns, semantic dictionaries, opinion clues, and knowledge for coreference resolution.

## Machine Learning

Machine learning technology aims to solve problems of inference and prediction: based on past data, we desire algorithms that can reliably forecast the future. Machine learning techniques have led to significant advances in the fields of natural language processing, computational biology, robotics and medicine. The machine learning group at Utah works in several areas, ranging from basic technology building to application development and from mathematical modeling to algorithmic implementation. These areas include structured prediction, domain adaptation, semi-supervised learning, bootstrapping and Bayesian statistics. Structured prediction aims at developing algorithms that can predict complex outputs, such as those found in natural language or biology. Domain adaptation, semi-supervised learning and bootstrapping address the frequently occurring problems of mismatches between past data and anticipated future data. Our work has led to significant advances in a variety of application domains, including natural language processing and data mining.

Faculty: Hal Daume III, Tom Henderson, John Hollerbach, Ellen Riloff

# COMPUTER SYSTEMS

## Architecture & VLSI

Computer architecture and VLSI design are inexorably intertwined. At Utah, Architecture and VLSI researchers are tackling issues related to the synergy of these fields, including multiple efforts to understand and reduce the architectural impact of interprocessor communication and a project designing custom hardware for interactive ray tracing.

On modern multi-core chips, it is critical that on-chip interconnects and coherence protocols enable fast and power-efficient data transfers between parallel threads. Professor Balasubramonian's research focuses on architectural mechanisms to improve the efficiency of on-chip communication by employing heterogeneous wires, novel interconnect topologies, and optimal caching structures. He is also involved in efforts to minimize on-chip communication with intelligent placement of data in large caches and with scalable transactional memory protocols. He and Professors Davis and Hall are also collaborating to optimize on-chip memory controller organizations in future multi-cores.

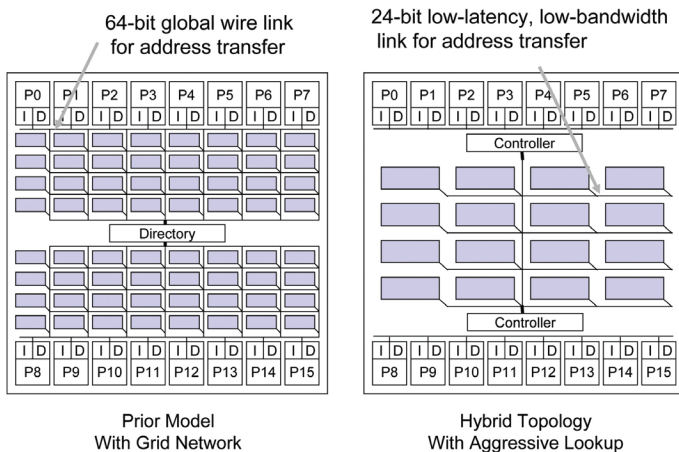
Professors Brunvand and Davis, in conjunction with computer graphics colleagues, are designing special-purpose hardware for ray tracing, a form of computer graphics that generates much higher quality and more realistic images than commodity graphics chips. The resulting processor employs multiple ray tracing pipelines and is based on previous work designing domain specific processors that support run-time configuration of the datapath. This allows it to operate at very close to the speed and power efficiency of a fully custom pipeline, but with enough programmability so that a variety of ray trace algorithms can be supported.

## Parallel Computing

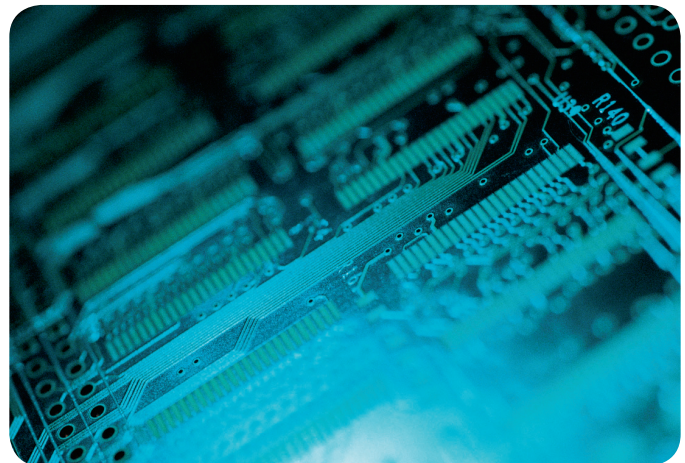
We are entering the multi-core era where every computer, whether embedded, laptop, desktop, server or supercomputer, is a parallel computer. As parallel computing is reaching the masses, faculty at Utah are developing new courses and expanding their research to embrace the changes in programming tools and systems software that naturally must arise in response to this paradigm shift, in collaboration with the previously-described architecture and VLSI research in this area.

Professor Hall is developing performance tuning tools, called autotuners, designed to ease the programming burden in the face of the growing complexity and diversity of modern computer architectures. Autotuners experiment with a set of alternative strategies for mapping application code to hardware to automatically select the mapping that yields the best performance. Such programming tools increase programmer productivity by reducing the effort of porting to new architectures, and empowering the programmer to maintain code that is simpler, and architecture independent.

Advances in parallel computing are ultimately tied to delivering correct and efficient systems. Professor Gopalakrishnan's group is developing push-button formal verification tools that can accept C programs written using the MPI, Pthread, and MCAPI (multicore communications API) libraries, and automatically seek deadlocks, resource leaks, and assertion violations. These techniques are based on automatically instrumenting the program and running them under the mercy of a *verification scheduler*. This scheduler plays out one interleaving (schedule), analyzes process/thread action dependencies in the schedule, and (for each dependency) forces another replay, till the interleaving space (inherently exponential) has been parsimoniously examined. Using this technique, their tool ISP (joint work with Professor Kirby) recently took a 14KLOC MPI/C



CMP Organization with a Large L2\$





program, determined the program to have only one *relevant interleaving*, and hence finished verification in a few seconds. Similar results are being obtained for Pthread and (soon) MCAPI code.

### Mobile & Embedded Systems

Mobile and embedded computer systems have become pervasive in all aspects of human life: transportation, entertainment, communication, etc. This trend will continue. Professor Kessler's group is working on context-aware web search systems where context can include physical location and activity type.

Professor Regehr's efforts address problems in creating dependable embedded software, particularly for highly constrained platforms. His group has created tools that take existing sensor network applications and enforce type-safe execution, detect the possibility of stack overflow, and reduce RAM usage using data compression techniques. Professor Davis' group is designing high performance, low-power, flexible domain-specific architectures which do things like speech and visual feature recognition. They are also designing tools to automate the design process.

### Networking & OS

Computer systems research at Utah spans operating systems, distributed systems, networking, and security. Much of this work is done in collaboration with researchers in programming languages and compilers, mobile and embedded systems, software engineering, and formal methods.

The Flux Research Group, led by several systems faculty and senior technical staff, develops the internationally acclaimed Emulab network emulation testbed. Technologies and ideas from Emulab will help form the basis of NSF's new GENI network instrumentation and experimentation infrastructure. Current Flux projects also include building an experimentation workbench, which integrates scientific workflow with Emulab, and developing a programmable

wireless testbed using software radios. Past projects include operating systems like Fluke and Janos, which pushed the envelope in terms of OS design and features.

Professor Kasera's networking research encompasses mobile systems and wireless networks, network security, new network architectures, and networks measurements. Ongoing research includes developing novel methods for enhancing wireless network security using unique device fingerprints and link signatures, developing distributed medium access protocols for next generation wireless communication technologies, building social networking platforms to facilitate collective decision making, and building robust overload control. Professor Kasera's group is also building mobile ad hoc network routing and security using accurate network performance characterizations and cross layer approaches.

### Programming Languages & Compilers

Professor Flatt's group is investigating how multiple programming languages can be made to interoperate without forcing all interactions to be defined in terms of a single shared language (such as JVM bytecode). They are also exploring how individual programming languages can be made more extensible.

Professor Kessler's research group is developing a new requirements specification technique that incorporates use cases, class diagrams and simple state machines to automatically generate concrete scenarios for the various stakeholders. They are also working on an investigation into techniques to improve meta-modeling in UML.

Professor Hall's research group is developing compiler optimization technology that exploits performance-enhancing features of modern architectures, including multi-core microprocessors, SIMD compute engines, accelerators, complex memory hierarchies, and software-controlled storage.

Professor Might's research team investigates software analysis technology that optimizes performance, detects security vulnerabilities, improves parallelism and eliminates bugs.



Testbed

**Faculty: Rajeev Balasubramonian, Erik Brunvand, Al Davis, Matthew Flatt, Mary Hall, Sneha Kasera, Robert Kessler, Matthew Might, John Regehr**

# COMPUTER GRAPHICS

## Geometric Design and Computation

The Geometric Design and Computation group is engaged in both fundamental and applied research in developing methods for representing, specifying, manipulating, and visualizing geometric models. The group has projects ranging from early conceptual design methods to innovative manufacturing processes and from detail modeling applications to large-scale assembly systems. Supporting these applications is fundamental work on surface and model representation, computational geometry, topology, differential geometry, and numerical methods.

## Perception

Perception research focuses on two complimentary goals. One aims to increase the effectiveness of computer graphics in conveying information about the three-dimensional world. We are interested in better understanding the spatial information potentially available in CG imagery, determining what spatial cues are actually used when CG imagery is viewed, and using this information to inform the development of improved rendering algorithms. A major thrust of this work has been directed at improving the accuracy of spatial actions conducted within virtual environments. The other goal uses the tools of computer graphics and visually immersive environments to probe basic questions about human perception. We are exploring fundamental issues concerning the processes used to scale distance judgments and the interaction between visual perception and locomotion. This is an interdisciplinary effort involving computer graphics, perceptual psychology, and computational vision.

## Ray Tracing

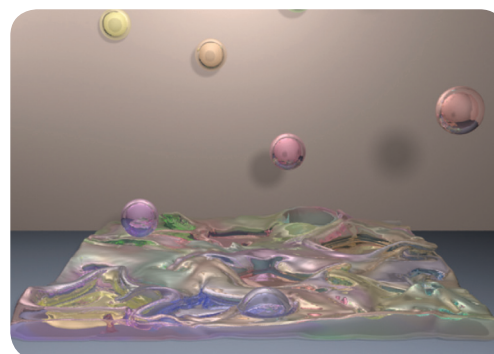
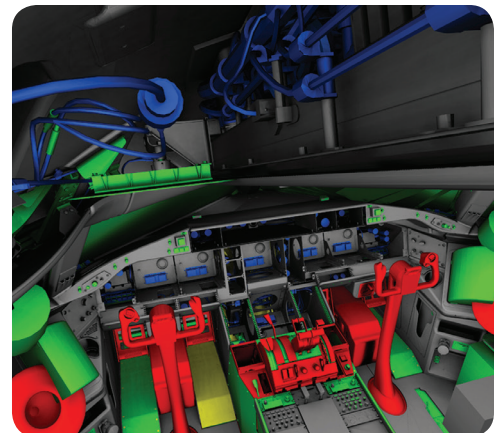
Interactive ray tracing research (IRT) at the University of Utah focuses on developing new algorithms and other optimizations for ray tracing complex scenes at multiple (15 or more) frames per second. Driven by applications in scientific visualization and traditional graphics, IRT uses only CPU resources to render datasets of hundreds of millions of polygons or tens of gigabytes of scientific data. Due to its lower complexity, IRT can actually outperform even high-end GPUs for large datasets. One large user of IRT is the University of Utah's Center for Simulation of Accidental Fires and Explosions, which employs our tools to visualize complex

datasets consisting of millions of particles representing an explosive device subjected to a fire. In addition to performance for large datasets, IRT enables use of more sophisticated shading techniques that enhance realism for graphics applications and help convey complex spatial information in scientific datasets.

## Simulation and Electronic Animation

While exploding trucks and collapsing buildings are rare occurrences in everyday life, they are frequently depicted in films, video games, and training simulations. Filming such effects in the real world can be dangerous and obtaining a specific outcome is often difficult. Consequently, such effects are increasingly generated through physical simulations where initial conditions and parameters can be tuned to produce the desired effect. Research in the Simulation and Electronic Animation Lab is focused on developing tools that allow artists to create high-quality, realistic, visually-detailed animations of complex materials for applications in computer graphics.

Mechanical component in a Boeing 777 rendered with Phong shading and shadows. Generated with the Manta Interactive Ray Tracing system. Dataset provided by Boeing Corporation.



This image is from an animation that demonstrates a method for tracking liquid surfaces. An invisible tank is filled as multicolored balls of fluid fall into it. The resulting surface contains complex geometric details which retain the different colors of the balls.

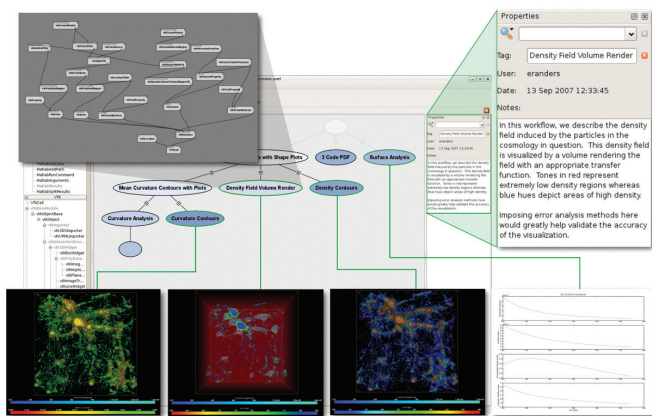
**Faculty: Adam Bargteil, Elaine Cohen, Sam Drake, Chuck Hansen, Rich Riesenfeld, Claudio Silva, Bill Thompson, Ross Whitaker**



# INFORMATION MANAGEMENT

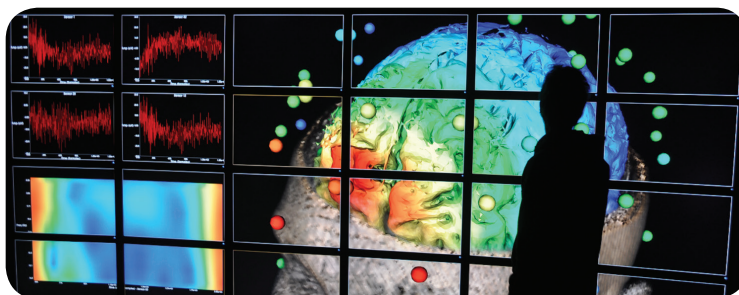
## Managing the Scientific Discovery Process

The Information Management group has been working on building new cyberinfrastructure that streamlines the creation, execution and sharing of complex visualizations, data mining and other large-scale data analysis applications. We developed VisTrails (<http://www.vistrails.org>), a new open-source, scientific workflow and provenance management system that was designed to manage rapidly evolving workflows common in exploratory applications. VisTrails provides novel mechanisms for capturing and interacting with provenance that greatly simplify the data exploration process. The system has been downloaded over 8,000 times since its beta release in Jan 2007. VisTrails has been adopted as part of the cyberinfrastructure in large scientific projects, as well as a teaching and learning tool in graduate and undergraduate courses, both in the U.S. and abroad.



VisTrails captures and manages the provenance of exploratory tasks, displayed here as a history tree where each node represents the workflow that generated a visualization. This tree allows access to previous workflow versions and to the precise actions that led to a particular result.

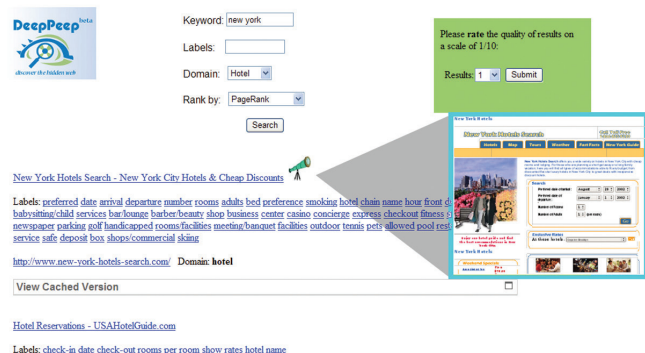
VisTrails allows the visualizations it generates to be rendered on a display wall. Here we show data collected in a study of the affects of repetitive transcranial magnetic stimulation on short-term memory. Using a 6x4 display wall to visualize disparate, multi-modal data provides adequate screen space to visualize each datum individually. This ability enhances the overall understanding of the dataset being studied as a whole.



## Large-Scale Web Information Integration

There has been an explosive growth in the volume of structured information on the Web. This information often resides in the *hidden* (or deep) Web, stored in databases and exposed only through queries over Web forms. A recent study by Google estimates that there are several millions of such form interfaces. However, the high quality information in online databases can be hard to find: it is out of reach for traditional search engines, whose index include only content in the surface Web.

Our group is combining techniques from machine learning, information retrieval and databases to build infrastructure that automates, to a large extent, the process of discovering and organizing hidden-Web data sources, a necessary step to large-scale retrieval and integration of Web information. This infrastructure will enable people and applications to more easily find the right databases and consequently, the hidden information they are seeking on the Web. We have used our hidden-Web infrastructure to build DeepPeep (<http://www.deeppeep.org>), a new search engine for Web forms.



DeepPeep is a search engine specialized in Web forms. It helps users discover the entry points to content in Deep Web (aka Hidden Web) sites, including online databases and Web services.

Faculty: Juliana Freire, Claudio Silva

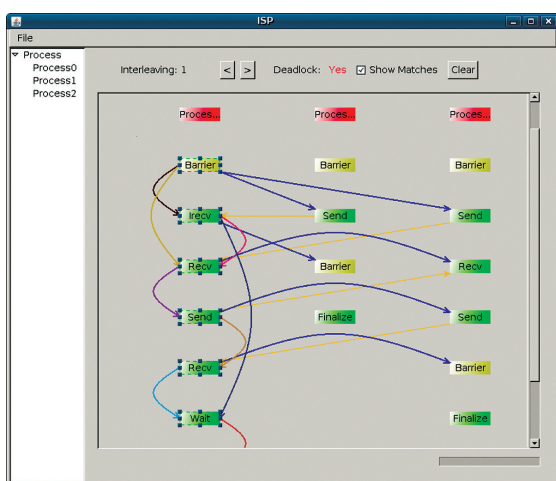
## Formal Methods and Verification

Research on formal methods in the School of Computing is unique in its tight integration with systems research activities at Utah and elsewhere.

In one research thrust, Profs. Gopalakrishnan and Kirby are collaborating to verify the correctness of communication structures in large-scale aggressively optimized parallel simulations written using the Message Passing Interface (MPI). Another effort led by Prof. Gopalakrishnan is aimed at improving the reliability of hardware cache coherence protocols through formal verification.

Prof. Slind is currently pursuing research on compiler correctness, with the goal of building validating compilers for security-critical applications. Such compilers formally prove the correctness of each successful run of the compiler. Security infrastructure, such as block ciphers and Elliptic Curve Cryptography are currently being used as examples. Prof. Slind also leads the development of the HOL-4 proof assistant, which is used in hardware and software verification.

Prof. Regehr's group builds tools that use lightweight formal methods to verify novel properties of embedded software. For example one tool uses abstract interpretation to bound the stack memory consumption of a compiled sensor network application. This is difficult because real embedded software uses many idioms that are hard to analyze, such as interrupts, recursion, and function pointers.

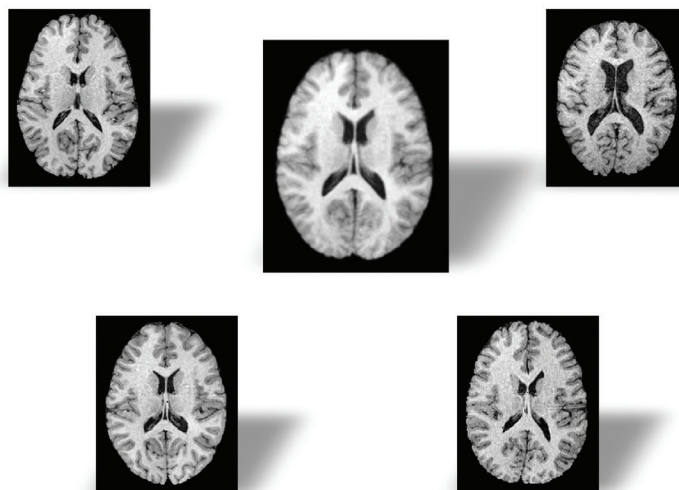


MPI Program Verification using the Utah ISP tool revealing a deadlock, and MPI call Completion Ordering

## Algorithms

Algorithms research at the School of Computing explores problems in numerous areas, including topics in massive data sets, data mining, computational geometry, shape analysis and data visualization. One strand of current research being developed by Prof. Venkatasubramanian deals with the computational challenges of doing statistics on large data sets, and how information-theoretic methods can be brought to bear on a variety of problems in data management, with application in general data cleaning scenarios, as well as bioinformatics.

Another research effort involves understanding algorithms in non-Euclidean spaces: a particular application of this effort is in the analysis of shape, particularly the shapes extracting from medical imaging modalities like MRI scanning and diffusion tensor imaging. Prof. Venkatasubramanian, together with Profs. Fletcher (CS) and Joshi (Bioengineering), is developing scalable, accurate algorithms for data analysis in non-Euclidean domains.



Four brain scans registered to a central atlas. Taken from Fletcher, Venkatasubramanian and Joshi, "The Geometric Median on Riemannian Manifolds with Application to Robust Atlas Estimation", Neuroimage, 2008

Faculty: Ganesh Gopalakrishnan, Mike Kirby,  
John Regehr, Konrad Slind

Faculty: Suresh Venkatasubramanian



# SCIENTIFIC COMPUTING

## Visualization

Scientific visualization, sometimes referred to as visual data analysis, is the graphical representation of data as a means of gaining understanding and insight into the data. Scientific visualization research at Utah has focused on applications spanning computational fluid dynamics, medical imaging and analysis, and fire simulations. Research involves novel algorithm development to building tools and systems that assist in the comprehension of massive amounts of scientific data. To comprehend spatial and temporal relationships between data, interactive techniques provide better cues and therefore, much of the scientific visualization research focuses on better methods for visualization and rendering at interactive rates.

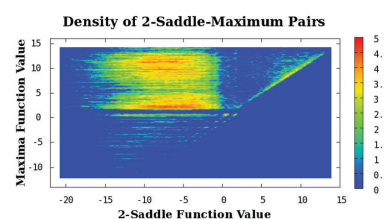
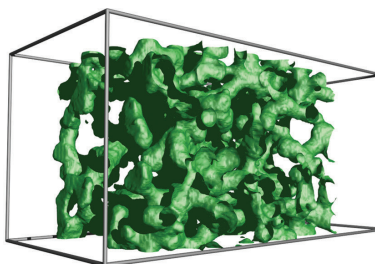
## Image Analysis

The School of Computing's research in image analysis addresses fundamental questions in 2D and 3D images and applications in a variety of fields including energy, defense, biology, and medicine. This research spans a wide range of areas including new methods for low-level image processing, such as filtering, segmentation, and surface reconstruction. Work on image analysis also focuses on statistical methods for analyzing shapes and applications of these methods to problems in medicine and biology. The work in image processing also includes applications of advanced computing to 3D images, which has resulted in new parallel algorithms and real-time implementations on graphics processing units (GPUs). A particularly important application area is neuroimage analysis, and collaborations with the University of Utah Brain Institute focus on disorders and diseases such as autism and Alzheimers. Examples are the analysis of diffusion-weighted MRI images for quantifying brain connectivity, the analysis of longitudinal pediatric images to understand brain development, and analysis of functional data for understanding brain function and the affects of disease. These applications drive the development of new methods for image processing, shape representation and analysis, and computational statistics.

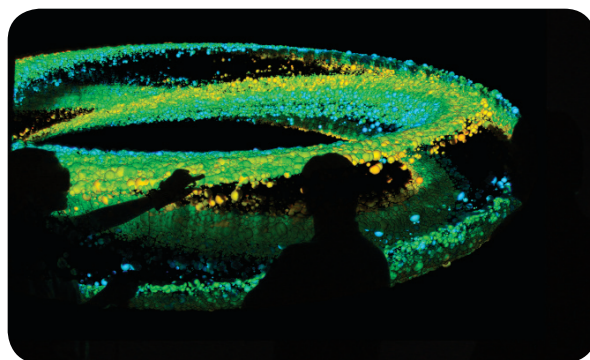
A visualization of a series of atomic particles that are part of a 3D simulation of magnetically confined fusion energy. Collaboration between Department of Energy researchers and the University of Utah (data courtesy Stephane Ethier of the Princeton Plasma Physics Laboratory)

## Simulation Science

The Scientific Computing faculty within the School of Computing perform cutting edge research in all of the aspects of the scientific computing pipeline: mathematical and geometric modeling; advanced methods in simulation such as high-performance computing and parallelization; numerical algorithm development; scientific visualization; and error quantification and evaluation. The School of Computing has scientific computing research efforts in a wide variety of areas, including adaptive methods, inverse and imaging problems, numerical analysis, uncertainty and error quantification, distributed and parallel computing, problem solving environments, integral methods, Monte Carlo algorithms, computational complexity and computational science applications. Students at both the undergraduate and graduate level working under faculty guidance are able to apply this knowledge to real-world problems in important scientific disciplines, including combustion, mechanics, geophysics, fluid dynamics, biology, and medicine. A collaborative base provides students with tremendous flexibility to seek out science which interests them, and strong mentoring from scientific computing track faculty enables students to mature as scientists.



Level set of scalar field representing the porous medium and histogram of the full topology of the volume represented as saddle-maximum pairs.



**Faculty: Martin Berzins, Thomas Fletcher, Guido Gerig, Chuck Hansen, Chris Johnson, Mike Kirby, Valerio Pascucci, Kris Sikorski, Claudio Silva, Ross Whitaker**



Technology will change, but a strong foundation in the core discipline of computer science prepares our graduates for work in industry or for graduate school. The School of Computing offers the only nationally ranked BS computer science degree program in Utah.

## COMPUTER SCIENCE

The School of Computing at the University of Utah has a long history of distinguished faculty and alumni who have made substantial contributions to research and industry. The School of Computing offers the only nationally ranked BS computer science degree program in Utah and is consistently rated in the top 50 computer science departments in the country. The undergraduate program provides a firm grounding in programming skills, followed by a study of more advanced topics such as algorithm analysis, software engineering, computer architecture, and systems programming. Beyond this level, students have complete flexibility in selecting from a wide selection of elective classes in areas of interest to them. Popular options are graphics, scientific visualization, operating systems, networks, compilers, artificial intelligence, programming languages, databases, robotics, natural language processing, and many others. The program culminates in a capstone experience, in which students work in groups to produce a significant software product of their choice.

## COMPUTER ENGINEERING

The primary technical objective of the Computer Engineering program at the University of Utah is to provide an in-depth study of hardware for both information-processing systems and digital control systems. To help meet this objective, we bring problems of current relevance in industry and research into the classroom. Virtually every faculty member is involved in research or other scholarly activity, and most spend part of their time consulting in the private sector. Faculty members teach classes in the areas of their research and consulting activities, thereby bringing to the students an up-to-date knowledge of the material.

## BS / MS

The School of Computing's BS/MS program was created to allow students the opportunity to earn both a bachelor and a master's degree in five years. Students typically apply for admission in their junior year and begin to take graduate-level courses during their senior year. The BS/MS program primarily benefits local students who otherwise would have been unlikely to pursue an advanced degree.

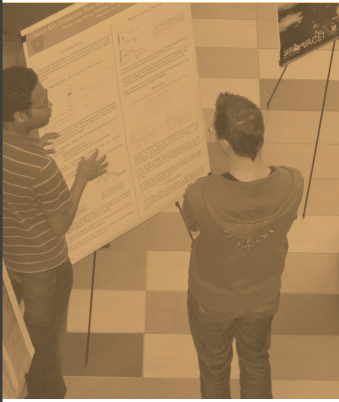
## ENTERTAINMENT ARTS & ENGINEERING PROGRAM

The School of Computing provides a specialty track through the Computer Science program with an emphasis on Entertainment Arts and Engineering (EAE). The EAE track is a joint program between the School of Computing and the College of Fine Arts (currently the fine arts side is housed in the Division of Film Studies). The purpose of this program is to provide an undergraduate, interdisciplinary academic path for those students that wish to have careers in the digital entertainment industry (video games, digital animation, computer generated special effects, etc.). There are currently two specified tracks: video games and animation, differing by the junior year Game/Animation series of classes.

The key feature of this program is its interdisciplinary nature. Students from both CS and Fine Arts will take common classes throughout their undergraduate years, culminating in a year long senior project where students will build a video game or animation from the ground up.

Students in the program can choose either a bachelor's degree in Film Studies or Computer Science.





The School of Computing at the University of Utah conducts an outstanding and well-funded research program. The School of Computing also has world class teaching with four faculty having received the prestigious University of Utah Distinguished Teaching Award. The environment in our department is challenging and fun, with a strong balance of theory and practice. Our students go on to highly successful careers and are leaders in the academic and industrial world.



## MASTER'S DEGREE

The School of Computing's MS program offers a spectrum of curriculum options ranging from a research oriented option culminating in a written MS thesis, to a coursework only option emphasizing flexibility and breadth in material studied. In between these two extremes is a project option, where a taste of research can be obtained on a one semester basis, while continuing to focus on coursework.



## PHD IN COMPUTER SCIENCE

The PhD program is a traditional research centered doctoral program emphasizing an in-depth, innovative scientific investigation leading to results publishable in respected professional journals and conferences. Sustained, close interaction with a faculty advisor and supervisory committee is a central aspect of a student's dissertation experience. All regular faculty and selected auxiliary faculty supervise Ph.D. research, often in the context of ongoing funded research projects.

The School of Computing offers 6 different Master's degree options.

### Masters of Computer Science

#### Computing Degrees

Robotics

Computer Engineering

Graphics and Visualization

Data Management and Analysis

Information Technology

The School of Computing offers 6 different PhD degree options.

### PhD of Computer Science

#### Computing Degrees

Robotics

Computer Engineering

Graphics and Visualization

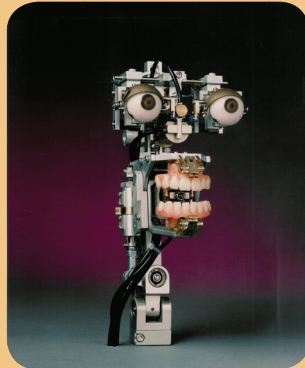
Data Management and Analysis

Scientific Computing

The computing degree program encourages students to pursue area specific coursework and advanced research at an early stage of their graduate study. Aimed at maximizing a students learning opportunities and research experiences, these tracks engage students in research activities as soon as possible.

## Robotics Track

The School of Computing and the Department of Mechanical Engineering at the University of Utah jointly offer the second graduate program in robotics in the US, with a curriculum that imparts fundamental knowledge about robotics and specific courses in perception, cognition, and action. The Robotics Track is a program of study for the M.S. or Ph.D., with virtually identical course requirements for students in either department. Prospective students will choose one or the other of the departments to apply to, guided primarily by undergraduate preparation and by which department the student wishes the graduate degree to be in. There are eight robotics faculty from both departments, who are able to supervise Robotics Track students from either department.



© SARCOS

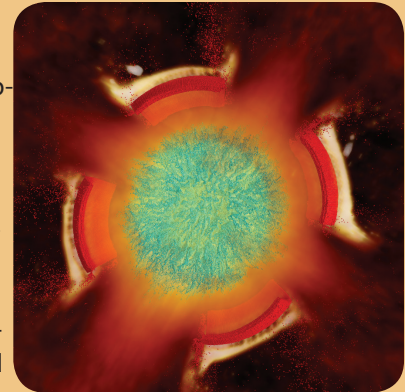
The field of robotics has expanded tremendously since its early focus on industrial robots, and now includes very diverse topics such as autonomous vehicles, medical robots, smart sensor networks, micro robots, robot vacuum cleaners, sentry robots, and pet robots. Robotics technology is embedded in many devices, which are not usually thought of as robots. Knowledge of how to model motion and an emphasis on real-time computation finds application in graphics, animation, and computer games.

Utah is world-famous for the robotics systems it has produced, including manipulators such as the Utah/MIT Dexterous Hand and the Sarcos Dexterous Arm, humanoid robots such as DB2, entertainment robots such as Disney figures and Jurassic Park the Ride dinosaurs, and virtual reality systems such as the Sarcos Treadport and Biport. Faculty expertise encompasses the entire theory-to-market stream, including ties to a UofU spin off Sarcos, piloted by a participating faculty member, and a CAD/CAM system prototyping device for Ford Motor Co. and the oil exploration industry. In combination with Utah's pioneering graphics program, robotics contributes to a strong research thrust in virtual reality.

## Scientific Computing Track

The Scientific Computing track trains students to perform cutting edge research in all of the aspects of the scientific computing pipeline: mathematical and geometric modeling; advanced methods in simulation such as high-performance computing and parallelization; numerical algorithm development; scientific visualization; and evaluation with respect to basic science and engineering.

Students will apply this knowledge to real-world problems in important scientific disciplines, including combustion, mechanics, geophysics, fluid dynamics, biology, and medicine. Students



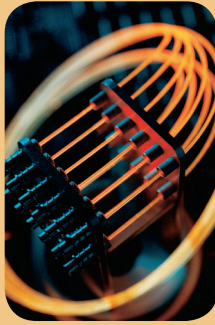
will integrate all aspects of computational science, yielding a new generation of simulation scientists who are performing fundamental research in scientific computing, as well as being interdisciplinary "bridge-builders" that facilitate interconnections between disciplines that normally do not interact. Our mission is to provide advanced graduate training in scientific computing and to foster the synergistic combination of computer and computational sciences with domain disciplines.

The School of Computing at the University of Utah is uniquely qualified to train students seeking expertise and experience in scientific computing. Many of the faculty actively conduct collaborations with other faculty both at the University of Utah and at other universities. The School of Computing has scientific computing research efforts in a wide variety of areas, including adaptive and high-order methods, inverse and imaging problems, numerical analysis, distributed and parallel computing, problem solving environments, validation and verification, uncertainty quantification, computational complexity and computational science applications. A collaborative base provides students with tremendous flexibility to seek out science which interests them, and strong mentoring from scientific computing track faculty enables students to mature as scientists.



## Information Technology Track

There has been an explosion in the volume of information manipulated by organizations. This information is very heterogeneous and includes structured databases as well as unstructured textual documents. A new generation of technologists is needed who have the skills and knowledge to manage the different technologies required to manage and leverage these data.



The goal of the M.S. Computing Degree in Information Technology (MSIT) is to train this new generation of technologists. It offers a mix of technology and management courses to provide students with a solid background in both areas. This unique combination of skills is currently in high demand in the IT industry.

The MSIT degree is a good investment for both information technologists and business professionals who want to deepen their technical knowledge and develop their management skills.

The curriculum for this degree draws from internationally recognized faculty in the School of Computing and David Eccles School of Business.

## Computer Engineering Track

Computer Engineering is a discipline that combines elements of both Electrical Engineering and Computer Science. Computer engineers design and study computer systems at many levels from the circuits that make up computers, to the architecture of processors and subsystems, to the programming interfaces of those processors. This usually involves an interesting mix of software and hardware skills and the integration of both skills.



The Computer Engineering graduate track allows students to pursue a graduate degree with a focus on these sorts of issues. The track offers M.S. (course-based, project, and thesis) and Ph.D. degrees. The Computer Engineering graduate track is offered with essentially the same requirements in both the School of Computing and the Department of Electrical and Computer Engineering. Students may choose to apply to either department depending on their background and interests within computer engineering. There is also a B.S. computer engineering track that is jointly administered by the two departments and involves courses from both.

## Graphics & Visualization Track

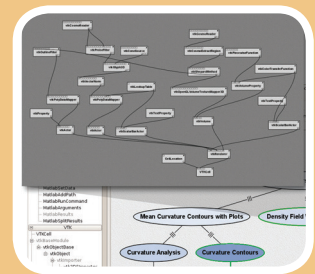
As part of the Computing Degree Program, the School of Computing at the University of Utah offers a specialized graduate track in Computer Graphics and Visualization. This track in the degree program encourages students to pursue area specific coursework and advanced research at an early stage of their graduate study. Aimed at maximizing a student's learning opportunities and research experiences, this track engages students in research activities as soon as possible. The Computer Graphics and Visualization degree track draws heavily on the many faculty and excellent facilities that have contributed to making Utah one of the nation's top-ranked graphics programs. (Utah was among the top five in the latest US News and World Report's rankings of graphics programs.)



The graphics program at the School of Computing is quite comprehensive, with research efforts in most areas of computer graphics, including geometric modeling, CAD/CAM, scientific visualization, biomedical visualization, computer vision, terrain modeling and rendering, haptics (force-feedback), realistic rendering, digital geometry processing, point-based graphics, immersive environments, and non-photorealistic rendering.

## Data Management & Analysis Track

The rate at which scientists and businesses are producing data is increasing at an unstoppable rate. Being able to efficiently process and make sense of such data has become a key scientific challenge in computer science. Not only must one be able to store such information compactly, but one additionally must develop algorithms to process it efficiently and intelligent systems that can reason about this data to find interesting patterns or make decisions. These topics form the core of the Data Management and Analysis track.



Students in this track may pursue a M.S. degree (course-based, project, and thesis) and Ph.D. degrees.

## Entertainment Arts and Engineering Program

In Spring 2007 the School of Computing and the College of Fine Arts teamed up to offer an interdisciplinary program in digital entertainment. Announced at the first annual Machinafest presentations, the "Entertainment Arts and Engineering Program" represents a bold new commitment to offer cutting edge courses designed for undergraduate students interested in pursuing careers in the digital entertainment industry, and expressing themselves using digital media. Video game design and development, 3D animation, computer-generated special effects, are but a few of the subject areas students will explore in the Entertainment Arts and Engineering Program.



Student character sample

"Video games and animation are two areas that students are personally involved with, practically from birth. Their reaction is often that they like what they see and experience, but feel that they could do it better. This program will give them the opportunity to develop the skills necessary to reach and achieve their

*"This is an exciting program for us as it gives University of Utah graduates a leap forward in a career in video games. In our studio and most others, programmers, artists, and designers work closely together and the program's emphasis on this cross training is its true strength."*

*Rob Nelson, Director of Technology, Avalanche Software, Disney Interactive Studios*

dreams" said Bob Kessler, Professor in the School of Computing. "We are proud to be offering content from all over campus, as gaming/animation is inherently interdisciplinary."

Students in the "Entertainment Arts and Engineering Program" receive a BS in Computer Science or a BA in Film Studies with an emphasis in Entertainment Arts and Engineering depending on whether their skills are on the technical or artistic side respectively. The goal is to allow stu-

dents to focus their Computer Science or Fine Art degrees on new and rapidly evolving digital entertainment mediums.

A key characteristic of the program is its interdisciplinary nature. As the digital entertainment industry continues to grow, employers are focusing more on students who understand both sides of the industry, whether it is a computer science students with additional fine arts skills or fine arts students with computing skills. "From a computer science perspective, the digital entertainment field offers many, many challenging technical problems. These problems are best solved with the involvement of both computer scientists and artists," said Professor Kessler.

The four-year program is designed to encourage students to take classes in both Computer Science and the Arts, not only exposing them to diversity in curriculum, but also perspectives.



"Passion of the McCain" created by students in the program.



Machinima movie created by students



# THE ENTERTAINMENT ARTS AND ENGINEERING PROGRAM

## MACHINIMA FEST '08

On the 23<sup>rd</sup> of April 2008 over 70 students participated in the 2<sup>nd</sup> Annual MachinimaFest. The fest featured animated films created using a 3D video game engine. The annual event included undergraduate and graduate students from the School of Computing, Division of Film Studies, and the Department of English. MachinimaFest is a part of the Entertainment Arts and Engineering Program.



Team Venison Curry, created one of the top machinima movies.

## Entertainment Arts and Engineering Scholarships

Four scholarships were handed out at the conclusions of the 2008 MachinimaFest. Each scholarship was presented to a student involved in the Entertainment Arts and Engineering Program. This year's recipients were Ken Williams and James Anjewierden from computer science and Al Johnstone and Chris Diller from the film department. The scholarships were made available with money donated from Disney Interactive Studios and the Kessler Family Scholarship fund.



John Carter, Rob Nelson (Disney), Alex Johnstone, Chris Diller, James Anjewierden, Ken Williams and Bob Kessler

## EAE Program Publicity

- |            |   |
|------------|---|
| May 2007   | Channel 2 News (KUTV) - reporter from morning show did a story on EAE Program.  |
| May 2007   | Students presented their machinima films at the 2007 CONDUIT SCI FI convention in Salt Lake City.   |
| April 2008 | Channel 2 News (KUTV) - reporter Peter Rosen did a piece on the program.  |
| April 2008 | Channel 5 News (KSL) - science reporter, Ed Yates did a story on EAE Program.   |
| May 2008   | Students presented their machinima films at the 2008 CONDUIT SCI FI convention in Salt Lake City.   |
| Sept. 2008 | Two machinima films, Venison Curry and Passion of the McCain were presented at the Cambridge Film Festival in Cambridge England.            |
| Nov. 2008  | Channel 2 News (KUTV) reporter Dan Sheldon did a news story on Utah Ute and BYU cougar machinima on the Sports section of the evening news. |
| March 2009 | One of the machinima films will be part of the SIGCSE video series.   |

# OUTREACH: SUMMER CAMPS

## Entertainment Arts and Engineering Summer Program

The School of Computing debuted the new Entertainment Arts and Engineering Summer Program Summer (EAESP) in June 2008. The two-week long camp was created for high school students and designed to introduce the students to the concepts of 3D modeling, texturing, rigging, animation, and rendering, using some of the most advanced software in the industry such as Autodesk Maya and Adobe Photoshop.

The curriculum was based on a final project where the students chose a character and then produced them in MAYA. During the two weeks the students worked on abstract designs for their characters by producing clay sculptures, drawings and verbal descriptions as preliminary steps to creating a 3D version in MAYA. The students learned engineering principles and



Student working on character

art concepts and applied both to the production of their character. The camp also involved visits to research laboratories in the School and fieldtrips to local game and modeling studios.

The camp was taught by Mark van Langeveld, a PhD graduate student in the School of Computing. Mark pioneered this same summer program at the University of Pennsylvania in 2004 and has been offering it every year since then. He graduated in Computer Graphics Design at UCLA and was the first graduate of the Computer Graphics and Game Technology engineering program at the University of Pennsylvania.



Characters created by students in the summer program.

## G/R/E/A/T Graphics & Robotic Exploration with Amazing Technology Summer Camp

In the summer of 2008, the School of Computing ran another summer camp, the Graphics and Robotics Exploration with Amazing Technology (GREAT) camp. This program was aimed at 9<sup>th</sup> and 10<sup>th</sup> graders and designed to introduce students to exciting tools in computer graphics, robotics and applications in computer programming.

David Johnson, who directed the camp, said, "We wanted to show how programming is a way of fostering creativity, and by making animations, games, and working in teams in robot competitions, the kids were motivated to make great progress in a short time." Erin Parker also taught in the camp, as did some very capable TAs.

The first part of the camp experience used a 3D



Animation created by student involved in the summer camp

graphics language environment called Alice, where programming fundamentals were taught in support of the campers developing an animation, an interactive environment, or a computer game.

The second part of the camp used LEGO Mindstorms© robot kits to show how the programming concepts learned in graphics could be applied to new problems. The students competed in teams to solve problems such as making an autonomous drag racer.

Contributions from Novell, Omniture, and the state of Utah ASTEC program were instrumental in funding the program.



Student participating in robot competition



# INDUSTRY INTERACTIONS

## Disney Interactive Studios Gives \$20K to Computing

The School of Computing received a \$20,000 gift from Disney-Avalanche Software, a Salt Lake-based subsidiary of Disney Interactive Studios that focuses on creation of Disney video games. Avalanche was acquired by Disney in May of 2005.

The Disney gift will go toward new undergraduate scholarships in the School of Computing, support for a summer camp for middle school children, and support for a distinguished lecture series. The gift will help build an important relationship between Disney and the School of Computing. The school plans to cooperate with Disney on a number of fronts, including training students for careers in digital media, establishing research collaborations between university faculty and Disney engineers, and increasing the visibility of digital media in Utah to attract more talented engineers, digital media companies, and attention to the state.



**Gift from other corporations included \$150K worth of software from Adobe, 20 Xbox consoles and \$12K from Microsoft, \$10K from Novell and \$5K from Omniture.**



**Adobe**

**Microsoft®**

**Novell.**

**OMNITURE®**  
— — —



# 2007 AND 2008 MASTERS AND PHD GRADUATES

## 2007

Graduate	Degree	Thesis Title
Viabhav Agarwal	MS	A Scalable Implementation of a Wireless Network Emulator
Louis Bavoil	MS	Efficient Multi-Fragment Effects on the GPU
Siddharth Ramesh	MS	Session-Level Congestion Control for the Internet
Sean Igo	MS	Identifying Reduced Passive Voice Constructions in Shallow Parsing Environments
Salman Pervez	MS	Practical Model Checking Methods for Message Passing Interface (MPI) Programs

### MS Non Thesis

Heballa Alzhawi	Solomon Boulos	Jeremy Archuleta	Abhishek Ranjan	Chelsea Robertson
Ravindra Lanka	Samuel Baird	Aaron Luptak	Richard Davidson	Reet Dipti Sitaula Dhakal
Lynden Jones	Harsh Doshi	Sucharita Otta	Devin Bunker	Kumar Chheda
Andrew Perkins	Wei Guo	Gregory Roth	Anupam Chakravorty	

Scott Owens	PhD	Compile-Time Information in Software Components
Jeremy Asbill	PhD	Automatic Scenario Generation from a Multi-Dimensional Requirements Model
Liqun Cheng	PhD	Context Aware Coherence Protocols for Future Processors
Jason Shepard	PhD	Topologic and Geometric Constraint-based Hexahedral Mesh Generation
Sai Susarla	PhD	Configurable Consistency for Wide-Area Caching
Milan Ikits	PhD	Interactive Exploration of Volumetric Data Sets with a Combined Visual and Haptic Interface
David Walter	PhD	Verification of Analog and Mixed-Signal Circuits Using Symbolic Methods
Betty Mohler	PhD	The Effect of Feedback Within a Virtual Environment on Human Distance Perception and Adaptation
Robert Palmer	PhD	Formal Analysis for MPI-based High Performance Computing Software
Matthew Kaplan	PhD	Artistic Graphics and Modeling
Nathan Barker	PhD	Learning Genetic Regulatory Network Connectivity from Time Series Data
Nicole Anderson	PhD	Context Aware Web Search Using Dynamically Weighted Information Fusion
Yu Sun	PhD	Measure Fingertip Force by Imaging the Fingernail and the Surrounding Skin

## 2008

Graduate	Degree	Thesis Title
Ashwin Deepak Swaminathan	MS	A Scalable Distributed Component Framework For Scientific Computing
Vivek Venkatesan	MS	Quantifying the Impact of Inter-Block Wire Delays on Processor Performance
Neda Sadeghi	MS	Automatic Classification of Alzheimer's Disease and Frontotemporal Dementia: A Decision Tree Approach with FDG-PET Cortical
Prashanth Radhakrishnan	MS	Stateful-Swapping in the Emulab Network Testbed

### MS Non Thesis

Seth Jaurez	Lee Myers	Leah Wouters	Aaron DeMille	Brian Young	Patrick Kelly
Sumit Tandon	Austin Robison	Leena Kora	Arvind Agarwal	Cha Hyeon Rhee	Kyeong Min
Pankaj Nathani	Brandt Erickson	Sankhadip Sengupta	Zachary Gildersleeve	Maria Lorena Carlo Unda	

David Edwards	PhD	Practical Sampling for Ray-Based Rendering
Peter Jensen	PhD	Hybrid Automated Fault Localization in Programs Written by Novice Programmers
Hiroyuki Kuwahara	PhD	Model Abstraction and Temporal Behavior Analysis of Genetic Regulatory Networks
Dominic Jones	PhD	Mining Events from Aviation Safety Data
Sarah Geneser	PhD	Quantification of Stochastic Behavior in Cardiac Electrophysiological Models
Xianming Chen	PhD	Dynamic Geometric Computation with B-Splines
Steven Callahan	PhD	Adaptive Visualization of Dynamic Unstructured Meshes
Miriah Meyer	PhD	Dynamic Particles for Adaptive Sampling of Implicit Surfaces
Guo-Shi Li	PhD	Interactive Texture Based Flow Visualization
Xiaofang Chen	PhD	Verification of Hierarchical Cache Coherence Protocols for Futuristic Processors
Scott Little	PhD	Efficient Modeling and Verification of Analog/Mixed-Signal Circuits Using Labeled Hybrid Petri Nets
Nathan Coopridge	PhD	Data-flow Analysis for Interrupt-driven Microcontroller Software
Jun Cheol Park	PhD	Channel-error and Collisions Aware, Secure Multihop Ad Hoc Wireless Networks
Won-Ki Jeong	PhD	Interactive Three Dimensional Image Analysis and Visualization using Graphics Hardware



# COMPUTER SCIENCE COURSES

- CS 1000 Engineering Computing
- CS 1001 Engineering Computing using MATLAB
- CS 1010 Introduction to UNIX
- CS 1020 Introduction to Programming in C++
- CS 1021 Introduction to Programming in Java
- CS 1040 Creating Interactive Web Content
- CS 1060 Explorations in Computer Science
- CS 1410 Introduction to Computer Science I
  
- CS 2000 Introduction to Programming in C
- CS 2010 Discrete Structures
- CS 2420 Introduction to Computer Science II
- CS 2960 Apple Certification
- CS 2963 LPI level 1
- CS 2964 LPI level 2
  
- CS 3010 Industry Forum
- CS 3200 Scientific Computation
- CS 3500 Software Practice I
- CS 3505 Software Practice II
- CS 3700 Fundamentals of Digital System Design
- CS 3710 Computer Design Laboratory
- CS 3810 Computer Organization
- CS 3950 Independent Study
- CS 3991 Computer Engineering Junior Seminar
- CS 3992 Computer Engineering Pre-Thesis/Pre-Project
  
- CS 4005 Honors Research Practice
- CS 4010 Teaching Introductory Computer Science
- CS 4100 Advanced Algorithms and Data Structures
- CS 4150 Algorithms
- CS 4400 Computer Systems
- CS 4500 Software Engineering Laboratory
- CS 4540 Web Software Architecture
- CS 4550 Simulation
- CS 4710 Computer Engineering Senior Project
- CS 4960 - CS 4964 Special Topics
- CS 4970 Computer Science Bachelor's Thesis
  
- CS 5010 Software Practice I
- CS 5020 Software Practice II
- CS 5100 Foundations of Computer Science
- CS 5300 Artificial Intelligence
- CS 5310 Robotics
- CS 5320 Computer Vision
- CS 5340 Natural Language Processing
- CS 5350 Machine Learning
- CS 5460 Operating Systems
- CS 5470 Compiler Principles and Techniques
- CS 5480 Computer Networks
- CS 5510 Programming Language Concepts
- CS 5520 Anatomy of a Modern Programming Language
- CS 5530 Database Systems
- CS 5540 Human/Computer Interaction
- CS 5600 Introduction to Computer Graphics
- CS 5610 Interactive Computer Graphics
- CS 5630 Scientific Visualization
- CS 5720 Analog Integrated Circuit Design
- CS 5740 Computer-Aided Design of Digital Circuits
- CS 5750 Synthesis and Verification of Asynchronous VLSI Systems
  
- CS 5780 Embedded System Design
- CS 5785 Advanced Embedded Systems
- CS 5830 VLSI Architecture
- CS 5960 - 5969 Special Topics
  
- CS 6020 Conducting, Publishing and Presenting Early-Career Research
- CS 6100 Foundations of Computer Science
- CS 6110 Formal Methods for System Design
- CS 6210 Advanced Scientific Computing I
- CS 6220 Advanced Scientific Computing II
- CS 6230 High Performance Parallel Computing
- CS 6300 Artificial Intelligence
- CS 6310 Robotics
- CS 6320 Computer Vision
- CS 6340 Natural Language Processing
- CS 6350 Machine Learning
- CS 6360 Virtual Reality
- CS 6370 Geometric Computation for Motion Planning
- CS 6380 Multiagent Systems
- CS 6470 Advanced Topics in Compilation
- CS 6480 Computer Networks
- CS 6490 Network Security
- CS 6510 Functional Programming
- CS 6530 Database Systems
- CS 6540 Human/Computer Interaction
- CS 6610 Advanced Computer Graphics I
- CS 6620 Advanced Computer Graphics II
- CS 6630 Scientific Visualization
- CS 6640 Image Processing
- CS 6670 Computer-Aided Geometric Design I
- CS 6680 Computer-Aided Geometric Design II
- CS 6710 Digital VLSI Design
- CS 6712 Digital IC Project Testing
- CS 6720 Advanced Integrated Circuit Design
- CS 6721 Analog Integrated Circuits Lab
- CS 6722 Analog Integrated Circuits Project Testing
- CS 6740 Computer-Aided Design of Digital Circuits
- CS 6750 Synthesis and Verification of Asynchronous VLSI Systems
- CS 6760 Modeling and Analysis of Biological Networks
- CS 6770 Advanced Digital VLSI Systems Design
- CS 6780 Embedded Systems Design
- CS 6785 Advanced Embedded Systems
- CS 6810 Computer Architecture
- CS 6830 VLSI Architecture
- CS 6960 - CS 6969 Special Topics
  
- CS 7010 Writing Research Proposals
- CS 7120 Information-Based Complexity
- CS 7240 Sinc Methods
- CS 7250 Advanced Topics in Scientific Computing
- CS 7310 Advanced Manipulation and Locomotion
- CS 7320 System Identification for Robotics
- CS 7460 Distributed Operating Systems
- CS 7520 Programming Language Semantics
- CS 7640 Image Processing
- CS 7650 Realistic Image Synthesis
- CS 7810 Advanced Computer Architecture
- CS 7820 Parallel Computer Architecture
- CS 7960 - 7969 Special Topics

# RESEARCH AWARDS

## Disclaimer:

The following information provided only includes the PI's and Co-PI's within the School of Computing. Many of the grants reported are multi university/lab grants, the amounts shown are the research dollars that have come to Utah.

### Rajeev Balasubramanian

"Exploiting Fast On-Chip Wires" (PI), NSF-CCF, \$175,00 (10/2004-9/2007)

"CAREER: Exploiting Heterogeneity Within Chip Multiprocessor" (PI), NSF Career Award, \$300,000 (5/2006-4/2011)

"Heterogeneity in Multi-Cores" NSF-REU Supplement for NSF CAREER Award, (PI), \$6,000, (5/2007 - 4/2008)

"Reconfiguration within Large Cache Hierarchies"(PI), Intel Corporation grant, \$150,000, (10/2007 - 9/2010)

"Towards Scalable Transactional Memory", (PI), University of Utah Seed Grant, \$30,000, (1/2008-12/2008)

"CPA-CSA: Algorithms and Implementations for Scalable Transactional Memory" (PI), NSF CPA Award, \$275,000, (6/2008-5/2011)

"Formal Specification, Verification, and Test Generation for Multi-core CPUs" (co-PI), Semiconductor Research Corporation (SRC) grant, \$187,291, (10/2008-9/2011)

Equipment grant, (PI), Intel Corporation, \$5,000, (11/2008)

### Martin Berzins

"Center for Simulation of Accidental Fires and Explosions" (co-PI), LLNL, \$177,352 (12/2002-03/2008)

"SDCI HPC: Improvement and Release of the Uintah Computational Framework" (PI), NSF, \$750,000 (12/2007-11/2010)

### Richard Brown

"Neural Probes for Electrical and Chemical Sensing" (co-PI), NIH (sub-contract with University of Michigan Biomedical Engineering), \$129,371, (12/2005-8/2008)

"SST Integrated Particle Counting and Potentiometric Sensor Array for Water Quality Analysis"(PI), NSF, \$299,994, (9/15/2005-8/31/2008)

"An Engineering Research Center in Wireless Integrated MicroSystems" (co-PI), NSF (sub-contract with University of Michigan), \$340,181, (9/2005-8/2009)

"Feasibility of Measuring Autoantibody Interference of Physiologically Active Muscle Cells Using a Biological Nano-sensor" (co-PI), ARUP Laboratories and the Department of Pathology, University of Utah, \$70,256, (7/2005-7/2009)

### Erik Brunvand

"Ray Trace Applications to Radio Frequency (RF) Propagation" Army Research Labs (ARL), \$140,087 (9/2007 - 12/2008)

"Hardware Support for Interactive Ray Tracing" (PI), NSF, \$505,382 (6/2006 - 5/2009)

### Elaine Cohen

"Principal Curvature Based Reparameterization of a Mesh Patch" (PI), MIT(NASA), \$40,040, (7/2008 - 6/2009)

"Hierarchical Solving of Symbolic Problems in Heterogeneous Geometric Environments" (PI), NSF, \$ 375,000 (2/2006 - 1/2010)

"ITR: A Unified Representation for Non-homogeneous Models Manifesting Surface, Volume, and Vector Attributes" (PI), NSF, \$499,982 (8/2002 - 6/2007)

"Collaborative Research Proposal: Hybrid Modeling for Geometric Design, Estimation, and Analysis" (co-PI), NSF, \$ 600,000 (4/2003 - 3/2007)

### Hal Daume III

"Cross-Task Language Learning with Small Data Sets" (PI), NSF, \$404,339. (10/2007 - 09/2010)

"Cross-Task Language Learning with Small Data Sets" (REU Supplement). (PI), NSF, \$6,000. (2/2008 - 12/2008)

"Computational Thinking Olympiad: Brainstorming Workshop" (PI), NSF, \$15,000. (08/2008 - 12/2008)

"Language Understanding for Research Papers" (PI), University of Utah Research Committee, \$5,940. (01/2009 - 01/2010)

Advanced Learning Technology for Statistical Machine Translation. (PI) University of Utah Seed Grant, \$32,937. (06/2009 - 05/2010)

### Al Davis

"A Biologically Motivated Scaling Theory for Computing"(PI), NSF, \$160,000 (9/2006-8/2008)

"Hardware Support for Interactive Ray-Tracing" (co-PI), NSF, \$500,000 (7/2006- 6/2009)

### Tom Fletcher

"Quantifying white matter connectivity in autism" Mentor: Dr. Janet Lainhart, Department of Psychiatry, Autism Speaks Mentor Based Fellowship. \$122,000, (2008)

"Quantifying white matter connectivity in autism" (PI), University of Utah Interdisciplinary Seed Grant. \$5,000 for 1 year, (2008)

### Juliana Freire

CAREER: "Storing, Querying and Re-Using Provenance of Computational Tasks"(PI), NSF, \$499,999 (2008-2013)

"CRI: IAD: A Service-Oriented Architecture for The Computation, Visualization and Management of Scientific Data" (co-PI), NSF, \$ 500,000 (2007-2010)

SBIR Phase I and IB: A Collaborative Architecture to Support Large-Scale Exploratory Workflows, (co-PI), NSF, \$150,000 (2007)

Center for Software Process Automation and Exploratory Data Mining. State of Utah, Centers of Excellence. \$200,000 (2008-2009)

"III-COR: Discovering and Organizing Hidden-Web Sources"(PI), NSF, \$336,000. Interna-



tional Travel Supplement US\$27,212. (2007–2010)

“SBIR Phase I: Provenance-Enabling DOE Visualization Applications” (co-PI), DOE, \$100,000 (2007–2008)

“Obtaining Ray Tracing for Unstructured Grids Using Advanced Hardware and Target Improvements to the VisTrails Software” (co-PI), DOE LANL \$200,000 (2007–2008)

“Center for Management of Exploratory Workflows—Business Team” (PI), State of Utah, Centers of Excellence, \$50,000 (2007–2008)

“Science and Technology Center for Coastal Margin Observation and Prediction” (co-PI), NSF, \$20,000,000; Utah portion: \$ 478,563. (2006–2011)

XML Data Management: Taking Order and Updates into Account” (PI), NSF \$270,000. (2006–2009)

“Managing Complex Visualizations” (PI), NSF, \$518,252. REU Supplement \$12,000. (2005–2009)

“CT-T: A Laboratory Workbench for Security Research” (co-PI) \$1,466,000. (2005–2009)

#### **Guido Gerig**

“National Alliance for Medical Imaging Computing” (Co-PI for Utah), NIH (subcontract with Harvard, BWH), \$312,675 (7/2007-7/2010)

“Characterization of Normal Brain Development Using Parallel MR” (Co-PI for Utah), NIH, (subcontract with UNC Chapel Hill), \$445,212 (7/2007-7/2012)

“Prospective Studies of the Pathogenesis of Schizophrenia, Silvio O. Conte Center” (PI for Utah), NIH, (subcontract with UNC Chapel Hill), \$436,253 (7/2007-7/2012)

“A Longitudinal MRI Study of Infants at Risk for Autism, Autism Centers of Excellence (ACE) Network” (PI for Utah), NIH, (subcontract with UNC Chapel Hill), \$726,792 (7/2007-7/2012)

“Neurobiological and Behavioral Consequences of Cocaine Use in Mother-Infant Dyads” (PI for Utah), NIH, (subcontract with UNC Chapel Hill), \$599,313 (9/2008-9/2013)

#### **Ganesh Gopalakrishnan**

Gift, Microsoft Research, (2008-2010)

“Formal Analysis and Code Generation Support for MPI” (PI) Microsoft, \$359,969, (6/2005-5/2007)

“Formal Methods for Multi-core Shared Memory Protocol Design” (PI), NSF, \$268,843, (6/2008 - 5/2011)

“Formal Specification, Verification, and Test Generation for Multi-core CPUs” (PI), SRC, \$187,291, (11/2008 - 10/2011)

NSF REU supplement \$6,000, (4/ 2008)

“CSR-SMA: Toward Reliable and Efficient Message Passing Software Through Formal

Analysis” (PI), NSF, \$399,996 (7/2005 – 6/2009)

#### **Mary Hall**

“Exascale Software Study” (co-PI), DARPA, (\$70K to Hall), (6/2008-9/2008)

“Compiler-Directed Automatic Performance Tuning” (PI) DoE, (\$1.5M, \$533K to Utah), (3/2008-2/2011)

“Compiler-Assisted Performance Tuning of Libraries and Application Kernels for Multi-Core Architectures” Gift from Intel Research Council (\$50K), (12/2007-11/2008)

“Petascale Hierarchical Simulations of Biopolymer Translocation through Silicon Nitride and Silica Nanopores and Nanofluidic Channels” (co-PI), NSF, (160K to Hall), (9/2007-9/2012)

“Compiler Requirements for enhanced FBDIMM Buffer on Board based memory technology (eBOB)” (PI), Sandia National Laboratory, (\$40K) 7/2007-9/2007)

“Performance Engineering Research Institute” (co-PI), DoE, SciDAC Institute (\$15M), (9/2006-11/2011)

“Intelligent Optimization of Parallel and Distributed Applications” (PI), NSF Computer Systems Research (\$885K), (8/2006-9/2010)

“A Dynamic Data-Driven Application System for Signal and Image Processing” (co-PI), NSF Dynamic Data-Driven Application System (\$356K), (12/2005-11/ 2008)

#### **Chuck Hansen**

VACET: Visualization and Analytics Center for Enabling Technologies, DOE Sci-DAC II. (Utah Team), DOE, Total: (approx) US\$ 11,000,000; Utah portion: US\$ 2,790,726 (2006-2011)

“Institute for Applied Mathematics and Computational Science”, (co-PI), KAUST, \$1.67M (6/2008-6/2013)

“CRI: A Hierarchical Data Storage System for Large Data Simulation, Comparison, and Visualization” (co-PI) NSF, \$506,243 (3/2006 - 2/2011)

“Advanced Volume Visualization” (PI) , NSF, \$250K (2/2006-1/2010)

“An Advanced Interactive Multifield, Multisource Atmospheric Visual Analysis Environment” (PI), NSF, \$178K (7/2005-6/2009)

“Center for Simulation of Fires and Explosions” (Senior Investigator), DOE, \$714K (10/2002-9/2009)

Advanced Visualization Research (co-PI), DOE/LANL, \$200K (8/2007-8/2008)

#### **Thomas Henderson**

Center for the Simulation of Accidental Fires and Explosions (PI), DOE, \$538,787 (12/2002-3/2008)

“Exploiting Raster Maps” (PI), IAVO Research and Scientific, \$30,000 (9/2006-7/2007)

#### **John Hollerbach**

“ITR/SY: Collaborative/RUI Research on the Perceptual Aspects of Locomotion Inter-

faces" (co-PI), NSF, \$1,400,000 (9/2001-8/2008)

"MRI: Instrument Development: High-Fidelity Magnetic Levitation Haptic Systems" (Utah co-PI), NSF, \$223,458 (7/2003-6/2009)

"ITR-(ASE+NHS+ECS)-(int+dmc+sim): Generation of Complex Environmental Flow Patterns for Virtual Environments" (PI), NSF, \$1,119,215 (10/2004-9/2009)

"Measuring Finger Forces by Imaging the Fingernail" (PI), NIH, \$392,677 (7/2006-6/2009)

"IGERT: Interdisciplinary Research Training in Biocentric Robotics" (PI), NSF, \$2,399,331 (7/2007-6/2012)

### **Christopher Johnson**

Center for Integrative Biomedical Computing (PI), NIH/NCRR, \$5,599,731 (9/2005 - 7/2010)

"Visualization and Analytics Center for Enabling Technologies" (PI), DOE, \$2,628,230 (9/2006 - 9/2011)

"Visualization" Subcontract with Texas A&M (PI), KAUST, \$1,393,329 (6/2008 - 5/2012)

Center for Computational Biology (PI), NIH/UCLA, \$2,628,629 (9/2004 - 7/2010)

"Visualization of Fault Characteristics and Uncertainties" (PI), ConocoPhillips, \$69,422 (1/2007 - 1/2009)

"CRI: A Hierarchical Data Storage System for Large Data Simulation, Comparison, and Visualization" (co-PI), NSF, \$506,243 (3/2006 - 2/2011)

"CDI-Type II: Collaborative Research: The Open Wildland Fire Modeling E-community: a virtual organization accelerating research, education, and fire management technology" (PI) NSF, \$641,588 (11/2008 - 10/2012)

### **Sneha Kasera**

"Opportunistic Secret Key Exchange Using Wireless Link Characteristics and Device Mobility" (PI), NSF, \$349,995 (9/2008-8/2011)

"Next Generation Communication Network Using Multicarrier Filter Bank" (co-PI), NSF, \$299,999 (5/2008-4/2011)

"Managing Network Resources during Disasters" (PI), UofU Research Foundation, \$30,000 (1/2008-3/2008)

"Utah's Engineers: A Statewide Initiative for Growth" (Computer Science Team Leader), NSF, \$1,617,869 (9/2007-8/2011)

"Robust Location Distinction Using Temporal Link Signatures" (SoC PI), UofU Research Foundation, \$70,000 (8/2007-7/2009)

"ARESENAL: A Cross Layer Architecture for Secure Resilient Tactical Mobile Ad Hoc Networks" (UofU PI), Army Research Lab/Office of Naval Research, Multi-university Research Initiative, \$400,000 (6/2007-5/2012)

### **Robert Kessler**

"Integrating XNA into the Entertainment Arts and Engineering Program" (co-PI), Microsoft, \$10,000 cash, \$10,000 equipment (XBox 360 consoles), (7/2007)

Gift of Adobe Master Collection Software from Adobe, 50 copies, \$124,950. (9/2007)

### **Mike Kirby**

"Quantifying and Controlling Error and Uncertainty in Computational Inverse Problems" (PI), NSF, \$406,262 (01/2004 - 12/2009)

"Visualization of High-Order Finite Element Methods" (PI), \$272,058 (8/2005 - 7/2008)

"Visualization of High-Order Finite Element Methods," (PI), \$342,265 (9/2008-9/2011)

"Development Of A Class Of Smoothness-Increasing Accuracy-Conserving (SIAC)," (PI), \$241,480 (3/2008 - 11/2010)

"CSR-SMA: Toward Reliable and Efficient Message Passing Software Through Formal Analysis" (co-PI), NSF, \$399,996 (7/2005 - 6/2009)

"Formal Analysis and Code Generation Support for MPI" (co-PI) Microsoft, \$359,969, (6/2005-5/2007)

"CRI: A Hierarchical Data Storage System for Large Data Simulation, Comparison, and Visualization" (Senior Personnel), NSF, \$506,243 (3/2006-2/2011)

"Prevention of Hemodialysis Vascular Access Stenosis" (Lead Investigator), NIH, \$5,532,724, (9/2006-8/2011)"

"CRI:IAD, A Service Oriented Architecture for the Computation, Visualization and Management of Scientific Data" (Co-PI), \$500,000 (6/2008 - 5/2011)

### **Matthew Might**

Phase I "Application of Advanced Environment Analysis for Secure, Scalable Software Development" NSF SBIR, \$99,969.00 (1/2007)

### **Valerio Pascucci**

"Topology-based Methods for Analysis and Visualization of Noisy Data" (PI), NSF, \$300,000 (2007-2010)

VACET: Visualization and Analytics Center for Enabling Technologies, DOE Sci-DAC II. (Utah Team), DOE, Total: (approx) US\$ 11,000,000; Utah portion: US\$ 2,790,726 (2006-2011)

### **John Regehr**

"Embedded and Hybrid Systems Program. Components and Aspects for Embedded Middleware" (co-PI), NSF, Utah award: \$360,002 (9/2004-8/ 2007)

"Parallel and Distributed Operating Systems Program. Experimenting with Garbage Collection in an Otherwise Conventional OS" (co-PI), NSF, \$380,000 (8/ 2005-7/ 2008)

CAREER. Vertically Integrated Analysis for Embedded Software. NSF, \$400,000 (5/2005-4/2010)

"Embedded and Hybrid Systems Program. Improving Sensor Network Software Reliability through Language, Tool, and OS Co-Design" (PI), NSF, Utah award: \$210,000 (9/2006-8/2009)

DARPA Computer Science Study Group. \$95,989 (3/2008-3/2009)



**Rich Riesenfeld**

“Legacy Engineering Modeling” ARO (subcontract from Hampton University), \$75,000, (5/2008-7/2009)

“Legacy Engineering” ARO (subcontract from Hampton University), \$105,000, (7/2006-6/2008)

“Hierarchical Solving of Symbolic Problems in Heterogeneous Geometric Environments” (co-PI), NSF, \$ 375,000, (2/2006 – 1/2010)

**Ellen Riloff**

“Coreference Resolution Research” (PI), LLNL, \$109,992 (10/2007-9/2009)

“Information Extraction of Events and Beliefs from Text” (co-PI), Department of Homeland Security, \$498,200 (10/2006-8/2009)

“Text Extraction and Data Visualization for Pet Health Surveillance” (PI), LLNL, \$42,930 (9/2007-12/2007)

“Student Research Workshop in Computational Linguistics at the ACL 2007 Conference” (PI), NSF, \$22,200 (4/2007-3/2008)

“Collaborative: Improving Subjectivity Analysis to Achieve High-Precision Information Extraction” (PI), NSF, \$275,010 (09/2002-08/2007)

“Bioforensics Text Extraction” (PI), LLNL, \$367,359 (09/2004-09/2007)

**Kris Sikorski**

Embedded Software for Distributed Smart Sensor Networks, (co-PI) NSF, \$289,880, (2004-2007)

**Claudio Silva**

SBIR Phase I: Provenance-Enabling DOE Visualization Applications. (coPI), DOE, US\$ 100,000 (2007–2008)

SBIR Phase I and IB: A Collaborative Architecture to Support Large-Scale Exploratory Workflows, (PI), NSF, \$150,000 (2007)

Centers of Excellence. Center for Software Process Automation and Exploratory Data Mining. State of Utah, US\$200,000 (2008–2009)

Imaging, Visualization, and Modeling Research Center, (co-PI), ExxonMobil, US\$ 2.2M (2008–2013)

CDI-Type II: Collaborative Research: The Open Wildland Fire Modeling E-community: a virtual organization accelerating research, education, and fire management technology, (co-PI), NSF, US\$ 641,790. (2008-2012)

CRI: IAD A Service-Oriented Architecture for The Computation, Visualization, and Management of Scientific Data, (PI), NSF, US\$ 500,000 (2008-2011)

Science and Technology Center for Coastal Margin Observation and Prediction, (co-PI), NSF, US\$ 20,000,000; Utah portion: US\$ 478,563 (2006-2011)

Data Management Enabling Technology Center, DOE SciDAC II. (Utah PI), DOE, Total:

(approx) US\$ 16,500,000; Utah portion: US\$ 910,000 (2006-2011)

VACET: Visualization and Analytics Center for Enabling Technologies, DOE Sci-DAC II. (Utah Team), DOE, Total: (approx) US\$ 11,000,000; Utah portion: US\$ 2,790,726 (2006-2011)

MSPA-MCS: Collaborative Research: New Methods for Robust, Feature-Preserving Surface Reconstruction, CCF-0528201 and CCF-0528209, (lead PI, Utah), NSF, Total: US\$ 480,686 (2005-8); Utah portion: US\$ 275,599 (2005-2008)

SEI: Managing Complex Visualizations, (co-PI), NSF, US\$ 530,252 (2005-2008)

Centers of Excellence. Center for Management of Exploratory Workflows-Business Team, (co-PI), State of Utah, US\$ 50,000 (2007-2008).

Topic in Visualization Research, (PI), DOE, US\$ 200,000 (2007-2008).

**William Thompson**

“HCC: Improving Spatial Perception in Virtual Environment” (PI), NSF, \$99,970 (9/2007-8/2009)

“Increasing Student Motivation Without Compromising Student Performance in Online Classes” (co-PI), NSF, \$499,937 (9/2008-8/2011)

“Designing Visually Accessible Spaces” (PI), NIH, \$1,192,000 (3/2007-2012)

“ITR/SY: Collaborative/RUI Research on the Perceptual Aspects of Locomotion Interfaces” (PI), NSF, \$1,127,471 (9/2001-8/2008)

**Suresh Venkatasubramanian**

Scalable, Accurate and Efficient Data Analysis for Medical Imaging. (PI), University of Utah Seed Grant, (1/2009-12/2009)

Scalable Shape Analysis in Non-Euclidean Spaces with Provable Guarantees. (PI), NSF-SGER: \$49,868.00 (1/2009-12/2009)

**Ross Whitaker**

National Center for Integrative Biological Computing (co-PI), NIH, \$5.7M (2005-2010)

“Large-scale computational reconstruction of three dimensional neural connectivity from serial-section microscopy” (co-PI), NIH, \$1.2M (2005-2009)

National Alliance for Medical Image Computing (PI), NIH, \$1M (2004-2009)

**Joe Zachary**

“Increasing Student Motivation Without Compromising Student Performance in Online Classes” (co-PI), NSF, \$499,937 (9/2008-8/2011)

**Total Expenditures:**

**2007 - \$9.0M**

**2008 - \$9.5M**

The background of the page is a light orange color with a faint, semi-transparent grid pattern. A window with a dark frame is visible in the upper middle section of the grid.

FACULTY  
PROFILES





## Rajeev Balasubramonian

Assistant Professor

[www.cs.utah.edu/~rajeev](http://www.cs.utah.edu/~rajeev)

[rajeev@cs.utah.edu](mailto:rajeev@cs.utah.edu)

Rajeev Balasubramonian received his B.Tech., Computer Science and Engineering, at the Indian Institute of Technology in 1998, and his M.S. and PhD in Computer Science at the

University of Rochester in 2000 & 2003.

Professor Balasubramonian's research focuses on many aspects of computer architecture. He is particularly interested in studying how future technology trends influence the design of high-performance microprocessors. There are several challenges in future technologies, all of which are being considered by Professor Balasubramonian's group: delay and power overheads within on-chip networks, delays and capacity pressures within last-level caches, heavy load on memory controllers, and support for efficient multi-threaded programming models such as transactional memory. Recent projects have examined the benefits of architectural wire management (representative publications at HPCA'05 and ISCA'06), models for optimal large cache design (ISCA'07 and MICRO'07), leveraging 3D for reliability (MICRO'07), and efficient data placement in large caches (two publications in HPCA'09).

### 2007 and 2008 Publications

#### 2007 Journals

M. Awasthi, V. Venkatesan, R. Balasubramonian, "Understanding the Impact of 3D Stacked Layouts on ILP", *The Journal of Instruction-Level Parallelism (JILP)*, Volume 9, pp : 1-27 June 2007.

N. Madan, R. Balasubramonian, "Power-Efficient Approaches to Redundant Multi-threading", *IEEE Transactions on Parallel and Distributed Systems (Special Issue on CMP Architectures)*, Vol. 18(8), pages 1066-1079, August 2007.

#### 2007 Refereed Conferences

N. Muralimanohar, R. Balasubramonian, "Interconnect Design Considerations for Large NUCA Caches", 34th International Symposium on Computer Architecture (ISCA-34), pages 369-380, June 2007.

N. Muralimanohar, R. Balasubramonian, N. Jouppi, "Optimizing NUCA Organizations and Wiring Alternatives for Large Caches with CACTI 6.0", 40th International Symposium on Microarchitecture (MICRO-40), pages 3-14, December 2007.

N. Madan, R. Balasubramonian, "Leveraging 3D Technology for Improved Reliability", 40th International Symposium on Microarchitecture (MICRO-40), pages 223-235, December 2007.

#### 2008 Journals

N. Muralimanohar, R. Balasubramonian, N.P. Jouppi, "Architecting Efficient Interconnects for Large Caches with CACTI 6.0", *IEEE Micro Special Issue on Top Picks from 2007 Computer Architecture Conferences*, Vol. 28(1), pages 69-79, January/February 2008.

#### 2008 Refereed Conferences

S. Pugsley, M. Awasthi, N. Madan, N. Muralimanohar, R. Balasubramonian, "Scalable and Reliable Communication for Hardware Transactional Memory", 17th International Conference on Parallel Architectures and Compilation Techniques (PACT-17), pages 144-154, October 2008.

### 2007 and 2008 Invited Talks and Presentations

September 2007, University of Rochester

September 2007, Cornell University

October 2007, Princeton University

October 2007, Brigham Young University

### 2007 and 2008 Professional Participation

Program committee member for ISPASS 2007, HiPC 2007, HPCA 2008, HiPC 2008, ICPP 2008, MICRO 2008, dasCMP 2008.

Co-organizer, 2nd Workshop on Chip Multiprocessor Memory Systems and Interconnects, held in conjunction with ISCA 2008.

Registration Chair for ISPASS 2007, HPCA 2008, ISPASS 2008.

NSF panels (July 2008, December 2008).

### 2007 and 2008 Honors and Awards

Research on large cache modeling (work appearing in ISCA-34 and MICRO-40 papers) selected to appear in *IEEE Micro's Special Issue on Top Picks from 2007 Computer Architecture Conferences*. This work is one of ten papers recognized as "the year's most significant research publications in Computer Architecture based on novelty and industry relevance".



**Adam Bargteil**  
 Assistant Professor  
[www.cs.utah.edu/~adamb](http://www.cs.utah.edu/~adamb)  
[adamb@cs.utah.edu](mailto:adamb@cs.utah.edu)

Adam W. Bargteil is an assistant professor at the University of Utah. He earned his Ph.D. in computer science from the University of California, Berkeley and spent two years as a post-doctoral fellow in the School of Computer Science at Carnegie Mellon University. His primary research interests lie in the area of physically based simulation for computer animation. His research has focused on developing tools that allow animators to create high-quality realistic, visually detailed animations of complex materials. Adam has co-authored three SIGGRAPH papers and three animated shorts showcasing his projects have appeared in the SIGGRAPH Electronic Theater. He received dual BS degrees in computer science and mathematics (magna cum laude) from the University of Maryland in 2000. Adam was a U.C. Microelectronics Fellow in 2000 and a Siebel Scholar in 2006. From 2005 to 2007, he was a consultant at PDI/DreamWorks, developing fluid simulation tools that were used in "Shrek the Third" and "Bee Movie."

Professor Bargteil's research interests are in computer graphics and animation, especially physics-based animation. In essence, this subfield develops mathematical models of the real world and uses numerical methods to compute motion. For computer graphics applications, physical fidelity and standard notions of accuracy are less important than visual fidelity and plausibility. These unique requirements for computer graphics allow the use of new approximations to the real world, but also present challenges, such as temporally coherent tracking of liquid surfaces. With collaborators, Prof. Bargteil has explored techniques for animating liquids, deformable solids, and materials that demonstrate behavior of both fluids and solids, such as clay, slime, and goop. The interdisciplinary nature of his work leads to overlaps with scientific computing, numerical methods, computational physics, and computational geometry.

### 2007 and 2008 Publications

Adam W. Bargteil, Chris Wojtan, Jessica K. Hodgins, and Greg Turk. "A Finite Element Method for Animating Large Viscoplastic Flow." ACM Transactions on Graphics (SIGGRAPH 2007), August 2007, Vol. 23, No. 3.

Ashley M. Eden, Adam W. Bargteil, Tolga G. Goktekin, Sarah Beth Eisinger, and James F. O'Brien. "A Method for Cartoon-Style Rendering of Liquid Animations." In the proceedings of Graphics Interface. Montreal, Canada, May 2007.

### 2007 and 2008 Professional Participation

Siggraph 2008. Symposium on Computer Animation 2007, 2008

### 2007 and 2008 Invited Talks and Presentations

University of Pennsylvania. Modeling Materials and Visual Detail for Computer Animation, April 2008.

Rutgers. Modeling Materials and Visual Detail for Computer Animation, April 2008.

University of Toronto. Modeling Materials and Visual Detail for Computer Animation, March 2008.

University of Southern California. Modeling Materials and Visual Detail for Computer Animation, March 2008.

University of California, Riverside. Modeling Materials and Visual Detail for Computer Animation, March 2008.

University of Utah. Modeling Materials and Visual Detail for Computer Animation, February 2008.



Warnock Engineering Building Courtyard





**Martin Berzins**  
 Director and Professor  
[www.cs.utah.edu/~mb](http://www.cs.utah.edu/~mb)  
[mb@cs.utah.edu](mailto:mb@cs.utah.edu)

Martin Berzins received his PhD from the University of Leeds in 1981.

Martin's research area is the study of serial and parallel novel computational algorithms for the numerical solution of partial differential equations (p.d.e.s). This area is part of the discipline of Scientific Computing. The physical problems that are modeled by p.d.e.s are of great importance to a wide range of both industrial and academic research groups. Examples range from being able to design better harbors to understanding environmental pollution, modeling the behavior of lubricants in a car engine or modeling fires and explosions. The approach taken in this research has been to derive numerical methods with adaptive error control and develop software on both serial and parallel computers for a broad, mathematically-defined problem class. This has made it possible for users from different physical applications areas to solve their problems by creating a mathematical model which fits inside the general problem class.

Martin's current research areas are:

- Parallel adaptive mesh algorithms for tera-scale and peta-scale computers
- Adjoint based error estimation and error control algorithms
- Positivity preserving high-order methods
- Analysis of methods used in modeling fires and explosions in the Utah CSAFE project

### 2007 and 2008 Publications

M.Berzins. "Is there still more to Science than Computation"? Computing in Science and Engineering,9,1,98-101 (2007).

Goodyer, C.E. and Berzins M. "Parallelisation and scalability issues of a multilevel EHL solver". Concurrency and Computation, vol. 19, pp. 369-396. 2007

Luitjens J. Berzins M. Henderson T.C. "Parallel space-filling curve generation through sorting". Concurrency and Computation Practice and Experience,19, 10, 1387-1402, 2007.

Berzins, M. "Adaptive Equally-Spaced Polynomial Interpolation" SIAM Review, December 2007.

Hamman C.R. Kirby M. and Berzins M. "Parallel Direct Simulation of Incompressible Navier Stokes Equations". Concurrency and Computation, 19, 10, 1403-1427, 2007.

M. Steffen, R. M. Kirby, M. Berzins, "Analysis and Reduction of Quadrature Errors in the Material Point Method (MPM)" International Journal for Numerical Methods in Engineering, 2008. Vol 76, pp. 922-948.

M. Steffen, P.C. Wallstedt, J.E. Guilkey, R.M. Kirby, and M. Berzins, "Examination and Analysis of Implementation Choices within the Material Point Method (MPM)"; Computer Modeling in Engineering & Sciences, 2008. Vol 31 No 2.

Luitjens J, Berzins, M and Henderson T.C. "Scalable Parallel AMR for the Uintah Multiphysics Code". Petascale Computing Algorithms and Applications. Ed D.A.Bader Chapman and Hall 2008. pp 67-81

Goodyer C.E., Wood J., Berzins M. "Mathematical Modelling of Chemical Diffusion through Skin using Grid-based PSEs Modeling, Simulation and Optimization of Complex Processes": Proceedings of the Third International Conference on High Performance Scientific Computing Editors: Hans Georg Bock, Ekaterina Kostina, Hoang Xuan Phu, Rolf Rannacher Springer Lecture Notes in Computer Science pages 249-258 2008

Tran L.T. Kim J. and Berzins M. "An Introduction to the MPM Method.in Numerical Analysis and Applied Mathematics". ICNAAM 2008. pp.26-29. Eds T.E. Simos, G. Psihoyios and Ch. Tsitouras. AIP Conference Proceedings 1048, 2008. ISBN 978-0-7354-0576-9.

### 2007 and 2008 Invited Talks and Presentations

#### 2007

- SIAM Conference on Computational Science, Invited Mini-symposium
- MPM Work Shop, Alberquerque, NM Sandia Labs
- Finite Elements in Fluids, Santa Fe, NM
- Minisymposium Talk, Icosahom, Beijing, China
- ODE Work Shop, Innsbruck, Austria
- Complex Systems Conference, Invited Plenary Talk, Boston, MS
- DOE/DOD Work Shop on Novel Architecture, Invited Talk, Washington DC
- Poster at NSF Technical Work Shop, Tempe, AZ
- Visiting Professor Seminar, University of Leeds
- Seminar at CWI, Amsterdam

#### 2008

- SCOREC Seminar RPI, May.
- Teragrid Conference - Panel On PetaScale Computing, June.
- NAG Technical Meeting Oxford - 2 invited talks, June.
- SIAM Annual Meeting Minisymposium talk, July.
- HPC Meeting Cedar City - Invited panel member, August.
- ICCNAM, Kos Greece, Invited Plenary talk, September.
- Workshop on Disaster Modeling TACC, Austin, November.
- Visiting Professor Seminar, University of Leeds, December
- Seminar at CWI, Amsterdam, December

### 2007 and 2008 Professional Participation

- Served on 3 panels - DOE
- Served on 5 NSF OCI Panels
- Co-Editor in Chief - Applied Numerical Mathematics
- Editorial Board - SIAM, Journal of Scientific Computing
- Editorial Board - Concurrency & Computation
- Editorial Board - International Journal of Numerical Methods in Fluids
- Technical Board - Numerical Algorithms, Oxford, UK
- Visiting Professor University of Leeds UK
- Member of NSF TRAC Teragrid Allocations Panel



**Richard B. Brown**  
Dean of Engineering and Professor  
[www.coe.utah.edu/brown](http://www.coe.utah.edu/brown)  
[brown@utah.edu](mailto:brown@utah.edu)

Richard B. Brown received B.S. and M.S. degrees in electrical engineering (computer emphasis) from Brigham Young University in 1976, and then worked in industry for five years before returning to school at the University of Utah, where he earned his Ph.D. in Electrical Engineering in 1985. He joined the Electrical Engineering & Computer Science (EECS) faculty at the University of Michigan, where he served as associate chair for EE and as interim chair of EECS. In July 2004, Professor Brown was appointed the 11<sup>th</sup> Dean of the College of Engineering at the University of Utah. His appointment is divided between the Department of Electrical & Computer Engineering and the School of Computing, with a courtesy appointment in Bioengineering.

Professor Brown has conducted major research projects in microprocessor design, low-power mixed-signal microcontrollers, and solid-state chemical sensors of many types. He has been active in technology transfer and is a founder of Sensicore, i-sens, and Mobius Microsystems.

#### 2007 and 2008 Publications

##### 2007 Journals

Michael S. McCorquodale, Justin D. O'Day, Scott M. Pernia, Gordon A. Carichner, Sundus Kubba, Richard B. Brown, "A Monolithic and Self-Referenced RF LC Clock Generator Compliant with USB 2.0," *IEEE Journal of Solid-State Circuits*, vol. 42, issue 2, pp. 385-399, Feb. 2007.

Jun Ho Shim, Juneho Kim, Geun Sig Cha, Hakhyun Nam, Ryan J. White, Henry S. White, Richard B. Brown, "Glass Nanopore-Based Ion-Selective Electrodes," *Analytical Chemistry*, 79(10), pp. 3568-3574, May 2007. (DOI:10.1021/ac061984z)

Kanak Agarwal, Rahul Rao, Dennis Sylvester, Richard Brown, "Parametric Yield Analysis and Optimization in Leakage Dominated Technologies," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 15, no. 6, pp. 613-623, June 2007.

##### 2008 Journals

Segyeong Joo\*, Richard B. Brown, "Chemical Sensors with Integrated Electronics," *Chemical Reviews*, vol. 208, issue 2, pp. 638-651, Feb. 2008. (DOI: 10.1021/cr068113+)

Koushik K. Das, Ching-Te Chuang, Richard B. Brown, "Reducing Parasitic BJT Effects in Partially-Depleted SOI Digital Logic Circuits," *Microelectronics Journal*, vol. 39, issue 2, pp. 275-285, Feb. 2008.

Matthew D. Johnson, Robert K. Franklin, Matthew D. Gibson, Richard B. Brown, Daryl R. Kipke, "Implantable Microelectrode Arrays for Simultaneous Electrophysiological and Neurochemical Recordings," *Journal of Neuroscience Methods*, vol. 174, issue 1, pp. 62-70, Sept. 2008.

##### 2008 Refereed Conferences

Amlan Ghosh, Rahul M. Rao, Jae-joon Kim, Ching-Te Chuang, Richard B. Brown, "On-Chip Process Variation Detection Using Slew-Rate Monitoring Circuit," 21<sup>st</sup> International Conference on VLSI Design, Hyderabad, India, Jan. 4-8, 2008, pp. 143-149.

Michael S. McCorquodale, Scott M. Pernia, Justin D. O'Day, Gordy Carichner, Eric Marsman, Nam Nguyen, Sundus Kubba, Si Nguyen, Jon Kuhn, Richard B. Brown, "A 0.5-480 MHz Self-Referenced CMOS Clock Generator with 90ppm Total Frequency Error and Spread Spectrum Capability," International Solid-State Circuits Conference, San Francisco, CA, February 3-7, 2008, vol. 5, pp. 350-619.

Matthew Guthaus, Dennis Sylvester, Richard Brown, "Clock Tree Synthesis with Data-Path Sensitivity Matching," Asia and South Pacific Design Automation Conference, Seoul, Korea, March 21-24, 2008, pp. 498-503.

Amlan Ghosh, Rahul M. Rao, Ching-Te Chuang, Richard B. Brown, "On-Chip Process Variation Detection Using Slew-Rate Monitoring Circuit," 9th International Symposium on Quality Electronic Design, San Jose, CA, March 17-19, 2008, pp. 815-820.

M. S. McCorquodale, S. M. Pernia, S. Kubba, G. Carichner, J. O'Day, E. Marsman, J. Kuhn, R. B. Brown, "A 25MHz All-CMOS Reference Clock Generator for XO-Replacement in Serial Wire Interfaces," IEEE International Symposium on Circuits and Systems, Seattle, WA, May 18-21 2008, pp. 2837-2840.

##### Chapters in Books

Robert Franklin, Steven Martin and Timothy D. Strong, Richard B. Brown, "Chemical and Biological Systems: Chemical Sensing for Liquids," in *Comprehensive Microsystems*, Y. B. Gianchandani, O. Tabata, H. Zappe (ed.) Oxford: Elsevier Ltd, 2007, vol. 2, pp. 433-462.

##### Other Presentations and Publications

Richard B. Brown, "Silicon Electrochemical Neurosensor Arrays," University of Puerto Rico, Mayaguez Campus, San Juan Puerto Rico, April 27, 2007.

Richard B. Brown, "Sensor Interface Electronics," Iowa State University, Ames, IA, November 17, 2007.

Richard B. Brown, "Electrochemical Neurosensor Systems," seminar at Georgia Institute of Technology, May 27, 2008.

Richard B. Brown, "Silicon Electrochemical Neurosensors," Global Management of Technology Conference 2008, Seoul, Korea, Sept. 25, 2008, slides pp. 189-210.

Richard B. Brown, Silicon Electrochemical Neurosensors, Korea Technology Industry Co., Technology Research Center, Seoul, Korea, Sept. 26, 2008.

#### 2007 and 2008 Professional Participation

##### Service

- Dean – College of Engineering
- Professor – School of Computing
- Professor – Electrical & Computer Engineering
- Adjunct Professor – Bioengineering
- Adjunct Professor – University of Michigan, Electrical Engineering and Computer Science Department
- Chair – College of Engineering Executive Committee



**Erik Brunvand**  
Associate Professor  
[www.cs.utah.edu/~elb](http://www.cs.utah.edu/~elb)  
[elb@cs.utah.edu](mailto:elb@cs.utah.edu)

- Member – College of Engineering Industrial Advisory Board
- Member – College of Engineering, Engineering National Advisory Committee
- Member – University Commercialization Advisory Board
- Member – Advancement Policy Council
- Member – Effort Reporting for Sponsored Research – Steering Committee
- Member – USTAR Building – Steering Committee
- Member – USTAR Interdisciplinary Quadrangle Master Planning Committees: Steering Committee and Open Space Committee
- Member – Disaster Resistant University Advisory Committee
- Member – Internal International Advisory Board
- Member – Asia Center Advisory Board
- Member – Communication, Leadership, Ethics and Research (CLEAR) Advisory Board
- Member – College of Pharmacy Dean Search Committee
- Member – Mathematics Steering Committee

*Advisory Committees and Activities*

- Member – MOSIS Advanced Technology Advisory Committee
- Chair – NSF MOSIS Advisory Council on Education
- Member – National Advisory Committee for BYU, Electrical and Computer Engineering Department
- Member – Utah Technology Council

*Consulting*

- V-Spring Capital

**2007 and 2008 Patents**

Michael S. McCorquodale and Richard B. Brown, “MEMS-Based, Computer Systems, Clock Generation and Oscillator Circuits and LC-Tank Apparatus for Use Therein”, U.S. Patent 7,157,984, January 2, 2007.

Steven M. Martin, Roy H. Olsson, III, Richard B. Brown, Robert K. Franklin, “Microsystem for Determining Clotting Time of Blood and Low-Cost, Single-Use Device for Use Therein”, U.S. Patent 7,291,310, Nov. 6, 2007

*Patents in Progress*

Henry S. White, Ryan J. White, Richard B. Brown, Hakhyun Nam, Jun Ho Shim, “Nanopore Based Ion-Selective Electrodes,” U.S. Patent Application No. 11/852,061 and International PCT Application No. PCT/US2007/019584 filed Sept. 7, 2007.

Amlan Ghosh, Rahul M. Rao, Jae-joon Kim, Ching-Te Chuang, Richard B. Brown, “Apparatus and Method for Determining the Slew Rate of a Signal Produced by an Integrated Circuit”, U.S. Patent Application filed 2008.

Erik Brunvand received a B.S. in Computer Science and a B.S. in Mathematics at the University of Utah in 1982, his M.S. in Computer Science at the University of Utah in 1984, and his PhD in Computer Science at Carnegie Mellon University in 1991.

Professor Brunvand joined the Department of Computer Science in 1990. He has interests in computer architecture and VLSI systems in general, and self-timed and asynchronous systems in particular. One aspect of his research involves compiling concurrent communicating programs into asynchronous VLSI circuits. The current system allows programs written in a subset of occam, a concurrent message-passing programming language based on CSP, to be automatically compiled into a set of self-timed circuit modules suitable for manufacture as an integrated circuit. His most recent research project is involved with designing custom hardware to accelerate ray tracing graphics. The end goal of this research is to develop technology to enable commodity ray tracing-based graphics chips that can replace or augment today’s GPUs and enable higher quality and more realistic graphics capabilities for future computers.

**2007 and 2008 Publications**

P. Shirley, K. Sung, E. Brunvand, A. Davis, S. Parker, and S. Boulos, “Rethinking Graphics and Gaming Courses Because of Fast Ray Tracing”, SIGGRAPH Educator’s Workshop (a refereed venue associated with SIGGRAPH). 2007. Article No. 15

D. Kopta, J. Spjut, E. Brunvand, and S. Parker, “Comparing Incoherent Ray Performance of TRaX vs. Manta,” *IEEE Symposium on Interactive Ray Tracing*, August 2008. Page 183

J. Spjut, D. Kopta, S. Boulos, S. Kellis, and E. Brunvand, “TRaX: A multi-threaded architecture for real-time ray tracing,” In 6th IEEE Symposium on Application Specific Processors (SASP), June 2008 Best Paper award for SASP08. Pages 108-114

**2007 and 2008 Professional Participation**

- NSF – Funding panel
- IEEE Symposium on Asynchronous Circuits and Systems – Steering Committee Chair
- IEEE Great Lakes Symposium on VLSI Design – Track Chair
- IEEE Transactions on VLSI – Reviewer
- IEEE Symposium on Asynchronous Circuits and Systems – Publication Chair
- IEEE Symposium on High Performance Computer Architecture – Reviewer
- IEEE Transactions on CAD – reviewer
- IEEE/EG Symposium on Interactive Ray Tracing – Program Committee
- IEEE/EG EuroGraphics – Program Committee





**Elaine Cohen**  
Professor  
[www.cs.utah.edu/~cohen](http://www.cs.utah.edu/~cohen)  
[cohen@cs.utah.edu](mailto:cohen@cs.utah.edu)

Elaine Cohen received her B.A. in Mathematics from Vassar College in 1968, her M.S. and PhD in Mathematics from Syracuse University in 1970 & 1974.

Prof. Cohen has focused her research in computer graphics, geometric modeling, virtual prototyping, haptics, and manufacturing, with emphasis on complex sculptured models represented using NURBS (Non-Uniform Rational B-splines) and NURBS-features. Also, Prof. Cohen has been working on issues related to design collaborations and reverse engineering in immersive environments. Results in manufacturing research have been focused on automating process planning, automatic toolpath generation for models having many surfaces, optimizing both within and across manufacturing stages and fixture automation. Recent research has produced algorithms for determining both visibility and accessibility of one object by another. Computation of such information is necessary for manufacturing, assembly planning, graphics, and virtual environments. Research in haptics has been focused on developing new approaches to solving geometric computations such as fast and accurate contact and tracking algorithms for sculptured models.

#### **2007 and 2008 Publications**

##### *2007 Journals*

X. Chen, R. F. Riesenfeld, E. Cohen and J. N. Damon, "Theoretically Based Algorithms for Robust Tracking of Intersection Curves of Deforming Parametric Surfaces," *Computer Aided Design*, v. 39, #5, May 2007, pp. 389-397.

X. Chen, R. Riesenfeld, E. Cohen, "Degree Reduction for NURBS Symbolic Computation on Curves," *International Journal of Shape Modeling*, vol. 13, no. 1, pp. 25-49, June, 2007.

Matthew Kaplan and Elaine Cohen, "Reconstructing the Frontal Geometry of Drawings of Arbitrary Surfaces," *Computers & Graphics*, v.31(4), August 2007, pp. 568-579.

##### *2007 Refereed Conference*

X. Chen, R. F. Riesenfeld, Elaine Cohen, "Sliding-Windows Algorithm for B-spline Multiplication," *Solid and Physically Based Modeling*, 2007. Pages: 265 - 276

W. Guo, E. Cohen, and G. Elber, "An Improved Algorithm for Curvature Analysis and Segmentation of Volume Data Sets Using Trivariate B-splines," *Proc. of the 2007 International Conference on Image Processing, Computer Vision, and Pattern Recognition*, H. Arabnia, ed., 2007, pp. 327-333, ISBN of the Proceeding: 1-60132-043-4.

##### *2008 Refereed Conference*

T. Martin, E. Cohen, and R. M. Kirby, "Volumetric Parameterization and Trivariate B-spline Fitting using Harmonic Functions," *Solid and Physical Modeling Symposium*, pp. 269-280, 2008, Selected for Cover Image, Winner, The Best Paper Award.

J-K Seong, E. Cohen, and G. Elber, "Voronoi Diagram Computations for Planar NURBS Curves," *Solid and Physical Modeling Symposium*, pp. 67-77, 2008.

J-K Seong, W-K Jeong, and E. Cohen, "Anisotropic Geodesic Distance Computation for Parametric Surfaces," *IEEE International Conference on Shape Modeling and Applications (SMI'08)*, pp. 179-186, 2008.

##### *Book Chapters*

D. E. Johnson and E. Cohen, "Haptic Rendering of Spline Models: Algorithms and Theory," *In Haptic Rendering: Foundations, Algorithms, and Applications*, M. Lin and M. Otaduy, eds., ISBN: 978-1-56881-332-5

#### **2007 and 2008 Invited Talks and Presentations**

Invited Speaker, Centre of Mathematics for Applications Workshop, "Interplay between the Representation of Geometry and Numerical Solution of Partial Differential Equations," Oslo, Norway, February 2007

Invited Speaker, Minisymposium on Computational Geometry and Analysis at 9th US National Congress on Computational Mechanics, July 2007

Invited Speaker, Minisymposium on Isogeometric Analysis at the Seventh International Conference on Mathematical Methods for Curves and Surfaces Tonsberg, Norway, 2008

Invited speaker and panelist: Community College Regional Leadership Forum, "Advancing Women's Leadership," 24-26 September 2008, Snowbird Utah

Invited speaker and panelist, "Jewish Women Scientists," National Council of Jewish Women Annual Fall Membership Brunch, 21 September 2008

#### **2007 and 2008 Professional Participation**

NSF - Member, Panel for Reviewing and Analyzing Submitted Proposals.

##### *Program Committee*

ACM Symposium on Solid and Physical Modeling, 2007

ACM Siggraph 2007 Symposium on Interactive Graphics & Games

Steering Committee, Solid Modeling Association, 2008-2011.

##### *Session Chair*

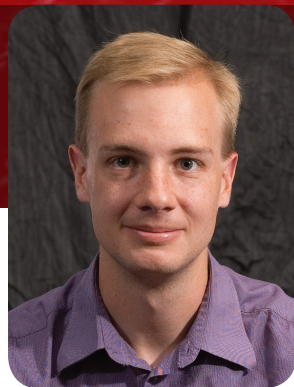
Seventh International Conference on Mathematical Methods for Curves and Surfaces Tonsberg, Norway, 2008

Solid and Physical Modeling, 2008

#### **2007 and 2008 Honors and Awards**

##### *Selected for Cover Image, Winner, The Best Paper Award*

T. Martin, E. Cohen, and R. M. Kirby, "Volumetric Parameterization and Trivariate B-spline Fitting using Harmonic Functions," *Solid and Physical Modeling Symposium*, pp. 269-280, 2008



**Hal Daume III**  
Assistant Professor  
[www.cs.utah.edu/~hal](http://www.cs.utah.edu/~hal)  
[hal@cs.utah.edu](mailto:hal@cs.utah.edu)

Hal Daume earned his PhD in Computer Science at the University of Southern California under the supervision of Daniel Marcu, and his B.S. in Mathematics from Carnegie Mellon University.

His research lies at the intersection of machine learning and natural language processing and spans several topics including document summarization, information extraction, structured machine learning and Bayesian techniques. He has published three journal articles and nine conference papers in top natural language processing and machine learning journals and conferences.

#### **2007 and 2008 Publications**

Yee Whye Teh, Hal Daume III and Daniel Roy. "Bayesian agglomerative clustering with coalescents" Proceedings of the Conference on Neural Information Processing Systems (NIPS), 2007 pp: 1473-1480

Hal Daume III. "Frustratingly easy domain adaptation" Proceedings of the Conference of the Association for Computational Linguistics (ACL), 2007 pp. 256-263

Hal Daume III and Lyle Campbell. "A Bayesian model for discovering typological implications" Proceedings of the Conference of the Association for Computational Linguistics (ACL), 2007 pp. 65-72

Hal Daume III. "Fast search for Dirichlet process mixture models" Proceedings of the Conference on Artificial Intelligence and Statistics (AI-STATS), 2007.

Piyush Rai and Hal Daume III. "The Infinite Hierarchical Factor Regression Model" Proceedings of the Conference on Neural Information Processing Systems (NIPS), 2008 pp: 1321-1328

Pu Liu, Qiang Shi, Hal Daume III and Gregory A. Voth. "A Bayesian statistics approach to multiscale coarse" Journal of Chemical Physics 2008. 129(21), 214114.

Hal Daume III. "Cross-Task Knowledge-Constrained Self Training" Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP), 2008. pp. 680-688

Percy Liang, Hal Daume III and Dan Klein. "Flattening Structured Classification: Trading Structure for Features" Proceedings of the International Conference on Machine Learning (ICML), 2008. Pages 592-599

Ulf Hermjakob, Kevin Knight and Hal Daume III. Name Translation in Statistical Machine Translation: Learning When to Transliterate. Proceedings of the Conference of the Association for Computational Linguistics (ACL), 2008. pages 389-397

Devyani Ghosh, John Carter and Hal Daume III. "Perceptron-based Coherence Prediction" Proceedings of the Workshop on Chip Multiprocessor Memory Systems and Interconnects, ICSA, 2008

#### **2007 and 2008 Invited Talks and Presentations**

Summer School in Computational- and Psycho-Linguistics September 2008  
University of Edinburgh

Automatic Document Summarization January 2007, Information Sciences Institute

Search-based Structured Prediction March 2007, University of Maryland, College Park

Bayesian Techniques for Natural Language Processing July 2007, Microsoft Research Asia, Beijing, China

#### **2007 and 2008 Professional Participation**

##### *Associate Editor:*

IEEE Transactions of Speech and Language Processing  
Machine Learning Journal

##### *Conference Area Chair:*

Association for Computational Linguistics (ACL)  
Empirical Methods in Natural Language Processing (EMNLP)

##### *Conference Program Committee:*

North American Chapter of the ACL (NAACL)  
Neural Information Processing Systems (NIPS)  
International Conference on Machine Learning (ICML)  
American Association for Artificial Intelligence (AAAI)  
International Joint Conference on Artificial Intelligence (IJCAI)  
ACM SIG in Information Retrieval (SIGIR)  
Conference on Uncertainty in Artificial Intelligence (UAI)  
Conference on Artificial Intelligence and Statistics (AI-STATS)



**Al Davis**  
Professor  
[www.cs.utah.edu/~ald](http://www.cs.utah.edu/~ald)  
[ald@cs.utah.edu](mailto:ald@cs.utah.edu)

Al Davis received his B.S. in Electrical Engineering at MIT in 1969, and his PhD in Electrical Engineering, Computer Science Division at the University of Utah in 1972. Traditionally

Professor Davis has worked in the areas of high performance computer architecture, asynchronous circuits and systems, VLSI, and parallel computation. His current focus is on the design of domain specific embedded system architectures. Domain specialization enables several orders of magnitude improvement in energy-delay product of the resulting devices when compared against traditional general purpose processors. These results have been shown in three domains to date: perception (speech, face, and gesture recognition), 3G cellular base band with media application suites, and for ray-traced graphics rendering. The same design methodology was employed for both of these architectures. This method is supported by a CAD package that automates most of the design process. Professor Davis is working with colleagues at the University of New Mexico to develop an accurate predictive model for VLSI device power based on process, architecture, and wiring complexity parameters. Lastly, Professor Davis is working with colleagues at Hewlett-Packard Laboratories to develop inter- and intra-die silicon nanophotonic devices and architectures for exascale computing systems.

#### 2007 and 2008 Publications

Karthik Ramani, Al Davis. "Application Driven Embedded System Design: A Face Recognition Case Study" Proceedings of the International Conference on Compilers, Architectures, and Synthesis for Embedded Systems (CASES 07). Innsbruck, Austria 2007, pp. 103 - 114.

J-H Ahn, R. G. Beausoleil, N. Binkert, A. Davis, M. Fiorentino, D. A. Fattal, N. P. Jouppi, M. McLaren, M. Monchiero, C. M. Santori, R. S. Schreiber, S. Spillane, D. Vantrease. A Nanophotonic Interconnect for High-Performance Many-Core Computation. Laser and Electro-Optical Society Newsletter, June 2008, pp. 15 - 22.

M. Moses, S. Forrest, A. Davis, J. H. Brown, M. Lodder. "Scaling Theory for Information Networks" Journal of the Royal Society Interface. 2008 V. 5, N. 29 Pages 1469-1480.

R. G. Beausoleil, J-H Ahn, N. Binkert, A. Davis, D. Fattal, M. Fiorentino, N. P. Jouppi, M. McLaren, C. M. Santori, R. S. Schreiber, S. M. Spillane, D. Vantrease, Q. Xu. A Nanophotonic Interconnect for High-Performance Many-Core Computation. Proceedings of the IEEE Symposium on High Performance Interconnects, Volume 00, 2008, pp. 182-189.

D. Vantrease, R. S. Schreiber, M. Monchiero, M. McLaren, N. P. Jouppi, M. Fiorentino, A. Davis, N. Binkert, R. G. Beausoleil, J-H Ahn. Corona: System Implications of Emerging Nanophotonic Technology. ISCA 2008, pp. 153-164.

#### 2007 and 2008 Patents Filed

M. McLaren, A. Davis, N. Binkert, "Prioritized Optical Arbitration" (pending, filed 01-Nov-2008).

N. Binkert, A. Davis, M. McLaren. "Method for Constructing A Logically High-radix Switch Topology From Low-radix Physical Networks" (pending, filed 08-Aug-2008).

N. P. Jouppi, A. Davis, N. Aggarwal, R. Kaufmann. "Integrated Checkpoint Storage for Fast, Power-Efficient Availability" (pending, filed 01-May-2008).

M. McLaren, N. P. Jouppi, N. Binkert, A. Davis, J-H. Ahn. "Opto-electronic switch using orthogonal, on-chip optical waveguides" (pending, filed 11-Mar-2008)

J-H Ahn, A. Davis, M. McLaren. "Two-phase optical bus for power efficient Communication" (pending, filed 10-Mar-2008).

N. Binkert, R. S. Schreiber, A. Davis, D. Vantrease. "An All Optical Dense Wave Division Multiplexed Barrier Synchronization Method" (pending, filed 29-Feb-2008).

N. Binkert, N. P. Jouppi, A. Davis. "Packaging Method for Three-Dimensional Die Stacks Employing Inter- and Intra-Device Optical Interconnect Using an Externally Supplied Laser" (pending, filed 23-Oct-2007).

M. McLaren, N. Jouppi, N. Binkert, A. Davis, J-H. Ahn. "Optically Connected Memory: A 3D Energy Efficient Optically Interfaced DRAM Module Architecture" (pending, filed 23-Oct-2007).

#### 2007 and 2008 Invited Talks and Presentations

Wire Based Power Prediction Location: Google, Mountain View, CA.  
Domain Specific Architecture Synthesis Place: Synaptics, Santa Clara, CA  
Compilation Based Scheduling and Culprit Analysis Location: Apple, Cupertino, CA  
Automated Design Space Exploration Location: Sun Laboratories, Menlo Park, CA  
Automated Design Space Exploration Location: AMD/ATI Santa Clara, CA

#### 2007 and 2008 Professional Participation

DARPA MTO - External Review Board  
CASES - Program Committee





**Matthew Flatt**  
Associate Professor  
[www.cs.utah.edu/~mflatt](http://www.cs.utah.edu/~mflatt)  
[mflatt@cs.utah.edu](mailto:mflatt@cs.utah.edu)

Professor Flatt received his B.S. in Math and Computer Science and his B.S. in Physics at Carnegie Mellon University in 1993, his M.S. and PhD in Computer Science at Rice University in 1998 & 1999.

Professor Flatt's research interests include practical and theoretical aspects of programming languages and programming environments. He is especially interested in programming environments and tools for extensible and interoperating programming languages.

#### 2007 and 2008 Publications

Matthew Flatt, Gang Yu, Robert Bruce Findler, and Matthias Felleisen. "Adding Delimited and Composable Control to a Production Programming Environment" ACM International Conference on Functional Programming 2007 ISBN 978-1-59593-815-2

#### 2007 and 2008 Professional Participation

##### Steering committee

ACM International Conference on Functional Programming (through 2007)

##### Program committee

- Workshop on Dynamic Languages and Applications (2007)
- Symposium on Practical Aspects of Declarative Languages (2008)
- Asian Symposium on Programming Languages and Systems (2008)
- ACM Workshop on Foundations of Object-Oriented Languages (2008)
- Functional and Declarative Programming in Education (2008)
- Workshop on Virtual Machines and Intermediate Languages (2008)



**Thomas Fletcher**  
Assistant Professor  
[www.sci.utah.edu/~fletcher](http://www.sci.utah.edu/~fletcher)  
[fletcher@sci.utah.edu](mailto:fletcher@sci.utah.edu)

Tom Fletcher received his B.A. degree in Mathematics at the University of Virginia in 1999. He received an M.S. in Computer Science in 2002 followed by a Ph.D. in Computer Science in 2004 from the University of North Carolina at Chapel Hill.

Dr. Fletcher's research is focused on creating novel methods at the intersection of statistics, mathematics, and computer science to solve problems in medical image analysis. He is currently collaborating with researchers in Autism and Alzheimer's disease at the University of Utah on the statistical analysis of combined imaging modalities, including structural MRI, DTI, fMRI and PET in longitudinal studies.

#### 2007 and 2008 Publications

##### 2007 Journals

Jeong, W.-K., Fletcher, P.T., Tao, R., Whitaker, R.T. Interactive visualization of volumetric white matter connectivity in diffusion tensor MRI using a parallel-hardware Hamilton-Jacobi solver, IEEE Transactions on Visualization and Computer Graphics (Proceedings of IEEE Visualization), vol. 13, no. 6, pp. 1480-1487, 2007.

Fletcher, P.T., Joshi, S. Riemannian Geometry for the Statistical Analysis of Diffusion Tensor Data. Signal Processing, vol. 87, no. 2, February 2007, pp. 250-262.

##### 2007 Refereed Conferences

Davis, B., Fletcher, P.T., Bullitt, E., Joshi, S. Population shape regression from random design data, IEEE International Conference on Computer Vision (ICCV), Winner of David Marr Best Paper Award, October, 2007. Pages 1-7

Jeong, W.-K., Fletcher, P.T., Tao, R., Whitaker, R.T. Interactive visualization of volumetric white matter connectivity in diffusion tensor MRI using a parallel-hardware Hamilton-Jacobi solver, IEEE Visualization, October, 2007. Pages 1480-1487

Goodlett, C., Fletcher, P.T., Lin, W., Gerig, G. Quantification of Measurement Error in DTI: Theoretical Predictions and Validation, Medical Image Computing and Computer Assisted Intervention (MICCAI), October, LNCS vol. 4791, pp. 10-17, 2007.

Fletcher, P.T., Tao, R., Jeong, W.-K., Whitaker, R.T., A Volumetric Approach to Quantifying Region-to-Region White Matter Connectivity in Diffusion Tensor MRI, In Information Processing in Medical Imaging (IPMI), LNCS 4584, pp. 346-358, 2007.

Fletcher, P.T., Powell, S., Foster, N.L., Joshi, S.C. Quantifying Metabolic Asymmetry Modulo Structure in Alzheimer's Disease, In Information Processing in Medical Imaging (IPMI), LNCS 4584, pp. 446-457, 2007.

Cates, J., Fletcher, P.T., Styner, M., Shenton, M., Whitaker, R. Shape Modeling and Analysis with Entropy-Based Particle Systems, In Information Processing in Medical Imaging (IPMI), LNCS 4584, pp. 333-345, 2007.

##### 2008 Journals

Juruss, E., Hardy, M., Tasdizen, T., Fletcher, P.T., Koshevoy, P., Chien, C.-B., Denk, W., Whitaker, R. Axon tracking in serial block-face scanning electron microscopy, Medical Image Analysis, 2008. Pages 180-188

*Thomas Fletcher continued on next page*

### **Thomas Fletcher continued**

Foster, N.L., Wang, A.Y., Tasdizen, T., Fletcher, P.T., Hoffman, J.M., Koeppe, R.A. Realizing the potential of positron emission tomography with 18F-fluorodeoxyglucose to improve the treatment of Alzheimer's disease, *Alzheimer's and Dementia*, vol. 4, no. 1, suppl. 1, pp. S29-S36, 2008.

### **2008 Refereed Conferences**

Cates, J., Fletcher, P.T., Styner, M., Hazlett, H., Whitaker, R.T. Particle-Based Shape Analysis of Multi-Object Complexes, In Proceedings of the 11th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI '08), pp. 477-485, 2008.

Goodlett, C.B., Fletcher, P.T., Gilmore, J.H., Gerig, G. Group Statistics of DTI Fiber Bundles Using Spatial Functions of Tensor Measures. *Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, LNCS vol. pp. 1068-1075, 2008.

Cates, J., Fletcher, P.T., Whitaker, R. A hypothesis testing framework for high-dimensional shape models. *MICCAI Workshop on Mathematical Foundations of Computational Anatomy (MFCA)*, 2008. pp. 170-181

Tao, R., Fletcher, P.T., Whitaker, R. A Framework for Joint Analysis of Structural and Diffusion MRI, *MICCAI Workshop on Computational Diffusion MRI (CDMRI)*, 2008. pp: 199-207

Fletcher, P.T., Venkatasubramanian, S., Joshi, S. Robust statistics on Riemannian manifolds via the geometric median, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2008. Pages 1-8

Cates, J., Fletcher, P.T., Warnock, Z., Whitaker, R. A shape analysis framework for small animal phenotyping with application to mice with a targeted disruption of *HoxD11*, *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2008. Page 215-515

Oguz, I., Cates, J., Fletcher, P.T., Whitaker, R., Cool, D., Aylward, S., Styner, M. Entropy-

based particle systems and local features for cortical correspondence optimization, *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2008. Pages 1637-1640

### **2007 and 2008 Invited Talks and Presentations**

Invited talk at the Summer 2007 Program on the Geometry and Statistics of Shape Spaces, "Characterizing Shape Changes Using Diffeomorphic Regression", July 2007.

Bioimaging Research Center, University of Georgia, "Statistics of Anatomy for Multimodal Image Analysis", March 2008.

Department of Radiology, University of Pennsylvania, "Statistics of Anatomy for Multimodal Image Analysis", March 2008.

Hausdorff Center for Mathematics, Bonn, Germany, Invited talk at the Workshop on Geometry and Statistics of Shapes, "Robust Statistics on Riemannian Manifolds via the Geometric Median", June 2008.

All-Hands Meeting, NIH Roadmap National Centers for Biomedical Computing (NCBC), "Statistics of Anatomy for Multimodal Image Analysis", August 2008.

MICCAI Workshop on Computational Diffusion MRI, New York, NY, "Volumetric Segmentation and Tract-Based Statistics of White Matter Pathways", August 2008

### **2007 and 2008 Professional Participation**

Program Committee - Mathematical Foundations of Computational Anatomy (MFCA) 2008

### **2007 and 2008 Honors and Awards**

2007 Marr Prize (Best Paper Award) International Conference on Computer Vision

Campus in the fall







**Juliana Freire**  
Associate Professor  
[www.cs.utah.edu/~juliana](http://www.cs.utah.edu/~juliana)  
[juliana@cs.utah.edu](mailto:juliana@cs.utah.edu)

Juliana Freire is an Associate Professor at the School of Computing at the University of Utah. Before, she was member of technical staff at the Database Systems Research Department at Bell Laboratories (Lucent Technologies) and an Assistant Professor at OGI/OHSU. An important theme in Professor Freire's work is the development of data management technology to address new problems introduced by emerging applications, including the Web and scientific applications. Her recent research has focused on two main topics: Provenance management for computational tasks and Web mining. Professor Freire is an active member of the database community, having co-authored over 80 technical papers and holding 4 U.S. patents. She is a recipient of an NSF CAREER and an IBM Faculty award. She has chaired or co-chaired several workshops and conferences, and she has participated as a program committee member in over 50 events. Her research has been funded by grants from the National Science Foundation, Department of Energy, the University of Utah and the State of Utah.

#### 2007 and 2008 Publications

S. Davidson, S. Cohen-Boulakia, A. Eyal, B. Ludascher, T. McPhillips, S. Bowers, M. K. Anand, and J. Freire. "Provenance in Scientific Workflow Systems", *IEEE Data Engineering Bulletin*, 32(4), pp. 44-50, 2007.

C. Scheidegger, H. Vo, D. Koop, J. Freire, C. Silva. "Querying and Creating Visualizations by Analogy", *IEEE Transactions on Visualization and Computer Graphics*, 13(6), pp. 1560-1567, 2007.

C. Silva, J. Freire, S. Callahan. "Provenance for Visualizations: Reproducibility and Beyond", *In IEEE Computing in Science & Engineering*, 9(5): 82-90 (2007).

C. Scheidegger, D. Koop, E. Santos, H. Vo, S. Callahan, J. Freire, C. Silva. "Tackling the Provenance Challenge One Layer at a Time", *Concurrency and Computation: Practice and Experience*, 2007. Pages 473-483

L. Barbosa and J. Freire. "Combining Classifiers to Identify Online Databases", *In Proceedings of the 16th International World Wide Web Conference*, pp. 431-440, 2007.

L. Barbosa and J. Freire. "An Adaptive Crawler for Locating Hidden-Web Entry Points", *In Proceedings of the 16th International World Wide Web Conference*, pp. 441-450, 2007.

L. Barbosa, J. Freire, and A. Silva. "Organizing Hidden-Web Databases by Clustering Visible Web Documents", *In Proceedings of the IEEE International Conference on Data Engineering (ICDE)*, pp. 326-335, 2007.

L. Barbosa, S. Tandon, and J. Freire. "Automatically Constructing a Directory of Molecular Biology Databases", *In Proceedings of the International Workshop on Data Integration in the Life Sciences (DILS)*, pp. 6-16, 2007.

E. Anderson, S. P. Callahan, D. A. Koop, E. Santos, C. E. Scheidegger, H. T. Vo, J. Freire and C. T. Silva. "VisTrails: Using Provenance to Streamline Data Exploration", *In Poster Proceedings of the International Workshop on Data Integration in the Life Sciences (DILS)*, pp. 8, 2007.

L. Moreau, B. Ludascher, I. Altintas, R. Barga, S. Bowers, S. Callahan, G. Chin Jr., B.

Clifford, S. Cohen, S. Cohen-Boulakia, S. Davidson, E. Deelman, L. Digiampietri, I. Foster, J. Freire, J. Frew, J. Futrelle, T. Gibson, Y. Gil, C. Goble, J. Golbeck, P. Groth, D. A. Holland, S. Jiang, J. Kim, D. Koop, A. Krenek, T. McPhillips, G. Mehta, S. Miles, D. Metzger, S. Munroe, J. Myers, B. Plale, N. Podhorszki, V. Ratnakar, E. Santos, C. Scheidegger, K. Schuchardt, M. Seltzer, Y. L. Simmhan, C. Silva, P. Slaughter, E. Stephan, R. Stevens, D. Turi, H. Vo, M. Wilde, J. Zhao, and Y. Zhao. *The First Provenance Challenge, Concurrency and Computation: Practice and Experience*, 2007. Pages 409-418

*Proceedings of International Provenance and Annotation Workshop (IPAW)*, 2008, Eds. J. Freire, D. Koop and L. Moreau.

Learning to Extract Form Labels, H. Nguyen, T. Nguyen, and J. Freire. *In Proceedings of the VLDB Endowment*, 1(1), pp. 684-694, 2008. *Papers from the International Conference on Very Large Databases (VLDB)*.

D. Koop, C. E. Scheidegger, S. P. Callahan, H. T. Vo, J. Freire, C. Silva. "VisComplete: Automating Suggestions for Visualization Pipeline", *IEEE Transactions on Visualization and Computer Graphics*, 14(6), pp. 1691-1698, 2008. *Papers from the IEEE Visualization Conference*.

C. Silva and J. Freire. "Software Infrastructure for Exploratory Visualization and Data Analysis: Past, Present, and Future", *In Journal of Physics: Conference Series*, vol. 125, *SciDAC 2008 Conference*, 2008. (pp15)

Antônio Baptista, Bill Howe, J. Freire, David Maier, and C. Silva. "Scientific Exploration in the Era of Ocean Observatories", *In IEEE Computing in Science & Engineering*, 10(3), pp. 53-58, 2008.

L. Moreau, J. Freire, J. Futrelle, R. McGrath, J. Myers and P. Paulson. "The Open Provenance Model: An Overview", *In Proceedings of International Provenance and Annotation Workshop (IPAW)*, pp. 323-326, 2008.

B. Howe, P. Lawson, R. Bellinger, E. Anderson, E. Santos, J. Freire, C. E. Scheidegger, A. Baptista and C. Silva. "End-to-End eScience: Integrating Workflow, Query, Visualization, and Provenance at an Ocean Observatory", *In Proceedings of the IEEE International Conference on e-Science*, 2008. Page(s): 127-134

K. Vieira, L. Barbosa, J. Freire and A. Silva. "Siphon++: A Hidden-Web Crawler for Keyword-Based Interfaces (Poster)", *In Proceedings of the ACM 17th Conference on Information and Knowledge Management (CIKM)*, 2008. Pages 1361-1362

S. Mergen, C. Heuser and J. Freire. "Querying Structured Information Sources on the Web", *In Proceedings of the International Workshop on Resource Discovery (RED)*, 2008. pp: 470-476

S. Mergen, C. Heuser and J. Freire. "A Search Engine for Querying Structured Information Sources on the Web", *In Proceedings of the Brazilian Symposium on Databases (SBBD)*, 2008.

E. Santos, L. Lins, J. P. Ahrens, J. Freire, C. Silva. "A First Study on Clustering Collections of Workflow Graphs", *In Proceedings of International Provenance and Annotation Workshop (IPAW)*, pp. 160-173, 2008.

*Juliana Freire continued on next page*



### **Juliana Freire continued**

S. P. Callahan, J. Freire, C. E. Scheidegger, C. Silva, H. T. Vo. "Towards Provenance-Enabling ParaView", In Proceedings of International Provenance and Annotation Workshop (IPAW), pp. 120-127, 2008.

T. Ellkvist, D. Koop, E. Anderson, J. Freire, C. Silva. "Using Provenance to Support Real-Time Collaborative Design of Workflows", In Proceedings of International Provenance and Annotation Workshop (IPAW), pp. 266-279, 2008.

C. E. Scheidegger, H. T. Vo, D. Koop, J. Freire, C. Silva. "Querying and Re-Using Workflows with VisTrails", In Proceedings of ACM SIGMOD International Conference on Management of Data, pp. 1251-1254, 2008

S. Davidson and J. Freire. "Provenance and Scientific Workflows: Challenges and Opportunities", In Proceedings of ACM SIGMOD International Conference on Management of Data, pp. 1345-1350, 2008.

L. Lins, D. Koop, E. Anderson, S. P. Callahan, E. Santos, C. E. Scheidegger, J. Freire, and C. Silva. "Examining Statistics of Workflow Evolution Provenance: A First Study", In Proceedings of International Conference on Scientific and Statistical Database Management (SSDBM), pp. 573-579, 2008.

H. Nguyen, E. Y. Kang, and J. Freire. "Automatically Extracting Form Labels", In Proceedings of IEEE International Conference on Data Engineering (ICDE), 2008 pp. 1498-1500

Using Mediation to Achieve Provenance Interoperability (Extended Abstract), T. Ellkvist, D. Koop, E. Santos, J. Freire, C. Silva, and L. Stromback. In Proceedings of the IEEE International Conference on e-Science, pp. 398-399, 2008.

J. Freire and C. Silva. "Simplifying the Design of Workflows for Large-Scale Data Exploration and Visualization", In Proceedings of the Microsoft eScience Workshop, 2008. pages 49-51

J. Freire and Claudio Silva. "Towards Enabling Social Analysis of Scientific Data", In CHI Social Data Analysis Workshop, 2008.

### **2007 and 2008 Invited Talks and Presentations**

#### *Tutorials*

Provenance Management: Challenges and Opportunities. Invited tutorial at Brazilian Symposium on Databases. Joao Pessoa, Brazil. October 2007.

Provenance and Scientific Workflows: Challenges and Opportunities. (Susan Davidson). Tutorial at the ACM International Conference on Management of Data (SIGMOD), Vancouver, Canada, June 2008.

Streamlining Data Exploration and Visualization through Scientific Workflows and Provenance. (Emanuele Santos, and Claudio Silva). Tutorial at the IEEE International Conference on e-Science, Indianapolis, December 2008.

#### *Keynote*

VisTrails: Using Provenance to Streamline Data Exploration. Keynote at the e-Science Workshop, Joao Pessoa, Brazil. October 2007.

#### *Other Invited Talks*

Querying and Creating Visualizations by Analogy. University of Southampton, Southampton, UK. August 2007.

Discovering and Organizing Hidden-Web Sources. Microsoft Search Labs, Mountain View, CA. August 2007.

Provenance Analytics: Exploring Science Trails. SciFoo, The Googleplex, Mountain View, CA. August 2007.

VisTrails: Using Provenance to Support Data Exploration through Workflows. IBM Almaden, San Jose, CA. August 2007.

Managing Provenance for Exploratory Tasks. Institute for Systems Biology, Seattle, WA. March 2007.

Automatically Constructing a Directory of Molecular Biology Databases. Workshop on Data Integration in the Life Sciences – Philadelphia, June 2007.

Simplifying the Design of Workflows for Large-Scale Data Exploration and Visualization. Microsoft eScience Workshop, Indianapolis, December 2008.

### **2007 and 2008 Professional Participation**

HPDC Provenance Challenge Workshop – Co-Chair  
IEEE International Conference on Data Engineering – Vice-Chair  
International World Wide Web Conference (WWW) – Vice-chair  
International Provenance and Annotation Workshop (IPAW) – Co-chair  
Symposium on Provenance in Scientific Workflows – Co-organizer  
ACM Conference on Information and Knowledge Management (CIKM) – Track-chair

#### *Program Committee*

IEEE Workshop on Scientific Workflows 2007, 2008  
Brazilian Symposium on Databases (SBBDB) 2007, 2008  
International Workshop on the Web and Databases (WebDB)  
International Conference on Very Large Databases (VLDB) 2007, 2008  
ACM International Conference on Management of Data (SIGMOD), 2007  
International Conference on Data Engineering (ICDE) 2007, 2008  
International World Wide Web Conference (WWW) 2007, 2008  
IEEE International Workshop on Scientific Workflows (SWF), 2008  
Data Integration in the Life Sciences (DILS), 2008.  
First International Workshop on Resource Discovery (RED), 2008  
International Provenance and Annotation Workshop (IPAW), 2008  
ACM Conference on Information and Knowledge Management (CIKM), 2008

*NSF panelist* - Academic Alliance for the National Center for Women in Technology

*NSF panelist* - Journal of Web Engineering - Editor

### **2007 and 2008 Honors and Awards**

Best paper award - IEEE Visualization Conference 2007  
NSF CAREER, 2008  
IBM Faculty Award, 2008



**Guido Gerig**  
Professor  
[www.sci.utah.edu/~gerig](http://www.sci.utah.edu/~gerig)  
[gerig@sci.utah.edu](mailto:gerig@sci.utah.edu)

Guido Gerig was recruited from the University of North Carolina at Chapel Hill to the University of Utah under the USTAR program. He received his Ph.D. in 1987 from the Swiss Federal Institute of Technology, ETH Zurich, Switzerland. Guido Gerig joined the faculty at UNC Chapel Hill as Taylor Grandy professor in August 1998 and with a joint appointment in the Departments of Computer Science and Psychiatry. In 2008, he accepted a new USTAR faculty position at the School of Computing and Scientific Computing and Imaging Institute (SCI) at the University of Utah, with adjunct appointments in Biomedical Engineering and Psychiatry.

Guido Gerig began research in the area of medical image analysis in 1985 at ETH Zurich, Switzerland. Since then, he has led a large number of national and international projects with close multidisciplinary collaboration between medicine, engineering, statistics, industry, and computer science. He is the director of the UTAH Center for Neuroimage Analysis (UCNIA) and supports a number of clinical neuroimaging projects with new methodology for image processing, registration, atlas building, segmentation, shape analysis, and statistical analysis. Current key research topics are analysis and modeling of the early developing brain, longitudinal analysis of multi-shape complexes, and new methodologies for statistical analysis of white matter using diffusion tensor imaging. Method developments are driven by challenging clinical applications that include research in schizophrenia, autism, multiple sclerosis, infants at risk for mental illness and aging. New tools and methods are open source and are made available to public.

## 2007 and 2008 Publications

### 2007 Journals

Carissa J. Cascio, Guido Gerig and Joseph Piven, Diffusion Tensor Imaging: Application to the Study of the Developing Brain, *J Am Acad Child Adolesc Psychiatry*. Feb. 2007 ;46(2):213-23

Belmonte MK, Mazziotta JC, Minshew NJ, Evans AC, Courchesne E, Dager SR, Bookheimer SY, Aylward EH, Amaral DG, Cantor RM, Chugani DC, Dale AM, Davatzikos C, Gerig G, Herbert MR, Lainhart JE, Murphy DG, Piven J, Reiss AL, Schultz RT, Zeffiro TA, Levi-Pearl, Offering to Share: How to Put Heads Together in Autism Neuroimaging. *J Autism Dev Disord* . Mar. 2007 : 2-13

Huang X, Lee YZ, McKeown M, Gerig G, Gu H, Lin W, Lewis MM, Ford S, Troster AI, Weinberger DR, Styner , Asymmetrical ventricular enlargement in Parkinson's disease. *Mov Disord* 2007 Aug 15;22(11):1657-60

J. H. Gilmore, W. Lin, I. Corouge, Y. S. K. Vetsa, J. K. Smith, Ch. Kang, H. Gu, R. M. Hamer, J. A. Lieberman, G. Gerig, Early Postnatal Development of Corpus Callosum and Corticospinal White Matter Assessed with Quantitative Tractography, *AJNR Am J Neuroradiol*. 2007 Oct;28(9):1789-95

Taylor WD, MacFall JR, Gerig G, Krishnan KR. Structural integrity of the uncinate fasciculus in geriatric depression: Relationship with age of onset. *Neuropsychiatric Disease and Treatment*, 2007; 3(5):669-674

Gilmore JH, Lin W, Prastawa MW, Looney CB, Vetsa YSK, Knickmeyer RC, Evans DD, Smith JK, Hamer RM, Lieberman JA, Gerig G. Regional gray matter growth, sexual

dimorphism, and cerebral asymmetry in the neonatal brain. *Journal of Neuroscience* 2007;27(6):1255-1260.

### 2007 Refereed Conferences

M. Styner, I. Oguz, S. Xu, D. Pantazis, and G. Gerig. Statistical group differences in anatomical shape analysis using hotelling T2 metric. *Proc SPIE Medical Imaging Conference*, Feb. 2007. Volume 6512

Sylvain Gouttard, Martin Styner, Sarang Joshi, Rachel G. Smith, Heather Cody, Guido Gerig, Subcortical structure segmentation using probabilistic atlas prior, *Proc. SPIE conference*, Feb. 2007. Volume 6512

Fan Fan Zhang, Casey Goodlett, Edwin Hancock, Guido Gerig, "Probabilistic White Matter Fiber Tracking using Particle Filtering", *EMMCVPR 2007, LNCS Oct. 2007 pp: 144-152*

Goodlett, C., Fletcher, P. Th. , Lin, W., and Gerig, G., "Quantification of measurement error in DTI: Theoretical predictions and validation", *Proc. MICCAI'07, Springer LNCS 4792*, Nov. 2007, pp. 10-17

Fan Fan Zhang, Casey Goodlett, Edwin Hancock, Guido Gerig, Probabilistic White Matter Fiber Tracking using Particle Filtering, *Proc. MICCAI 2007, Springer LNCS 4791*, Nov. 2007, pp. 144-151

Terriberly TB, Damon JN, Pizer SM, Joshi SC, Gerig , Population-based fitting of medial shape models with correspondence optimization. *Inf Process Med Imaging* 2007;20():700-12

Gorcowski, K. Styner, M., Jeong, J.Y., Marron, J. S. , Piven, J., Cody Hazlett,, H. Pizer, S.M., Gerig, G., Statistical Shape Analysis of Multi-Object Complexes, *Proc. CVPR'07, IEEE Press Pages. 1-8*

C. B. Goodlett, P. T. Fletcher, W. Lin, and G. Gerig, Noise-induced bias in low-direction diffusion tensor MRI: Replication of Monte-Carlo simulation with in-vivo scans, short paper *Proc. ISMRM 2007 pp: 1600*.

Martin Styner, Shun Xu, Mohammed El-Sayed, Guido Gerig, Correspondence Evaluation in local shape analysis and structural subdivision, *ISBI 2007, IEEE press. pp: 1192-1195*

### 2008 Journals

Fan Zhang, Edwin R. Hancock, Casey Goodlett and Guido Gerig, "Probabilistic White Matter Fiber Tracking using, Particle Filtering and von Mises-Fisher Sampling", *Medical Image Analysis MedIA*, Feb 2009;13(1):5-18 [Epub June 2008]

Niyati Mukherjee, Chaeryon Kang, Honor M. Wolfe, Barbara S. Hertzberg, J. Keith Smith, Weili Lin, Guido Gerig, Robert M. Hamer, John H. Gilmore, "Discordance of Prenatal and Neonatal Brain Development in Twins, August 2008", *Early Human Development*, Sept 2008 [Epub ahead of print]

Rebecca C. Knickmeyer, Sylvain Gouttard, Chaeryon Kang, Dianne Evans, Kathy Wilber, Keith J. Smith, Robert M. Hamer, Weili Lin, Guido Gerig, John H. Gilmore, "A Structural MRI Study of Human Brain Development from Birth to Two Years", *The Journal of Neuroscience*, Nov 2008, 28(47 ):12176-12182

*Guido Gerig continued on next page*

### **Guido Gerig continued**

Casey B. Goodlett, P. Thomas Fletcher, John H. Gilmore, and Guido Gerig, "Group Analysis of DTI Fiber Tract Statistics with Application to Neurodevelopment", *NeuroImage* Nov. 2008 [Epub ahead of print]

Weili Lin, Ph.D., Quan Zhu, M.S., Wei Gao, M.S. Yasheng Chen, D.Sc., Cheng-Hong Toh, M.D., Martin Styner, Ph.D., Guido Gerig, Ph.D., J Keith Smith, M.D., Ph.D., Bharat Biswal, Ph.D., John Gilmore, M.D., "Functional Connectivity Magnetic Resonance Imaging Reveals Cortical Functional Connectivity in the Developing Brain", *AJNR*, 29:1883-1889, November-December 2008

John H. Gilmore, MD; Lauren Smith, BA, Honor Wolfe, MD; Barbara Hertzberg, MD; J. Keith Smith, MD; Nancy Chescheir; Dianne Evans, Chaeryon Kang; Robert M. Hamer, Weili Lin, Guido Gerig, "Prenatal Mild Ventriculomegaly Predicts Abnormal Development of the Neonatal Brain", *Biological Psychiatry*, Dec 2008, 64(12): 1069-1076

Kubicki M, Styner M, Bouix S, Gerig G, Markant D, Smith K, Kikinis R, McCarley RW, Shenton ME. "Reduced Interhemispheric Connectivity in Schizophrenia- Tractography Based Segmentation of the Corpus Callosum". *Schizophr Res*/Dec 2008;106(2-3):125-131

Marcel Prastawa, Elizabeth Bullitt, and Guido Gerig, "Simulation of Brain Tumors in MR Images for Evaluation of Segmentation Efficacy", *Medical Image Analysis (MedIA)* Dec. 2008 [Epub ahead of print]

### **2008 Refereed Conferences**

Xu, Shun C. A. Styner, Martin, Gilmore, John H. Gerig, Guido, Multivariate longitudinal statistics for neonatal-pediatric brain tissue development, *Proc. of SPIE, Medical Imaging 2008: Im. Proc.*, Vol. #, pp. , Feb. 17, 2008

Styner, M., Oguz, I., Heimann, T., Gerig, G., Minimum description length with local geometry, *Biomedical Imaging: From Nano to Macro*, 2008. ISBI 2008. 5th IEEE International Symposium on 14-17 May 2008 Page(s): 1283 - 1286 Digital Object Identifier 10.1109/ISBI.2008.4541238

Shun Xu, Martin Styner, and Guido Gerig, "Multivariate Nonlinear Mixed Model to Analyze Longitudinal Image Data: MRI Study of Early Brain Development", *Proc. of IEEE Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA)* June 2008. pp. 1-8

A.Fedorov, E.Billet, M.Prastawa, G.Gerig, A.Radmanesh, S.K.Warfield, R.Kikinis, and N.Chrisochoides, Evaluation of Brain MRI Alignment with the Robust Hausdorff Distance Measures, accepted as oral presentation at ISVC08 (4<sup>th</sup> Int. Symp. On Visual Computing), Springer LNCS Fall 2008. pp. 594-603

Marcel Prastawa and Guido Gerig, Brain Lesion Segmentation through Physical Model Estimation, accepted as oral presentation at ISVC08 (4<sup>th</sup> Int. Symp. On Visual Computing), Springer LNCS Fall 2008. pp. 562-571

Casey Goodlett, P. Thomas Fletcher, John Gilmore, and Guido Gerig, Group Statistics of DTI Fiber Bundles Using Spatial Functions of Tensor Measures, *Proc. MICCAI'08, Lecture Notes in Computer Science LNCS*, Springer Verlag, Vol. 5241, Sept. 2008, pp. 1068 -- 1073, nominated best paper award

Sylvain Gouttard, Martin Styner, Marcel Prastawa, Joseph Piven, and Guido Gerig, Assessment of Reliability of Multi-site Neuroimaging via Traveling Phantom Study, *Proc. MICCAI'08, Lecture Notes in Computer Science LNCS*, Springer Verlag, Vol. 5242, Sept. 2008, pp. 263 - 270

### **2007 and 2008 Invited Talks and Presentations**

Dec. 12, 2007, Neuroimaging of the very early age to discover brain changes: Challenges, limits and potential, invited presentation chaired session, ACNP Conference, Florida

Nov. 15, 2007: Computational NeuroImage Analysis Laboratory, Hanyang University, Seoul, Korea: Invited Presentation: Medical Image Analysis: Statistical Shape Analysis

Nov. 14, 2007: Computational NeuroImage Analysis Laboratory, Hanyang University, Seoul, Korea: Invited Presentation: Medical Image Analysis: Diffusion Weighted Imaging

Sept. 19, 2007: Coordinate systems for computing DTI statistics in population studies, Tutorial presentation MICCAI 2007, Brisbane, Australia

June 6, 2007: MR-DTI: Non-invasive imaging of neuroanatomy of white matter, workshop presentation, Human Brain Mapping HBM conference, Chicago, IL

April 15, 2007, Medical Image Analysis: Advancing Medicine via Computational Science, invited presentation CPE Lyon, France

March 17, 2007, MR Imaging of Early Brain Development: Challenges and Insights, INRIA Sophia Antipolis, invited seminar presentation

Dec. 15, 2008, New trends in medical image processing, invited presentation theme session at Indian Conference on Computer Vision, Graphics and Image Processing ICVGIP, Orissa, India

Dec. 10, 2008, White Matter Development in Very Early Ages: Normative Models of Healthy Growth to study Risk Populations and Disease, invited presentation panel, ACNP 2008, Scottsdale, AZ

Nov. 7, 2008, Mapping Early Brain Development via Neuroimaging, invited presentation UCLA LONI CCB Seminar, Los Angeles, CA

September 10, 2008, Mapping Brain Changes Over Time during Development: Challenges, Limits and Potential, invited talk for Workshop on Studying the Early Developing Brain, MICCAI 2008, NYU, New York

Sept. 6, 2008, Computational pipelines for clinical studies, invited talk for Tutorial on DTI, MICCAI 2008, NYU, New York

August 28. 2008, Analysis of brain white matter properties via DW MRI: The role of normative atlases, invited presentation at 5<sup>th</sup> Annual World Congress of IBMISPS (Int. Brain Mapping and Intraoperative Surgical Planning Society), Los Angeles, CA

July 14, 2008, Mapping Brain Changes Over Time during Development, Guido Gerig, IPAM (Institute for Pure and Applied Mathematics), UCLA, invited talk to Summer School: Mathematics in Brain Imaging

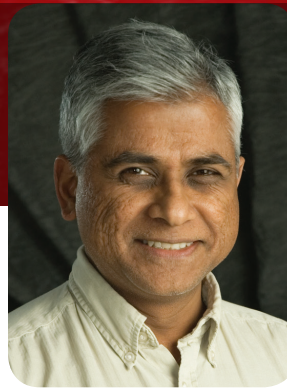


## Ganesh Gopalakrishnan

Professor

[www.cs.utah.edu/~ganesh](http://www.cs.utah.edu/~ganesh)

[ganesh@cs.utah.edu](mailto:ganesh@cs.utah.edu)



Ganesh Gopalakrishnan received his B.S. in Electrical Engineering from Regional Engineering College in Calicut, India in 1978, his M.Tech. in Electrical Engineering, Indian Institute of Technology in Kanpur, India in 1980, and his Ph.D. in Computer Science at State University of New York at Stony Brook, New York in 1986.

Professor Gopalakrishnan's primary research areas are Formal analysis of systems (e.g., shared memory consistency models, cache coherency protocols, parallel scientific computing software written using MPI and threads) and Formal verification methods and tools (partial order reduction, distributed model-checking, enumerative model-checking, assume/guarantee reasoning, SAT-based analysis).

### 2007 & 2008 Publications

#### 2008 Journal

I. Melatti, R. Palmer, G. Sawaya, Y. Yang, R. M. Kirby, and G. Gopalakrishnan, "Parallel and distributed model checking in Eddy," *Journal of International Journal on Software Tools for Technology Transfer (STTT)*, Springer Berlin / Heidelberg, ISSN1433-2779 November 2008. (Special section on SPIN.)

#### 2007 Refereed Conferences

Robert Palmer, Michael DeLisi, Ganesh Gopalakrishnan and Robert M. Kirby, "An Approach to Formalization and Analysis of Message Passing Libraries," *Proceedings of the 12th International Workshop on Formal Methods for Industrial Critical Systems (FMICS)*, Berlin, Germany, July 1-2, 2007. Won the EASST (European Association of Software Science and Technology) Best Paper Award.

Yu Yang, Xiaofang Chen, Ganesh Gopalakrishnan and Robert M. Kirby, "Distributed Dynamic Partial Order Reduction Based Verification of Threaded Software," *Proceedings of Model Checking Software: 14th International SPIN Workshop*, Berlin, Germany, July 1-3, 2007. pp: 58-75

Robert Palmer, Ganesh Gopalakrishnan and Robert M. Kirby, "Semantics Driven Dynamic Partial-Order Reduction of MPI-based Parallel Programs," *Proceedings of Parallel and Distributed Systems: Testing and Debugging (PADTAD)*, London, England, July 9, 2007. Won the Best Paper award.

Salman Pervez, Robert Palmer, Ganesh Gopalakrishnan, Robert M. Kirby, Rajeev Thakur, and William Gropp, "Practical Model Checking Methods for Verifying Correctness of MPI Programs," *Recent Advances in Parallel Virtual Machine and Message Passing Interface (EuroPVM/MPI)*, Paris, 344-353, LNCS 4757, France, September 30 - October 3, 2007.

Xiaofang Chen, Yue Yang, Michael Delisi, Ganesh Gopalakrishnan, Ching-Tsun Chou, "Hierarchical Cache Coherence Protocol Verification One Level at a Time through Assume Guarantee," *IEEE Intl. High Level Design Validation and Test Workshop*, Irvine, CA, Nov 7-9, 2007, pages 107-114.

Xiaofang Chen, Steven M. German, and Ganesh Gopalakrishnan, "Transaction Based Modeling and Verification of Hardware Protocols," *Formal Methods in Computer Aided Design*, Austin, November 11-14, 2007, pages 53-61.

*Ganesh Gopalakrishnan continued on next page*

April 17th, 2008, Advanced methodology for quantitative analysis of white matter tracts from MR Diffusion Weighted Imaging, Guido Gerig, invited presentation UNC BRIC GE Seminar Series, Chapel Hill, NC

Feb. 6, 2008: Neuroimaging of the early developing brain: Challenges, limits and potential, Invited Presentation at special Seminar on DTI imaging by Nicholas Ayache (with Peter Basser, C-F Westin et al.), INRIA Sophia Antipolis, France

### 2007 and 2008 Professional Participation

Editorial Board (Executive Committee) *MEDICAL IMAGE ANALYSIS* Journal, published by Elsevier B.V.

Board Member Medical Image Computing and Computer Assisted Intervention MICCAI

Board Member IEEE SPIE Conference IMAGING

Reviewer for IEEE TMI, MedIA, NeuroImage, IEEE PAMI, Academic Radiology, JMIV

#### Program Committee

MICCAI 2008, MICCAI 2007 (area chair, paper selection committee)

CVPR 2008, CVPR 2007

MIAR 2008

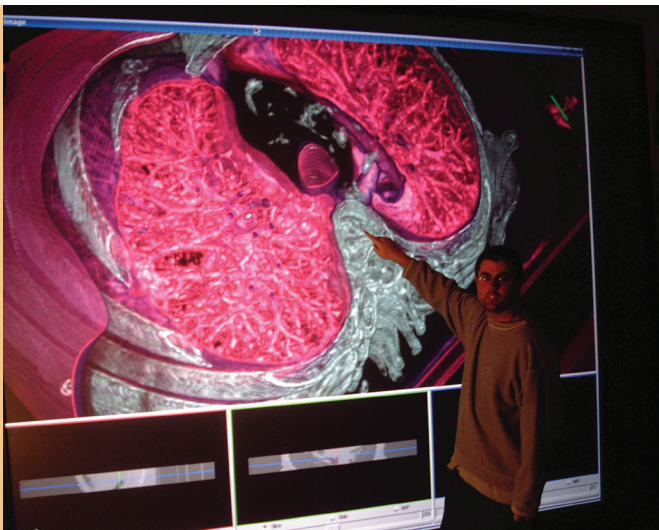
MMBIA 2008

ECCV 2008

SPIE 2008, SPIE 2007

IMPI 2007

ICCV 2007



Tumor in Lung Visualized from 4D CT Data with Biolmage

### **Ganesh Gopalakrishnan continued**

Xiaofang Chen, Steven M. German and Ganesh Gopalakrishnan, "Transaction Based Modeling and Verification of Hardware Protocols," TECHCON, Lake Buena Vista, FL, 2007. Best Paper in Verification Session.

Ganesh Gopalakrishnan and Robert M. Kirby, "Formal Methods for MPI Programs," Pages 19-27, Issue 193, Electronic Notes in Theoretical Computer Science (ENTCS), 2007.

#### *2008 Refereed Conferences*

Sarvani Vakkalanka, Michael DeLisi, Ganesh Gopalakrishnan, and Robert M. Kirby, "Scheduling Considerations for Building Dynamic Verification Tools for MPI," Parallel and Distributed Systems - Testing and Debugging (PADTAD-VI), Seattle, WA, July, 2008.

Yu Yang, Xiaofang Chen, Ganesh Gopalakrishnan, and Robert M. Kirby, "Efficient Stateful Dynamic Partial Order Reduction," Model Checking Software, 15th International SPIN Workshop, Los Angeles, CA, August 2008, LNCS, pp. 288-305.

Sarvani Vakkalanka, Michael DeLisi, Ganesh Gopalakrishnan, Robert M. Kirby, Rajeev Thakur, and William Gropp, "Implementing Efficient Dynamic Formal Verification Methods for MPI Programs," Recent Advances in Parallel Virtual Machine and Message Passing Interface (EuroPVM/MPI), Dublin, Ireland, 2008, LNCS 5205, pp. 248-256.

Subodh Sharma, Sarvani Vakkalanka, Ganesh Gopalakrishnan, Robert M. Kirby, Rajeev Thakur, and William Gropp, "A Formal Approach to Detect Functionally Irrelevant Barriers in MPI Programs," Recent Advances in Parallel Virtual Machine and Message Passing Interface (EuroPVM/MPI), Dublin, Ireland, 2008, LNCS 5205, pp. 265-273.

Sarvani Vakkalanka, Ganesh Gopalakrishnan, and Robert M. Kirby, "Dynamic Verification of MPI Programs with Reductions in Presence of Split Operations and Relaxed Orderings," Computer Aided Verification (CAV) 2008, pp. 66-79, LNCS 5123.

Guodong Li, Michael DeLisi, Ganesh Gopalakrishnan, and Robert M. Kirby, "Formal Specification of the MPI-2.0 Standard in TLA+," Poster Paper, Principles and Practices of Parallel Programming (PPoPP), 283-284, 2008.

Sarvani Vakkalanka, Subodh V. Sharma, Ganesh Gopalakrishnan, and Robert M. Kirby, "ISP: A Tool for Model Checking MPI Programs," Poster Paper, Principles and Practices of Parallel Programming (PPoPP), 285-286, 2008.

Chao Wang, Yu Yang, Aarti Gupta, and Ganesh Gopalakrishnan, "Dynamic Model Checking with Property Driven Pruning to Detect Race Conditions," ATVA 2008, pp. 126-140, LNCS 5311.

### **2007 and 2008 Invited Talks and Presentations**

Ganesh Gopalakrishnan and Yu Yang, "Runtime Model Checking of Multithreaded C Programs using Automated Instrumentation Dynamic Partial Order Reduction and Distributed Checking," Half Day tutorial at FM'08: 15th International Symposium on Formal Methods, May 26 - 30, 2008, Abo Akademi University, Turku, Finland.

"Inspect, ISP, and FIB: reduction-based verification and analysis tools for concurrent

programs," talk given at Microsoft Research, Bangalore, India, June 6, 2008.

"In-Situ Model Checking of MPI Parallel Programs," talk presented at Microsoft Research, Redmond, WA, August 27, 2007.

"Formal Analysis for Debugging and Performance Optimization of MPI," talk presented at Microsoft, Redmond, WA, March 2, 2007.

### **2007 and 2008 Professional Participation**

Co-Organizers Rajeev Alur, Ganesh Gopalakrishnan, Vineet Kahlon, and Stephen Siegel, "Exploiting Concurrency Efficiently and Correctly -- (EC)<sup>2</sup>," CAV 2008 Workshop, July 7-8, 2008, Princeton, NJ.

Organizer, "Gary Lindstrom Retirement and Festschrift," University of Utah, May 5, 2007.

#### *Program Committee*

Methods and Models for CoDesign (MEMOCODE), 2007, 2008.

Computer Aided Verification (CAV), 2007, 2008.

Theorem-proving and Higher Order Logic (TPHOLs), 2007, 2008.

Formal Methods in Computer-Aided Design (FMCAD), 2007, 2008.

### **2007 and 2008 Honors and Awards**

Plaque awarded by Microsoft to Gopalakrishnan and Kirby at Supercomputing 2007 in recognition of our group's "Early contributions to Microsoft's Windows Compute Cluster Server 2003, and Charter Membership of the Microsoft High Performance Computing Institute Program."

#### *Best Paper Award*

Robert Palmer, Ganesh Gopalakrishnan and Robert M. Kirby, "Semantics Driven Dynamic Partial-Order Reduction of MPI-based Parallel Programs," Proceedings of Parallel and Distributed Systems: Testing and Debugging (PADTAD), London, England, July 9, 2007.

#### *Best Paper Award*

Robert Palmer, Michael DeLisi, Ganesh Gopalakrishnan and Robert M. Kirby, "An Approach to Formalization and Analysis of Message Passing Libraries," Proceedings of the 12th International Workshop on Formal Methods for Industrial Critical Systems (FMICS), Berlin, Germany, July 1-2, 2007. Won the EASST (European Association of Software Science and Technology) award.

#### *Best Paper Award*

Xiaofang Chen, Steven M. German and Ganesh Gopalakrishnan, "Transaction Based Modeling and Verification of Hardware Protocols," TECHCON, Lake Buena Vista, FL, 2007.





**Mary Hall**  
Associate Professor  
[www.cs.utah.edu/~mhall](http://www.cs.utah.edu/~mhall)  
[mhall@cs.utah.edu](mailto:mhall@cs.utah.edu)

FACULTY

Mary Hall joins the School of Computing this fall as an associate professor. Her research focuses on compiler technology for exploiting performance-enhancing features of a variety of computer architectures. Prior to joining University of Utah, Professor Hall held positions at University of Southern California, Caltech, Stanford and Rice University.

Professor Hall's current research involves developing compiler-based autotuning technology, and applying it to application domains that include molecular dynamics, biomedical imaging, signal processing and social networks. Autotuners experiment with a set of alternative application mapping strategies to select the mapping that best exploits architectural features such as deep memory hierarchies, specialized compute engines and multiple cores.

Professor Hall has served on over 40 program committees in compilers and their interaction with architecture, parallel computing, and embedded and reconfigurable computing, including 2009 program chair of the Code Generation and Optimization Conference, and workshop co-chair for SC08. She is active in the ACM, serving as SIG Governing Board Liaison to the ACM History Committee, and previously on the ACM Health of Conferences Committee. She also participates in outreach programs to encourage the participation of women in computer science.

#### 2007 and 2008 Publications

##### 2007 Journals

Bailey, D. H., Lucas, R., Hovland, P., Norris, B., Yelick, K., Gunter, D., de Supinski, B., Quinlan, D., Worley, P., Vetter, J., Roth, P., Mellor-Crummey, J., Snively, A., Hollingsworth, J., Reed, D., Fowler, R., Zhang, Y., Hall, M., Chame, J., Dongarra, J., Moore, S. "Performance Engineering: Understanding and Improving the Performance of Large-Scale Codes," *CT-Watch Quarterly*, Volume 3, Number 4, November 2007.

C. Chen, J. Chame, Y. L. Nelson, P. Diniz, M. Hall and R. Lucas, "Compiler-assisted performance tuning," *Journal of Physics: Conference Series*, Vol. 78, 2007.

##### 2007 Refereed Workshops

M. Demertzi, P. Diniz, M. Hall, A. Gilbert, Y. Wang. "A Combined Hardware/Software Optimization Framework for Signal Representation and Recognition," *Proceedings of the Workshop on Dynamic Data-Driven Application Systems*, held in conjunction with ICCS '07, May 2007.

C. Chen, J. Shin, S. Kintali, J. Chame and M. Hall. "Model-Guided Empirical Optimization for Multimedia Extension Architectures: A Case Study," *Proceedings of the Workshop on Performance Optimization of High-Level Languages*, held in conjunction with IPDPS '07, March, 2007.

B. Bansal, U. Catalyurek, J. Chame, C. Chen, E. Deelman, Y. Gil, M. Hall, V. Kumar, T. Kurc, K. Lerman, A. Nakano, Y.L. Nelson, J. Saltz, A. Sharma and P. Vashishta. "Intelligent Optimization of Parallel and Distributed Applications," *Proceedings of the Workshop on Next Generation Software*, held in conjunction with IPDPS '07, March, 2007.

##### 2008 Journals

David H. Bailey, Jacqueline Chame, Chun Chen, Jack Dongarra, Mary Hall, Jeffrey K. Hollingsworth, Paul Hovland, Shirley Moore, Keith Seymour, Jaewook Shin, Ananta Tiwari,

Sam Williams, Haihang You. "PERI Auto-Tuning," *Journal of Physics: Conference Series*, Vol. 125, 2008.

M. Hall, Y. Gil and R. Lucas. "Self-Configuring Applications for Heterogeneous Systems: Program Composition and Optimization Using Cognitive Techniques," *Proceedings of the IEEE, Special Issue on Cutting-Edge Computing*, Vol. 96(5), May 2008.

##### 2008 Refereed Workshops

Y. Nelson, B. Bansal, M. Hall, A. Nakano, and K. Lerman. "Model-Guided Performance Tuning of Parameter Values: A Case Study with Molecular Dynamics Visualization," *Proceedings of the Workshop on High-Level Parallel Programming Models and Supportive Environments*, held in conjunction with IPDPS '08, April, 2008.

M. Demertzi, P. C. Diniz, M. W. Hall, A. C. Gilbert and Y. Wang. "The Potential of Computation Reuse in High-Level Optimization of a Signal Recognition System," *Proceedings of the Workshop on NextGeneration Software*, held in conjunction with IPDPS '08, April, 2008.

V. Kumar, M. Hall, J. Kim, V. Ratnakar, T. Kurc, E. Deelman, J. Saltz, "Designing and Parameterizing a Workflow for Optimization: A Case Study in Biomedical Imaging," *Proceedings of the Workshop on Next Generation Software*, held with IPDPS '08, April, 2008.

##### Poster Presentation

Jacqueline Chame, Chun Chen, Mary Hall, Paul Hovland, Muhammad Murtaza, Jaewook Shin. "Tune: Compiler-Directed Automatic Performance Tuning," *Argonne National Laboratory, Poster Presentation, High Performance Computer Science Workshop*, April 2008.

#### 2007 and 2008 Invited Talks and Presentations

"Autotuning of Scientific Applications," 13th SIAM Conference on Parallel Processing for Scientific Computing, March, 2007.

"A Compiler-Based Strategy for Performance Tuning of Applications," invited speaker, *Workshop in Memory of Ken Kennedy*, Rice University, December, 2007.

"Compiler-Assisted Performance Tuning," *Argonne National Laboratory, Argonne, IL*, July, 2007.

"A Compiler-Based Strategy for Performance Tuning of Scientific Applications," invited speaker, *DOE SciDAC 2007 Conference*, June, 2007.

"Hot Topics and Future Directions in Programming Languages," invited panelist and panel chair, *CRA-W Programming Languages Summer School*, May, 2007.

"Coping with Architectural Complexity using Compiler-Guided Empirical Search," invited speaker, *Intel Corporation*, May, 2007.

"A Compiler Strategy for Automatic Performance Tuning of Scientific Applications," invited speaker, *Oak Ridge National Laboratory*, February, 2007.

"Multicore Programming Strategies: What Approaches will work?," invited speaker,

*Mary Hall continued on next page*



### **Mary Hall continued**

Workshop on Bridging Multicore's Programmability Gap, SC08, November, 2008.

"The Role of Compiler Technology in Managing the Complexity of Architectures and Applications," invited speaker SIAM Annual Meeting, July, 2008;

"TUNE: The Structure of an Autotuning Compiler," invited speaker, Intel Academic Software Workshop, May, 2008.

"What Role Does Code Generation and Optimization Play for Multi-Core Enablement?," invited panelist, International Symposium on Code Generation and Optimization, April, 2008.

"Multicore Chips and Parallel Programming," invited speaker, High Performance Computer Science Week, April, 2008.

### **2007 and 2008 Professional Participation**

ACM History Committee, SIG Governing Board Liaison

SIGPLAN PLDI Conference Steering Committee (June 2004-June 2007)

Workshop co-Chair, SC 2007 and SC 2008.

Workshop organizer, Autotuning of Libraries and Applications, High Performance Computer Science Week, April 2008.

Organizing committee and host, NSF Workshop on the Future of Compiler Research and Education, February 2007.

### *Program committees*

\* Program Chair and Workshop Organizer, Workshop on Software Tools for Multicore Systems, March, 2007.

\* Workshop on Parallel Execution of Sequential Programs on Multi-core Architectures (PESPMA 2008)

\* SC 2007

\* ACM Languages, Compilers and Tools for Embedded Systems, 2007.

\* International Symposium on Code Generation and Optimization, 2007.

\* Workshop on High-Level Parallel Programming Models and Supportive Environments 2007



Research wall in Warnock building



**Charles Hansen**  
Professor  
[www.cs.utah.edu/~hansen](http://www.cs.utah.edu/~hansen)  
[hansen@cs.utah.edu](mailto:hansen@cs.utah.edu)

Charles Hansen received a BS in computer science from Memphis State University in 1981 and a PhD in computer science from the University of Utah in 1987. He has been a member of the faculty at Utah since 1997. From 1989 to 1997, he was a Technical Staff Member in the Advanced Computing Laboratory (ACL) located at Los Alamos National Laboratory, where he formed and directed the visualization efforts in the ACL. He was a Bourse de Chateaubriand PostDoc Fellow at INRIA, Rocquencourt France, in 1987 and 1988. From Fall 2004 to Spring 2005, he was a Visiting Professor at ARTIS/GRAVIR IMAG/INRIA Grenoble France.

Professor Hansen's research interest focuses build tools and systems that assist in the comprehension of massive amounts of scientific data. To comprehend spatial and temporal relationships between data, interactive techniques provide better cues and therefore, the main focus of his research has focused on better methods for visualization and rendering at interactive rates. These have included exploiting novel data structures for rapid data access and processing of visualization algorithms. With the advent of the programmable GPU, his background in parallel algorithms has provided unique opportunities for novel methods exploiting the hardware. With students, he has explored time-dependent methods for accelerating isosurface extraction, parallel image based rendering techniques for visualization, interactive multidimensional volume rendering and advanced volume graphics that include modeling and shading, the combination of haptics and visualization for perceptualization of data, and remote visualization.

#### 2007 and 2008 Publications

Ingo Wald, H. Friedrich, Aaron Knoll, Charles Hansen, "Interactive Isosurface Ray Tracing of Time-Varying Tetrahedral Volumes", In IEEE Transactions on Visualization and Computer Graphics 2007 (Proceedings of IEEE Visualization/InfoVis 2007), pp. 1727-1734. 2007.

E.W. Bethel, C. Johnson, C. Aragon, Prabhat, O. Ruebel, G. Weber, V. Pascucci, H. Childs, P.-T. Bremer, B. Whitlock, S. Ahern, J. Meredith, G. Ostrouchov, K. Joy, B. Hamann, C. Garth, M. Cole, C. Hansen, S. Parker, A. Sanderson, C. Silva, X. Tricoche. "SciDAC Visualization and Analytics Center for Enabling Technologies - Strategy for Petascale Visual Data Analysis Success," CTWatch Quarterly, Volume 3, Number 4, November 2007.

E.W. Bethel, C.R. Johnson, K. Joy, S. Ahern, V. Pascucci, H. Childs, J. Cohen, M. Duchaineau, B. Hamann, C. Hansen, D. Laney, P. Lindstrom, J. Meredith, G. Ostrouchov, S.G. Parker, C.T. Silva, A. Sanderson, X. Tricoche, "SciDAC Visualization and Analytics Center for Enabling Technology", Journal of Physics: Conference Series, vol. 78, 2007.

David Chisnall, Min Chen, Charles Hansen, "Ray-Driven Dynamic Working Set Rendering For Complex Volume Scene Graphs Involving Large Point Clouds", The Visual Computer Vol.23 (3), 2007, 167-179.

Aaron Knoll, Younis Hijazi, Charles Hansen, Ingo Wald, Hans Hagen, "Interactive Ray Tracing of Arbitrary Implicit with SIMD IntervalArithmetic," 2nd IEEE/EG Symposium on Interactive Ray Tracing 2007, Ulm, Germany, 2007. pp. 11-18

Christoph Garth, Guo-Shi Li, Xavier Tricoche, Charles D. Hansen and Hans Hagen "Visualization of Coherent Structures in Transient Flows", TopolnVis 2007, Grimma, Germany.

Aaron Knoll, Ingo Wald, and Charles Hansen "Coherent Multiresolution Isosurface Ray Tracing", The Visual Computer 2008. ISSN 0178-2789

Guo-Shi Li, Charles Hansen, Xavier Tricoche, "Physically-based Dye Advection for Flow Visualization", Computer Graphics Forum Journal, Volume 27, Number 3, 2008, pp. 727-73.

Guo-Shi Li, Xavier Tricoche, Daniel Weiskopf, Charles Hansen, "Flow Charts: Visualization of Vector Fields on Arbitrary Surfaces", IEEE Transactions on Visualization and Computer Graphics, Volume 14, Number 5, 2008, pp. 1067-1080.

Younis Hijazi, Aaron Knoll, Charles Hansen, Hans Hagen, "CSG operations of arbitrary primitives with inclusion arithmetic and real-time ray tracing", Curves and Surfaces 2008, Norway

#### 2007 and 2008 Invited Talks and Presentations

- "Multidimensional Transfer Functions and other GPU Methods", Exxon-Mobile, August 2008.
- "Interactive Texture-based Flow Visualization", LANL, August 2008.
- "Interactive Texture-based Flow Visualization", Curves and Surfaces 2008, Norway
- "CSAFE: Large Scale Scientific Computation", Visualization Seminar University of Kaiserslautern, 2008
- "On Visualization and Graphics", IRISA, Rennes, France, May 2007, Invited Talk
- "Large-Scale Scientific Visualization in C-SAFE", Capstone, CEA CUIIC, Bordeaux, France. Capstone Address.
- "Future of Large-Scale Scientific Visualization", Distinguished Lecture Series, University of Nebraska, Lincoln, April 2007. Distinguished Lecture
- Interdisciplinary Research at SCI Keynote Address Norway Workshop on Visualization Bergen, Norway May 2007
- Advanced Volume Rendering Visualization Seminar University of Kaiserslautern July 2007
- User study or Loser Study? Dagstuhl Visualization Workshop Dagstuhl Germany July 2007

#### 2007 and 2008 Professional Participation

ACM Super Computing, 2009  
ACM I3D, 2009  
Pacific Vis, 2008  
TopoVis: Topological Methods for Visualization, 2007, 2009  
IEEE/Eurographics Eurovis, 2007, 2008  
Eurographics Workshop on Parallel Graphics and Visualization, 2007, 2008  
Netherlands Organization for Scientific Research: 2007, 2008  
IEEE Visualization Conference – Papers co-chair 2007, 2008  
IEEE Transactions on Visualization and Computer Graphics – guest editor  
CISMM – External advisory board  
RENCI – External advisory board



## Thomas C. Henderson

Professor

[www.cs.utah.edu/~tch](http://www.cs.utah.edu/~tch)

[tch@cs.utah.edu](mailto:tch@cs.utah.edu)

Thomas C. Henderson received his BS in Math from Louisiana State University in 1973 and his PhD in Computer Science from the University of Texas at Austin in 1979. He is currently a full

Professor in the School of Computing at the University of Utah. He has been at Utah since 1982, and was a visiting professor at DLR in Germany in 1980, and at INRIA in France in 1981 and 1987, and at the University of Karlsruhe, Germany in 2003. Prof. Henderson was chairman of the Department of Computer Science at Utah from 1991-1997, and was the founding Director of the School of Computing from 2000-2003.

Prof. Henderson is the author of *Discrete Relaxation Techniques* (University of Oxford Press), and editor of *Traditional and Non-Traditional Robotic Sensors* (Springer-Verlag); he serves as Co-Editor-in-Chief of the *Journal of Robotics and Autonomous Systems* and was an Associate Editor for the *IEEE Transactions on Pattern Analysis and Machine Intelligence*. His research interests include autonomous agents, robotics and computer vision, and his ultimate goal is to help realize functional androids. He has produced over 200 scholarly publications, and has been principal investigator on over \$8M in research funding. Prof. Henderson is a Fellow of the IEEE, and received the Governor's Medal for Science and Technology in 2000. He enjoys good dinners with friends, reading, playing basketball and hiking.

Professor Henderson's primary areas of research are autonomous intelligent systems, smart sensor networks, parallel programming, and digital image/map analysis.

### 2007 and 2008 Publications

Kyle A Luthy, Edward Grant, and Thomas C. Henderson "Leveraging RSSI for Robotic Repair of Disconnected Wireless Sensor Networks", IEEE International Conference on Robotics and Automation, Rome, April 6-16, 2007.

J. Luitjens, M. Berzins and T. Henderson, "Parallel space-filling curve generation through sorting," *Concurrency and Computation: Practice & Experience*, July 2007 Vol 19, Issue 10, Pages: 1387-1402, 2007.

Thomas C. Henderson, Kris Sikorski, Kyle Luthy, and Eddie Grant, "Computational Sensor Networks," IEEE Int'l Conf on Intelligent Robots and Systems, San Diego, 29 Oct - 2 Nov, 2007.

Workshop Paper, "Robot Semantic Web," Thomas C. Henderson, Lynne Parker, Ruediger Dillmann, and Xiuyi Fan, in "Robot Semantic Web Workshop," IEEE Int'l Conf on Intelligent Robots and Systems, San Diego, 29 Oct, 2007.

Xinwei Xue and Thomas C. Henderson, "Feature Fusion for Basic Behavior Unit Segmentation from Video Sequences", *Robotics and Autonomous Systems*, 2008. pp. 239-248

Thomas C. Henderson, "Further Observations on the Wireless Sensor Network Leadership Protocol," IEEE Intl Conf on Multisensor Fusion and Integration, Seoul, South Korea, pp. 163-167, 20-22 August, 2008.

Felix Sawo, Thomas C. Henderson, Christopher Sikorski, and Uwe D. Hanebeck, "Sensor Node Localization Methods based on Local Observations of Distributed Natural Phenomena," IEEE Intl Conf on Multisensor Fusion and Integration, Seoul, South Ko-

rea, pp. 301-308, 20-22 August, 2008. Best Paper Award

Megan Hegarty, Eddie Grant, L. Reid, and Thomas C. Henderson, "A Dynamic Compression System for Improving Ulcer Healing: Design of a Sensing Garment", IEEE Intl Conf on Multisensor Fusion and Integration, Seoul, South Korea, pp: 551-556, 20-22 August, 2008.

Justin Luitjens, Bryan Worthen, Martin Berzins, and Thomas C. Henderson, "Scalable Parallel AMR for the Unintah Multi-Physics Code," *Petascale Computing: Algorithms and Applications*, David Bader (ed), CRC Press, 2008. pp. 67-81

"Robotshare: A Google for Robots," X. Fan and Thomas C. Henderson, *International Journal of Humanoid Robotics (IJHR)* Volume: 5, Issue: 2 June 2008, pp. 311-329.

### 2007 and 2008 Invited Talks and Presentations

Invited Workshop Talk, Schloss Dagstuhl Event: Univ of Karlsruhe Graduate School on Sensor Actuator Networks Annual Retreat, 17 Sept 2007, "Research Directions in Sensor Networks," Wadern, Germany

DARPA Urban Challenge: National Qualifying Event (NQE) Participant, DARPA Urban Challenge Project is one of 36 teams in the NQE Victorville, CA, 25 Oct - 2 November 2007

Honda Research Institute Europe, "Computational Sensor Networks," Frankfurt, Germany, 30 October 2008.

Interlink Workshop on Intelligent Cognitive Systems, Santa Monica, CA, 4-5 Sept. 2008.

University of Hamburg, "Computational Sensor Networks," Hamburg, Germany, 3 Nov. 2008.

### 2007 and 2008 Professional Participation

Program Committee Chair, Americas, IEEE International Conference on Multisensor Fusion and Integration August 20-22, 2008, Seoul, Korea

Program Committee Member, IEEE Conference on Cognitive Systems, 2-4 April 2008, Karlsruhe, Germany

Baden-Wuerttemberg Research Program Review Panel, Stuttgart, Germany 1 April 2008

International Conference on Acoustics, Speech and Signal Processing, (ICASSP) 2007, April 15-19, Honolulu, Hawaii

Information Processing on Sensor Networks, (IPSN) 2007, April 25-27, Cambridge, MA

International Conference on Advanced Robotics (ICAR), Korea, Aug 21-24. Jeju Island, Korea, 2007. DCOSS 2007, 18-20 June, Sante Fe, NM

Program Chair, IROS 2007, 16-17 June San Francisco, CA

External Evaluation Panel, ICIS Project, University of Delft, The Netherlands, 28-29 June 2007





**Lee Hollaar**

Professor

[www.cs.utah.edu/~hollaar](http://www.cs.utah.edu/~hollaar)

[hollaar@cs.utah.edu](mailto:hollaar@cs.utah.edu)

Grant Reviewer, German State of Baden-Wuerttemberg, FIT Panel reviewer, 9 March 2007

2nd International Conference on Computer Vision Theory and Applications (VISAPP 2007) 8 - 11 March, 2007 Barcelona, Spain

European Commission Invited Interlink Workshop Member, WG3 Intelligent and Cognitive Systems, 15-16 November 2007, Zurich, Switzerland, Invited Talk and Participation, European Research Consortium for Informatics and Mathematics, International Cooperation Activities and Emerging ICTs (Interlink), Funded by Future and Emerging Technologies Programme of the European Commission

International Review Panelist Site Visit, Ambisense Baden-Wuerttemberg Research Project, University of Tuebingen, 18 September 2007, Tuebingen, Germany

Guest Editor, Special Issue, Advanced Robotics Journal, Selected Papers from IROS 2007.

Workshop Organizer, "Robot Semantic Web," IEEE Int'l Conf on Intelligent Robots and Systems, San Diego, 29 Oct, 2007.

#### 2007 and 2008 Honors and Awards

##### *Best Paper Award*

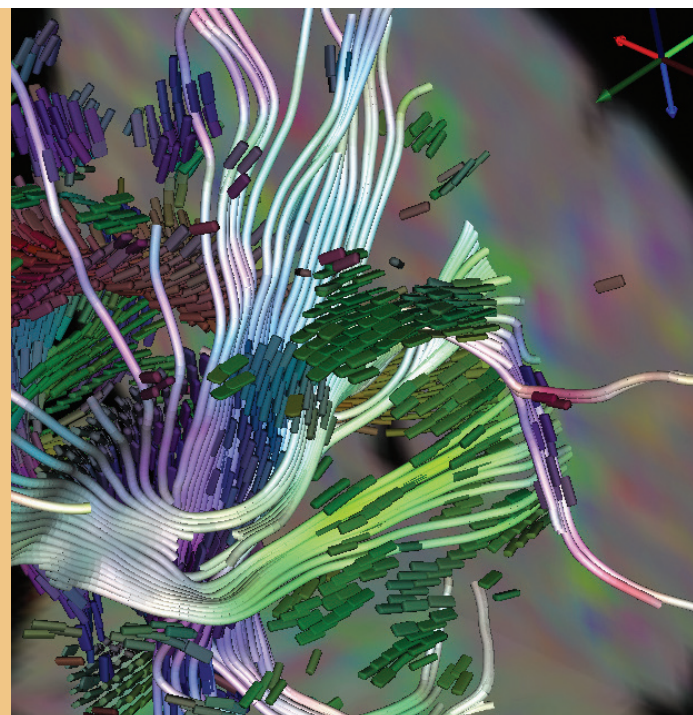
"Sensor Node Localization Methods based on Local Observations of Distributed Natural Phenomena," Felix Sawo, Thomas C. Henderson, Christopher Sikorski, and Uwe D. Hanebeck, IEEE Intl Conf on Multisensor Fusion and Integration, Seoul, South Korea, pp. 301-308, 20-22 August, 2008.

Lee A. Hollaar received his B.S. Electrical Engineering from Illinois Institute of Technology in 1969, his M.S. and Ph.D. in Computer Science at the University of Illinois in 1974 & 1975 and was a Non-matriculated student at the University of Utah College of Law, 1989-1993. During his 1996-97 sabbatical, he was a Committee Fellow at the Senate Judiciary Committee, where he worked on patent reform legislation, database protection, and what eventually became the Digital Millennium Copyright Act. He was also a visiting scholar with Circuit Judge Randall R. Rader at the Court of Appeals for the Federal Circuit.

His past research was on hardware and software tradeoffs in system design, particularly as they apply to systems handling large text databases. He is the co-inventor of a new method of rapidly searching text stored and was the primary architect for perhaps the first distributed, workstation-based information retrieval system. He also worked on avionics and navigation systems.

He was Director of Campus Networking during the development of the University's campus-wide data communications network, and remains interested in distributed systems and telephony. Prior to coming to Utah, he designed and supervised the construction of the first campus-wide data network at the University of Illinois at Urbana-Champaign.

Professor Hollaar's current research interests center on intellectual property and computer law. He is the author of "Legal Protection of Digital Information," which covers copyrights and patents for computer software and other digital works, published in 2002 by BNA Books and available on the Internet at no cost.



Tensorlines and superquadratic glyphs



## John Hollerbach

Professor

[www.cs.utah.edu/~jmh](http://www.cs.utah.edu/~jmh)

[jmh@cs.utah.edu](mailto:jmh@cs.utah.edu)

John M. Hollerbach received his B.S. in Chemistry from the University of Michigan in 1968, his M.S. in Mathematics from the University of Michigan in 1969, his S.M. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology in 1975, and his Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology in 1978.

### 2007 and 2008 Publications

Aghili, F., Hollerbach, J.M., and Buehler, M., "A modular and high-precision motion control system with an integrated motor," *IEEE/ASME Trans. Mechatronics*, 12, 2007, pp. 317-329.

Sun, Y., and Hollerbach, J.M., "Active robot calibration algorithm," *Proc. IEEE Intl. Conf. Robotics and Automation*, May 19-23, 2008, Pasadena, CA. pp. 1276-1281.

Kulkarni, S., Minor, M., Pardyjak, E., and Hollerbach, J.M., "Combined wind speed and angle control in a virtual environment," *Proc. IEEE/RSJ Intl. Conf. Intelligent Robots and Systems (IROS)*, Sept. 22-26, 2008, Nice, France.

Frey, M., Johnson, D.E., and Hollerbach, J.M., "Full-arm haptics in an accessibility task," *Proc. 16th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Reno, Nevada, March 13-14, 2008, pp. 405-412.

Sun, Y., Hollerbach, J.M., and Mascaro, S.A., "Imaging the fingertip force direction," *IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, June 18-23, 2007, Minneapolis, MN. pp. 1-6.

Hollerbach, J.M., "Locomotion interfaces and rendering," in: *Haptic Rendering: Foundations, Algorithms, and Applications*, Ming Lin and Miguel Otaduy, eds., A.K. Peters, 2008, pp. 83-92.

Hollerbach, J.M., Khalil, W., and Gautier, M., "Model identification," in: *Springer Handbook of Robotics*, B. Siciliano and O. Khatib, eds., Springer, 2008, pp. 321-344.

Sun, Y., and Hollerbach, J.M., "Observability index selection for robot calibration," *Proc. IEEE Intl. Conf. Robotics and Automation*, May 19-23, 2008, Pasadena, CA. pp. 831-836.

Sun, Y., Hollerbach, J.M., and Mascaro, S.A., "Predicting fingertip forces by imaging coloration changes in the fingernail and surrounding skin," *IEEE Trans. Biomedical Engineering*, 55, 2008, pp. 2363-2371.

Colton, M., and Hollerbach, J.M., "Reality-based haptic force models of buttons and switches," *Proc. IEEE Intl. Conf. Robotics and Automation*, April 10-14, 2007, Rome, Italy, pp. 497-502.

de Bever, J.T., Hollerbach, J.M., Roemer, R., and Parker, D., "Robotic patient positioning system for MR guided high intensity focused ultrasound treatment of cancer," *7th Interventional MRI Symposium*, Baltimore, Sept. 12-23, 2008.

### 2007 and 2008 Invited Talks and Presentations

January 22, 2007: "Developments in locomotion and haptic interfaces," *Robotics Seminar Series*, Division of Intelligent and Interactive Computing, Georgia Institute of Technology.

April 17, 2008: "Measuring fingertip forces by imaging coloration changes in the fingernail," *Neurocolloquium Tuebingen*, Werner Reichart Centre for Integrative Neuroscience, University of Tuebingen, Germany.

April 18, 2008: "Torso force and wind display," *Cyberwalk Workshop*, Max Planck Institute, Tuebingen, Germany.

### 2007 and 2008 Professional Participation

Editor in Chief - *International Journal of Robotics Research*

General Chair - *World Haptics Conference 2009*

USA Regional Officer - *International Foundation of Robotics Research (IFRR)*

Advisory Committee - *Robotics Science and Systems*

Vice President for Conference Activities - *IEEE Robotics and Automation Society*

Associate Vice President of the Steering Committee for Technical Programs - *IEEE Robotics and Automation Society*

External Review Committee - *iCORE, the Alberta Informatics Circle of Research Excellence*.

External Advisory Board - *Robotics Institute, Carnegie Mellon University*

Strategic Advisory Committee - *Engineering Research Center on Computer Integrated Surgical Systems and Technology, Johns Hopkins University*

Member - *CRA Interim Computing Community Consortium Council*





**Christopher Johnson**  
Distinguished Professor and Director of the SCI Institute  
[www.cs.utah.edu/~crj](http://www.cs.utah.edu/~crj)  
[crj@cs.utah.edu](mailto:crj@cs.utah.edu)

Chris Johnson directs the Scientific Computing and Imaging (SCI) Institute at the University of Utah where he is a Distinguished Professor of Computer Science and holds faculty appointments in the Departments of Physics and Bioengineering. His research interests are in the areas of scientific computing and scientific visualization. Dr. Johnson founded the SCI research group in 1992, which has since grown to become the SCI Institute employing over 145 faculty, staff and students. Professor Johnson serves on several international journal editorial boards, as well as on advisory boards to several national and international research centers. Professor Johnson has received several awards, including the the NSF Presidential Faculty Fellow (PFF) award from President Clinton in 1995 and the Governor's Medal for Science and Technology from Governor Michael Leavitt in 1999. He is a Fellow of the American Institute for Medical and Biological Engineering and a Fellow of the American Association for the Advancement of Science.

### 2007 and 2008 Publications

E. Wes Bethel, Chris Johnson, Ken Joy, Sean Ahern, Valerio Pascucci, Hank Childs, Jonathan Cohen, Mark Duchaineau, Bernd Hamann, Charles Hansen, Dan Laney, Peter Lindstrom, Jeremy Meredith, George Ostrouchov, Steven Parker, Claudio Silva, Allen Sanderson and Xavier Tricoche. SciDAC Visualization and Analytics Center for Enabling Technology, *Journal of Physics: Conference Series*, vol. 78, no. 012032, pp. 1-5, 2007.

C. C. Douglas, M. J. Cole, P. Dostert, Y. Efendiev, R. E. Ewing, G. Haase, J. Hatcher, M. Iskandarani, C. R. Johnson, and R. A. Lodder, "Dynamically identifying and tracking contaminants in water bodies" in *Computational Science - ICCS 2007: 7th International Conference*, Beijing, China, May 27-30, 2007, Proceedings, Part I, Y. Shi, G. D. van Albalda, P. M. A. Sloot, and J. J. Dongarra (eds.), Springer-Verlag, Berlin Heidelberg, Lecture Notes in Computer Science series, vol. 4487, pp. 1002-1009, 2007

C. C. Douglas, D. Bansal, J. D. Beezley, L. S. Bennethum, S. Chakraborty, J. L. Coen, Y. Efendiev, R. E. Ewing, J. Hatcher, M. Iskandarani, C. R. Johnson, M. Kim, Deng Li, R. A. Lodder, J. Mandel, G. Qin, and A. Vodacek, "Dynamic data-driven application systems for empty houses, contaminat tracking, and wildland fireline prediction" in *Grid-Based Problem Solving Environments*, P. W. Gaffney and J. C. T. Pool (eds.), IFIP series, Springer-Verlag, Berlin, pp. 255-272, 2007

J. Krueger, K. Potter, R. MacLeod, and C.R. Johnson. "Unified Volume Format: A General System For Efficient Handling Of Large Volumetric Datasets" *IADIS Computer Graphics and Visualization*. pp: 19-26 2008

K. Potter, J. Krueger, and C.R. Johnson. "Towards The Visualization Of Multi- Dimensional Stochastic Distribution Data" *IADIS Computer Graphics and Visualization*. pp: 191-196 2008

M. Hansen, M. Hockin, G. Kindlmann, Nevell, I. Wu, D. Grunwald, D. Weinstein, G. Jones, C.R. Johnson, J. Van de Berg, M. Capecchi, and C. Keller. "Optimization of volumetric computed tomography for skeletal analysis of model genetic organisms". *The Anatomical Record*, 2008. Volume 291 Issue 5, Pages 475 - 487

J.F. Shepherd and C.R. Johnson. "Hexahedral Mesh Generation for Biomedical Models in SCIRun". *Engineering with Computers*, (Special Issue on Biomedical Engineering), 2008. ISSN-0177-0667

M. Callahan, M.J. Cole, J.F. Shepherd, J.G. Stinstra, and C.R. Johnson. "A Meshing Pipeline for Biomedical Computing". *Engineering with Computers*, (Special Issue on Biomedical Engineering), 2008. ISSN-0177-0667

X. Tricoche, R. MacLeod, and C.R. Johnson. "Visual Analysis of Bioelectric Fields. In Proceedings of Visualization in Medicine and Life Sciences" Springer-Verlag, 2008. ISBN 978-3-540-72629-6

J.F. Shepherd, C. R. Johnson, "Hexahedral Mesh Generation Constraints," *Engineering with Computers*, Vol. 24, No. 3, pp. 195-213, 2008

A.R. Sanderson, M.R. Meyer, R.M. Kirby, and C.R. Johnson. "A Framework for Exploring Numerical Solutions of Advection Reaction Diffusion Equations using a GPU Based Approach". *Journal of Computing and Visualization in Science*, 2008 ISSN 1432-9360.

C.R. Johnson and X. Tricoche. *Biomedical Visualization. Advances in Biomedical Engineering*, Edited by Pascal Verdonck, Elsevier, pp. 209-272, 2008

### 2007 and 2008 Invited Talks and Presentations

#### Keynote, Plenary and Distinguished Lectures:

- 1) Visualizing the Future, UK e-Science All Hands Meeting, Edinburgh, UK, September 2008 (Plenary Speaker).
- 2) Visualizing the Future, 5th International Conference on Geographic Information Science, Park City, September 2008 (Plenary Speaker).
- 3) Large-Scale Visualization, PARA 2008, Trondheim, Norway, May 2008 (Plenary Speaker).
- 4) Computing and Visualizing the Future of Biomedicine, Department of Biomedical Engineering, University of Texas, Austin, January 2008 (Distinguished Lecture).
- 5) Moving Beyond Pretty Pictures, IEEE Visualization Conference 2007, Sacramento, October 2007 (Capstone Speaker).
- 6) Computational Bioimaging and Visualization, VIP IMAGE, Porto, Portugal, October 2007 (Keynote Speaker).
- 7) Computing the Future of Biomedicine, Centre for Scientific Computing, Simon Fraser University, Vancouver, Canada, October 2007 (Distinguished Lecture).
- 8) Large-Scale Bioimaging and Visualization, IEEE International Parallel and Distributed Processing Symposium (IPDPS), Long Beach, March 2007 (Keynote Speaker).
- 9) Visualizing the Future, Utah Computer Society, Salt Lake City, February 2007 (25th Anniversary Keynote Presentation).

#### Other Invited Presentations:

- 1) Visual Computing, ARUP Laboratories, Salt Lake City, October 2008.
- 2) Large-Scale Visual Analysis Tools, DOE Scientific Data Analysis and Visualization for Petascale Computing Workshop, Snowbird, Utah, July 2008.
- 3) Seeing the Results of Scientific Computations, AAAS, Boston, February, 2008.
- 4) Putting it All Together: Highlights of Recent National Reports on Computing, DOE ASC PI Meeting, Monterey, February, 2008.
- 5) Visual Computing and Imaging: Interdisciplinary Approaches, Center for Interdisciplinary Art and Technology, University of Utah, February, 2008.
- 6) Large Scale Visual Data Analysis, Ultrascale Visualization Workshop, Reno, Nov. 2007.
- 7) Visual Computing: Research Challenges, University of Kaiserslautern, Germany, July, 2007.

*Christopher Johnson continued on next page*



*Christopher Johnson continued*

- 8) Visual Computing: Research Challenges, MIT, Boston, June, 2007.
- 9) Visual Computing: Research Challenges, Harvard University, Boston, May, 2007.

**2007 and 2008 Professional Participation**

*National and International Advisory Boards:*

- 1) UK Centre for Numerical Algorithms and Software for Advanced Computing - International Steering Board
- 2) Networking and Data Analysis Grand Challenge Center, Sandia National Laboratory, External Advisory Board
- 3) Computing Research Association Education Committee
- 4) Virtual Physiological Human Network of Excellence
- 5) Fundamental and Computational Science Directorate Review Committee, Pacific Northwest National Laboratory
- 6) President's Council of Advisors on Science and Technology (PCAST), Member of the Networking and Information Technology Technical Advisory Group (TAG)
- 7) Institute for Computational Engineering and Sciences, University of Texas, Austin, Board of Visitors
- 8) Mathematics Awareness Advisory Committee. Joint Policy Board for Mathematics (SIAM, AMS, ASA, MAA)
- 9) DOD Telemedicine and Advanced Technology Research Center (TATRC) Institute of Triple Helix Innovation Scientific Advisory Board
- 10) NIH National Center for Biomedical Computation, Stanford University, Scientific Advisory Board
- 11) Finnish Centre of Excellence in Inverse Problems, Scientific Advisory Board
- 12) Bavarian Graduate School of Computational Engineering, International Advisory Board
- 13) NIH National Alliance for Medical Image Computing, Advisory Board

*Workshop Co-Chair:*

- 1) Co-Chair, Ultrascale Visualization Workshop, SC07 (November 2007)

- 2) Co-Chair, DOE Visualization and Analytics Workshop (June 2007)

*Journal and Book Series Editorial Boards:*

- 1) SIAM Journal on Scientific Computing, Special Issue on Computational Science and Engineering, Co-Editor (2008)
- 2) DOE Office of Advanced Scientific Computing Research Communications Project Editorial Board
- 3) Computers in Engineering, Special Issue on Biomedical Computing, Co-Editor (2007)
- 4) SIAM Computational Science and Engineering, Book Series
- 5) Computer Graphics Year in Review
- 6) Electronic Transactions in Numerical Analysis

*Other:*

- 1) International Program Committee, Int. Symposium on Volume Graphics 2008
- 2) Program Committee, 4th IEEE International Conference on e-Science 2008
- 3) Steering Committee, International Society on Inverse Problems in Science and Engineering, 2008
- 4) 2nd ECCOMAS Conference on Computational Vision and Medical Image Processing, 2009
- 5) Organizing Committee, DOE ASCR Computer Science PI Meeting, 2008
- 6) Program Committee, International Conference on Computational Science and its Applications 2008
- 7) Technical Program Committee, IEEE International Parallel and Distributed Processing Symposium 2008
- 8) Scientific Program Committee, VECPAR 2008
- 9) International Program Committee, International Symposium on Volume Graphics 2007
- 10) Program Committee, IEEE International Symposium on Computer-Based Medical Systems 2007
- 11) Organizing Committee, 4th International Conference on Functional Imaging and Modeling of the Heart, 2007

John E. and Marva M. Warnock  
Engineering Building





**Sneha Kaser**  
 Assistant Professor  
[www.cs.utah.edu/~kaser](http://www.cs.utah.edu/~kaser)  
[kaser@cs.utah.edu](mailto:kaser@cs.utah.edu)

Sneha Kumar Kaser heads the Advanced Networked Systems Research (ANSR) Group at the University of Utah. His research interests include networks and systems - technologies, protocols and applications encompassing mobile and pervasive systems and wireless networks, network security and reliability, overload and congestion control, multicast communication, Internet pricing, Internet measurements and inferencing.

### 2007 and 2008 Publications

#### Conferences and Workshops

M. Probst and Sneha K. Kaser, "Statistical Trust Establishment in Wireless Sensor Networks," in Proceedings of IEEE International Conference on Parallel and Distributed Systems (ICPADS), December 2007. pp.1-8

S. Ramesh and Sneha K. Kaser, "Best Effort Session-level Congestion Control," in Proceedings of IEEE International Conference on Network Protocols (ICNP), October 2007. Pages: 236-245

N. Patwari and Sneha K. Kaser, "Robust Location Distinction Using Temporal Link Signatures," in Proceedings of ACM Sigmobile 13<sup>th</sup> International Conference on Mobile Computing and Networking (MOBICOM), September 2007. Pages: 111 - 122

Sneha K. Kaser, "A Connection Oriented Internet Architecture to Restrict Reachability," in IEEE LANMAN Workshop, June 2007. Pages: 151-156

J. Duerig, R. Ricci, D. Gebhardt, J. Zhang, Sneha K. Kaser and J. Lepreau, "The Flexlab Approach to Realistic Evaluation of Networked Systems," in Proceedings of 4<sup>th</sup> Usenix Symposium on Network System Design and Implementation (NSDI), April 2007. Pp. 201-214

J. C. Park and Sneha K. Kaser, "Securing Ad hoc Wireless Networks against Data Injection Attacks Using Firewalls," in Proceedings of IEEE Wireless Communications and Networking Conference (WCNC), March 2007. Pages: 2843-2848

S. Jana and Sneha K. Kaser, "On Fast and Accurate Detection of Unauthorized Access Points Using Clock Skews," ACM Sigmobile 14<sup>th</sup> International Conference on Mobile Computing and Networking (MOBICOM), September 2008. Pages 104-115

J. Zhang, M.H. Firooz, N. Patwari, and Sneha K. Kaser, "Advancing Link Signatures for Location Distinction," ACM Sigmobile 14<sup>th</sup> International Conference on Mobile Computing and Networking (MOBICOM), September 2008. Pages 26-37

S. Pichumani and Sneha K. Kaser, "On Implementing Security at the Transport Layer," In the Third International Conference on Communication System Software and Middleware (COMSWARE), January 2008. Invited Paper. Pages: 318-326

### 2007 and 2008 Invited Talks and Presentations

"Enhancing Wireless Network Security Using Unique Device and Link Characteristics," in ARL/ONR MURI meeting at University of California, Davis, September 2008.

"Robust Ad Hoc Networks," in ARL/ONR MURI at University of Maryland, College Park, August 2007.

"Building Robust Networked Systems," Computer Science colloquium, Utah State University, November 2007

### 2007 and 2008 Patents

Sneha K. Kaser, Ramachandran Ramjee, D. Raz, Y. Shavitt, and P. Sinha, "Fair Sharing of Multi-access Channels," U.S. Patent 7317686, January 2008.

### 2007 and 2008 Professional Participation

#### Editorial Boards

ACM Mobile Computing and Communications Review (MC<sup>2</sup>R) (since January 2008)  
 ACM/Springer Wireless Networks Journal (since February 2007)  
 Computer Networks Journal (COMNET) (since January 2005)  
 ACM Mobile Computing and Communications Review (MC<sup>2</sup>R) (6/060-12/2007)

#### Conference Organization

Demo Chair - IEEE Conference on Mobile Ad Hoc and Sensor Networks (MASS) 2008  
 Panels Co-chair - IEEE Conference on Sensor, Mesh, and Ad Hoc Communications, and Networks (SECON) 2008

#### Conference Technical Program Committees

IEEE Conference on Computer Communications (INFOCOM), 2008  
 IEEE Conference on Sensor, Mesh, and Ad Hoc Communications, and Networks (SECON), 2007, 2008  
 IEEE International Conference on Pervasive Computing and Communications (PERCOM), 2007, 2008  
 IEEE Conference on Mobile Ad Hoc and Sensor Networks (MASS), 2008  
 Third International Conference on Communication Systems Software and Middleware (COMSWARE), 2007, 2008  
 ACM Sigmobile International Conference on Mobile Computing and Networking (MOBICOM), 2007  
 IEEE International Conference on Parallel and Distributed Systems (ICPADS), 2007

#### Student Poster/Demo Committee

ACM Sigmobile International Conference on Mobile Computing and Networking (MOBICOM), 2007

#### Review Panels

National Science Foundation Review Panel, 2008.  
 National Science Foundation Review Panel, 2008.  
 Department of Homeland Security, SBIR Reviewer, 2008.  
 National Science Foundation Review Panel, 2007.

### 2007 and 2008 Honors and Awards

In the School of Computing Student Research Poster Competition in 2008, three out of five prizes were won by my students. The first prize was won by my student Jun Cheol Park.

Commended by the Dean of College of Engineering, University of Utah, for being among the top 15% teachers based on student evaluations for Spring 2007.





**Robert Kessler**  
 Professor  
[www.cs.utah.edu/~kessler](http://www.cs.utah.edu/~kessler)  
[kessler@cs.utah.edu](mailto:kessler@cs.utah.edu)

Robert (Bob) R. Kessler has been on the faculty of the University of Utah since 1983 and is currently a professor and associate director of the School of Computing. He earned his B.S., M.S., and Ph.D. in 1974, 1977, and 1981 respectively, all from the University of Utah. His early work was centered on the portable implementation of the Lisp programming language and then distributed and parallel implementations of Lisp. In the early 90's, he founded the Center for Software Science, a state of Utah Center of Excellence, which was a research group working in nearly all aspects of system software for sequential and parallel/distributed computers. In the late 90's Professor Kessler served as chairman of the Department of Computer Science. At about that same time, his research interests expanded into software engineering and he also dabbled in agent technologies. His most recent interests are in undergraduate education and tackling the challenges of declining computer science enrollment by the introduction of computer gaming into early CS classes. He has authored two books and over fifty journal and conference publications. Professor Kessler has received over \$6.5M in external research funding from government and industrial sources and \$10M in equipment grants. He has founded two startup companies and has been on the board of directors of several others. Professionally he served several years as an officer of the ACM SIGPLAN organization and was the co-editor-in-chief of the International Journal of Lisp and Symbolic Computation for seven years. He is an award winning teacher having received the College of Engineering Outstanding Teaching Award in 2000 and the University of Utah's highest teaching honor, the Distinguished Teaching Award in 2001.

#### 2007 and 2008 Publications

R. Kessler and N. Dykman, "Integrating Traditional and Agile Processes In the Classroom", SIGCSE 2007, 312-316.

#### 2007 and 2008 Participation

##### *Entertainment Arts and Engineering Program*

In 2007, Dr. Kessler along with the chair and staff of the Division of Film Studies created the Entertainment Arts and Engineering Program. The new interdisciplinary program was designed for undergraduate students interested in pursuing careers in the digital entertainment industry. Dr. Kessler currently serves as Lead over the program.

Professor Kessler has provided numerous radio and television interviews describing the EAE program and has helped to push student Machinima work out to broad audiences.

#### 2007 and 2008 Honors and Awards

IEEE Software: 25<sup>th</sup> Anniversary Top Picks  
 37 out of 1200 papers selected

L. Williams, R. R. Kessler, W. Cunningham, R. Jeffries "Strengthening the Case for Pair Programming" IEEE Software, Aug. 2000 pp: 19-25



**Mike Kirby**  
 Associate Professor  
[www.cs.utah.edu/~kirby](http://www.cs.utah.edu/~kirby)  
[kirby@cs.utah.edu](mailto:kirby@cs.utah.edu)

Robert M. ("Mike") Kirby received his B.S. in Applied Mathematics and Computer and Information Sciences from Florida State University in 1997, his M.S. in Applied Mathematics from Brown University in 1999 and his M.S. in Computer Science from Brown University in 2001, his Doctor of Philosophy in Applied Mathematics from Brown University in 2003.

Professor Kirby's research focus is on large-scale scientific computing and visualization, with an emphasis on the scientific cycle of mathematical modeling, computation, visualization, evaluation, and understanding. His primary research interests are: Computational Science and Engineering, High-Order Methods: Algorithm Development and Applications, Scientific Visualization, Concurrent Programming: Verification and Applications, and High Performance Computing.

#### 2007 and 2008 Publications

##### *2007 Journals*

Elijah P. Newren, Aaron L. Fogelson, Robert D. Guy and Robert M. Kirby, "Unconditionally Stable Discretizations of the Immersed Boundary Equations", Journal of Computational Physics, Vol. 222, Issue 2, pages 702-719, 2007.

Robert M. Kirby, Zohar Yosibash and George Em Karniadakis, "Towards Stable Coupling Methods for High-Order Discretizations of Fluid-Structure Interaction: Algorithms and Observations", Journal of Computational Physics, Vol. 223, Issue 2, pages 489-518, 2007.

Sarah E. Geneser, Robert M. Kirby, Dongbin Xiu and Frank B. Sachse, "Stochastic Markovian Modeling of Electrophysiology of Ion Channels: Reconstruction of Standard Deviations in Macroscopic Currents", Journal of Theoretical Biology, Vol. 245, Issue 4, pages 627-637, 2007.

C.W. Hamman, R.M. Kirby and M. Berzins, "Parallelization and Scalability of a Spectral Element Channel Flow Solver for Incompressible Navier-Stokes Equations", Concurrency and Computation: Practice and Experience, Volume 19, Issue 11, pages 1403-1422, 2007.

Miriah Meyer, Blake Nelson, Robert M. Kirby and Ross Whitaker, "Particle Systems for Efficient and Accurate Finite Element Visualization", IEEE Transactions on Visualization and Computer Graphics, Vol. 13, Number 5, pages 1015-1026, 2007.

Sean Curtis, Robert M. Kirby, Jennifer K. Ryan and Chi-Wang Shu, "Post-processing for the Discontinuous Galerkin Method Over Non-Uniform Meshes", SIAM Journal of Scientific Computing, Vol. 30, Number 1, pages 272-289, 2007.

Miriah Meyer, Robert M. Kirby and Ross Whitaker, "Topology, Accuracy, and Quality of Isosurface Meshes Using Dynamic Particles", IEEE Transactions on Visualization and Computer Graphics (IEEE Visualization Issue), Vol. 13, Number 6, pages 1704-1711, 2007.

Sarah E. Geneser, Robert M. Kirby and Robert S. MacLeod, "Application of Stochastic Finite Element Methods to Study the Sensitivity of ECG Forward Modeling to Organ Conductivity", IEEE Transactions on Biomedical Engineering, Vol. 55, Number 1, pages 31-40, 2007.



*2007 Refereed Conferences*

Yu Yang, Xiaofang Chen, Ganesh Gopalakrishnan and Robert M. Kirby, "Distributed Dynamic Partial Order Reduction Based Verification of Threaded Software", Proceedings of Model Checking Software: 14th International SPIN Workshop, Berlin, Germany, July 1-3, 2007.

Robert Palmer, Michael Delisi, Ganesh Gopalakrishnan and Robert M. Kirby, "An Approach to Formalization and Analysis of Message Passing Libraries". Proceedings of the 12th International Workshop on Formal Methods for Industrial Critical Systems (FMICS), Berlin, Germany, July 1-2, 2007.

Robert Palmer, Ganesh Gopalakrishnan and Robert M. Kirby, "Semantics Driven Dynamic Partial-Order Reduction of MPI-based Parallel Programs". Proceedings of Parallel and Distributed Systems: Testing and Debugging (PADTAD), London, England, July 9, 2007.

Salman Pervez, Ganesh Gopalakrishnan, Robert M. Kirby, Robert Palmer, Rajeev Thakur and William Gropp, "Practical Model Checking Method for Verifying Correctness of MPI Programs", Proceedings of EuroPVM-MPI 2007, Paris, France, September 30 - October 3, 2007.

*2008 Journals*

J.S. Hesthaven and R.M. Kirby, "Filtering in Legendre Spectral Methods", Mathematics of Computation, Vol. 77, Number 263, pages 1425-1452, 2008.

Elijah P. Newren, Aaron L. Fogelson, Robert D. Guy and Robert M. Kirby, "A Comparison of Implicit Solvers for the Immersed Boundary Equations", Computer Methods in Applied Mechanics and Engineering, Vol. 197, Issues 25-28, pages 2290-2304, 2008.

Michael Steffen, Sean Curtis, Robert M. Kirby and Jennifer K. Ryan, "Investigation of Smoothness-Increasing Accuracy-Conserving Filters for Improving Streamline Integration Through Discontinuous Fields", IEEE Transactions on Visualization and Computer Graphics, Vol. 14, Number 3, pages 680-692, 2008.

Michael Steffen, Robert M. Kirby and Martin Berzins, "Analysis and Reduction of Quadrature Errors in the Material Point Method (MPM)", International Journal of Numerical Methods in Engineering, Vol. 76, Issue 6, pages 922-948, 2008.

C.W. Hamman, J.C. Klewicki and R.M. Kirby, "On the Lamb vector divergence in Navier-Stokes flows", Journal of Fluid Mechanics, Vol. 610, pages 261-284, 2008.

Tobias Preusser, Hanno Scharr, Kai Krajssek and Robert M. Kirby, "Building Blocks for Computer Vision with Stochastic Partial Differential Equations", International Journal of Computer Vision, Vol. 80, Number 3, pages 375-405, 2008.

Robert M. Kirby and Claudio Silva, "The Need For Verifiable Visualization", IEEE Computer Graphics and Applications, Vol. 28, Number 5, pages 78-83, 2008.

Miriah Meyer, Ross Whitaker, Robert M. Kirby, Christian Ledergerber and Hanspeter Pfister, "Particle-based Sampling and Meshing of Surfaces in Multimaterial Volumes", IEEE Transactions on Visualization and Computer Graphics (IEEE Visualization Issue), Vol. 14, Number 6, pages 1539-1546, 2008.

M. Steffen, P.C. Wallstedt, J.E. Guilkey, R.M. Kirby and M. Berzins, "Examination and Analysis of Implementation Choices within the Material Point Method", Computer Modeling in Engineering and Science, Vol. 31, Number 2, pages 107-128, 2008.

*2008 Refereed Conferences*

Tim Kroger, Inga Altrogge, Olaf Konrad, Robert M. Kirby and Tobias Preusser, "Estimation of Probability Density Functions for Parameter Sensitivity Analyses", Proceedings of Simulation and Visualization (SimVis) 2008, Magdeburg, Germany, February 28-29, 2008.

Tobias Martin, Elaine Cohen and Robert M. Kirby, "Volumetric Parameterization and Trivariate B-spline Fitting using Harmonic Functions", Proceedings of ACM Solid and Physical Modeling, Stony Brook, NY, June 2-4, 2008.

Sarvani Vakkalanka, Ganesh Gopalakrishnan and Robert Kirby, "Dynamic Verification of MPI programs with Reductions in Presence of Split Operations and Relaxed Orderings", 20th International Conference on Computer Aided Verification (CAV 2008), Princeton, NJ, July 7-14, 2008.

Sarvani Vakkalanka, Michael DeLisi, Ganesh Gopalakrishnan and Robert M. Kirby, "Scheduling Considerations for building Dynamic Verification Tools for MPI", Proceedings of Parallel and Distributed Systems: Testing and Debugging (PADTAD), Seattle, WA, July 20-21, 2008.

Yu Yang, Xiaofang Chen, Ganesh Gopalakrishnan and Robert M. Kirby, "Efficient Stateful Dynamic Partial Order Reduction", Proceedings of Model Checking Software: 15th International SPIN Workshop, Los Angeles, CA, August 10-12, 2008.

Sarvani Vakkalanka, Michael DeLisi, Ganesh Gopalakrishnan, Robert M. Kirby, Rajeev Thakur and William Gropp, "Implementing Efficient Dynamic Formal Verification Methods for MPI Programs", Proceedings of EuroPVM-MPI 2008, Dublin, Ireland, September 7-10, 2008.

Subodh Sharma, Sarvani Vakkalanka, Ganesh Gopalakrishnan, Robert M. Kirby, Rajeev Thakur and William Gropp, "A Formal Approach to Detect Functionally Irrelevant Barriers in MPI Programs", Proceedings of EuroPVM-MPI 2008, Dublin, Ireland, September 7-10, 2008.

**2007 and 2008 Invited Talks and Presentations**

Center for Computation and Technology, Louisiana State University. Presented a sabbatical talk as a Special Guest Lecture entitled "Building Symbiotic Relationships Between Formal Verification and High-Performance Computing", December 2008.

Center for Computation and Technology, Louisiana State University. Presented a sabbatical talk in the Computational Mathematics Seminar Series entitled "Visualization of High-Order Finite Element Methods", December 2008.

Department of Mathematics, University of Reading, United Kingdom. Presented a sabbatical talk entitled "Analysis-Guided Improvements of the Material Point Method", November 2008.

*Mike Kirby continued next page*



**Matthew Might**  
Assistant Professor  
[www.cs.utah.edu/~might](http://www.cs.utah.edu/~might)  
[might@cs.utah.edu](mailto:might@cs.utah.edu)

#### *Mike Kirby continued*

School of Mathematics, University of Edinburgh, United Kingdom. Presented a sabbatical talk entitled "Computational Methods for Quantifying Uncertainty in Biological Modelling", October 2008.

Department of Applied Mathematics, Technical University Delft, The Netherlands. Presented a talk entitled "Visualization of High-Order Finite Element Methods", August 2008.

Meeting on Extreme Engineering: Opportunities Using Petaflop Computing, Daresbury Laboratory (UK). Presented a talk entitled "Building Symbiotic Relationships between Formal Verification and High- Performance Computing", July 2008.

Intelligent Visualization and Simulation Lab, University of Kaiserslautern, Germany. Presented a talk entitled "Visualization of High-Order Finite Element Methods", June 2008.

Center of Complex Systems and Visualization, University of Bremen, Germany. Presented a talk entitled "Topology, Accuracy, and Quality of Isosurface Meshes Using Dynamic Particles", February 2008.

School of Computing, University of Leeds (UK). Presented a talk entitled "Simulation Science: The Modeling of Real-World Problems", July 2007.

International Workshop on High-Order Finite Element Methods, Herrsching am Ammersee (near Munich), Germany. Presented a talk entitled "Visualization of High-Order Finite Element Methods", May 2007.

Institute for Numerical Simulation, University of Bonn, Germany. Presented a talk entitled "Simulation Science: The Modeling of Real-World Problems", April 2007.

Center of Complex Systems and Visualization, University of Bremen, Germany. Presented a talk entitled "Particle Systems for Efficient and Accurate High-Order Finite Element Visualization", March 2007.

#### **2007 and 2008 Professional Participation**

Papers Committee, IEEE Visualization 2008

Panels Co-Chair, IEEE Visualization 2007 and 2008

#### **2007 & 2008 Honors and Awards**

- Awarded Leverhulme Visiting Professorship, Department of Aeronautics, Imperial College London (UK)
- Best Paper Award, ACM Solid and Physical Modeling Symposium (SPM'08), 2008.
- Best Paper Award, Parallel and Distributed Systems: Testing and Debugging (PAD-TAD), 2007.
- Best Paper Award, Formal Methods for Industry Critical Systems (FMICS), 2007.

Dr. Might joined the school as an assistant professor in the fall of 2008. Before joining the School of Computing, he received his Ph.D. from Georgia Tech and then worked for two start-ups, Diagis and yaplet.com. Dr. Might's research in the field of programming languages and compilers is focused on tackling the key challenges in modern software development: improving security and harnessing parallelism. Driven by the escalation of information security crisis, he is actively investigating and constructing software tools for programmers to use that can prove the absence of security flaws and find bugs in software systems; his work with Diagis involved commercializing such tools. In response to hardware manufacturers recent insistence on doubling cores instead of clock-speeds, he is also investigating software analyses and tools that can automatically parallelize sequential software across multiple processors and detect flaws in explicitly parallel software.

#### **2007 and 2008 Publications**

Matthew Might. "Logic-flow analysis of higher-order programs." Proceedings of the 34th Annual ACM Symposium on the Principles of Programming Languages (POPL 2007). Long paper category. Nice, France January, 2007. pages 185--198.

Matthew Might, Benjamin Chambers and Olin Shivers. "Model Checking via GCFA." Proceedings of the 8th International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI 2007). Nice, France. January, 2007. pages 59--73.

Matthew Might and Olin Shivers. "Analyzing environment structure of higher-order languages using frame strings." Journal of Theoretical Computer Science. Volume 375, Issues 1-3. Festschrift for John C. Reynolds's 70th birthday. 2007. pages 137--168.

Matthew Might and Olin Shivers, Exploiting reachability and cardinality in higher-order flow analysis. Journal of Functional Programming, 2008, 18, pp 821-864

#### **2007 and 2008 Professional Participation**

POPL 2007: Logic-flow analysis of higher-order programs.

VMCAI 2007: Model-checking via Gamma-CFA.

Max-Planck Institute, Spring 2008: Static analysis of higher-order programs.

Northwestern University, Spring 2008: Static analysis of higher-order programs.

Brandeis University, Spring 2008: Static analysis of higher-order programs.

#### **2007 and 2008 Patents**

Cryptographic container security system. October 28, 2008. US# 7,443,293.

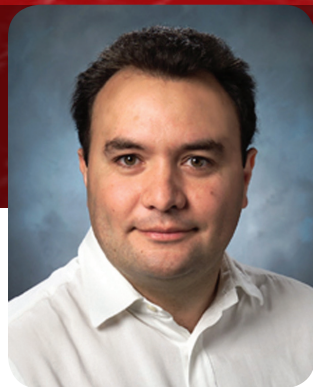
Angled-beam detection system for container inspection. April 8, 2008. US# 7,356,118.

#### **2007 and 2008 Honors and Awards**

ACM Doctoral Dissertation Award Nominee.

SIGPLAN Doctoral Dissertation Award Nominee.

Georgia Tech College of Computing Outstanding Dissertation Award.



**Valerio Pascucci**  
Associate Professor  
[www.sci.utah.edu/~pascucci](http://www.sci.utah.edu/~pascucci)  
[pascucci@sci.utah.edu](mailto:pascucci@sci.utah.edu)

Valerio Pascucci is an associate professor in the School of Computing and a member of the SCI faculty. Before joining SCI, Dr. Pascucci served as a Project Leader at the Lawrence Livermore National Laboratory, Center for Applied Scientific Computing (from May 2000) and Adjunct Professor at the Computer Science Department of University of California Davis (from July 2005). Valerio earned a Ph.D. in computer science at Purdue University in May 2000, and a EE Laurea (Master), at the University "La Sapienza" in Roma, Italy, in December 1993.

Dr. Pascucci's research interests include: data analysis, topological methods for image segmentation, progressive and multi-resolution techniques for scientific visualization, combinatorial topology, geometric compression, computer graphics, computational geometry, geometric programming, and solid modeling.

### 2007 and 2008 Publications

G. H. Weber, P.-T. Bremer, and V. Pascucci. "Topological landscapes: A terrain metaphor for scientific data" *IEEE Transactions on Visualization and Computer Graphics*, 2007. pp. 1416-23

A. Gyulassy, V. Natarajan, B. Hamann, and V. Pascucci. "Efficient computation of morse-smale complexes for three-dimensional scalar functions" *IEEE Transactions on Visualization and Computer Graphics*, 2007 pp. 1440-7

A. Gyulassy, V. Natarajan, B. Hamann, M. Duchaineau, V. Pascucci, E. Bringa, and A. Higginbotham. "Topologically clean distance fields" *IEEE Transactions on Visualization and Computer Graphics*, 2007. pp. 1432-1439

V. Pascucci, G. Scorzelli, P.-T. Bremer, and A. Mascarenhas. "Robust on-line computation of reeb graphs: Simplicity and speed" *ACM Transactions on graphics: ACM SIGGRAPH 2007 Papers*, 2007. pp. 581-589

G. H. Weber, S. Dillard, H. Carr, V. Pascucci, and B. Hamann. "Topology-controlled volume rendering" *IEEE Transactions on Visualization and Computer Graphics*, 13(2):330-341, 2007.

D. Laney, P.-T. Bremer, A. Mascarenhas, P. Miller, and V. Pascucci. "Understanding the structure of the turbulent mixing layer in hydrodynamic instabilities" *IEEE Transactions on Visualization and Computer Graphics*, 13(1):1053-1060, 2007.

S. P. Callahan, L. Bavoil, V. Pascucci, and C. T. Silva. "Progressive volume rendering of large unstructured grids" *IEEE Transactions on Visualization and Computer Graphics*, 13(1):1307-1314, 2007.

K. J. Janine Bennett, Valerio Pascucci. A genus oblivious approach to cross parameterization. *Computer Aided Geometric Design*, 25(8):592-606, November 2008.

H. Edelsbrunner, J. Harer, A. Mascarenhas, V. Pascucci, and J. Snoeyink. Timevarying reeb graphs for continuous space-time data. *Computational Geometry: Theory and Applications*, 41(3):149-166, November 2008.

A. Gyulassy, P.-T. Bremer, B. Hamann, and V. Pascucci. A practical approach to morse-smale complex computation: Scalability and generality. *IEEE Trans. Vis. Comput.*

*Graph*, 14(6):1619-1626, 2008.

G. Scorzelli, A. Paoluzzi, and V. Pascucci. Parallel solid modeling using bsp dataflow. *International Journal of Computational Geometry and Applications (IJCGA)*, 18(5):441-467, October 2008.

### 2007 and 2008 Invited Talks and Presentations

- "Ecoles D'Eté on "Advanced Methods in Scientific Visualization", organized by INRIA, CEA, EDF. Centre Port-Royal, Saint-Lambert-des-Bois, France, 2007
- The University of Nevada Reno, Department of Computer Science & Engineering and The Northern Nevada IEEE, Reno, NV, September 28, 2007
- Nashville 2007 Fall Creek Falls: Key Challenges in Modeling and Simulation, Nashville, TN, September 26, 2007
- Battelle briefing by Industrial Partnerships and Commercialization (IPAC) Office and the Deputy Director for Science and Technology, Livermore, September 25, 2007
- SIGGRAPH 2007, San Diego, CA, August 8, 2007
- FET 2007, IUSV Workshop, CS Department UC Davis, CA, August 1, 2007
- Third University of Rome, Computer Science Department, July, 9, 2007
- Dagstuhl seminar on Scientific Visualization, July, 2007
- DOE/ASCR Visualization and Analytics Workshop, Salt Lake City, Utah, June 7-8, 2007
- Directorate Review Committee, Livermore, CA, April 19, 2007
- Ecological Sustainability and Global Security (E3SGS) Berkeley, CA, April 18, 2007
- SciDAC 2008, Seattle, Washington, October 2008.
- Fifth International Conference on Flow Dynamics, Sendai, Japan, October, 2008.
- Sandia National Laboratory, Computation Directorate, Livermore, CA, May, 2008.
- Ohio State University Computer Science and Engineering, Columbus, Ohio, May, 2008.
- Stanford Linear Accelerator Center SciDAC Computational Astrophysics Consortium Meeting, Stanford, California, April, 2008.
- Arizona State University, Tempe, Arizona, February, 2008.

### 2007 and 2008 Professional Participation

- Livermore Principal Investigator for the (VACET), SciDAC2 project. Oct 2006 - present.
- Principal Investigator and Project Leader for the TechBase research project on "Embedded Geospatial Intelligence. April 2007 - present.
- Principal Investigator and Project Leader for the LDRD research project. Oct. 2004 - present.
- Principal Investigator for the "Data Representation" component of the project for "Streaming techniques for image processing" supported by NGA. March 2005 - present.
- Computer Scientist, ASC PPPE Project (ASCI VIEWS), CASC, LLNL. May 2000 - Present.
- Adjunct Professor, CS Department, UC Davis. July 2005 - Present.
- Co-Chair and Organizer of TopolnVis 2008
- DOE Panel on the Status of Required Computational and Applied Math Tools for Fusion Simulation, February-May, 2007.

### Program Committee

- Eurographics 2008.
- IEEE conference on "Visualization" (VIS) 2007.
- ACM Symposium on "Computational Geometry" (SoCG) 2007.
- IEEE Conference on "Shape Modeling and Applications" (SMI) 2007.
- International Symposium on Visual Computing (ISVC) 2007.
- IASTED Conference on "Graphics and Visualization in Engineering" (VGE) 2007
- IASTED Conference on "Visualization, Imaging, and Image Processing" (VIIP) 2007





**John Regehr**  
 Assistant Professor  
[www.cs.utah.edu/~regehr](http://www.cs.utah.edu/~regehr)  
[regehr@cs.utah.edu](mailto:regehr@cs.utah.edu)

John Regehr received his B.S. in Mathematics and Computer Science from Kansas State University in 1995, his Masters of Computer Science from the University of Virginia in 1997, and his PhD. in Computer Science from the University of Virginia in 2001.

### 2007 and 2008 Publications

Nathan Cooperider and John Regehr. "Offline Compression for On-Chip RAM". Proceedings of the ACM SIGPLAN 2007 Conference on Programming Language Design and Implementation (PLDI 2007), San Diego, CA, June 2007. Pages: 363 - 372

Will Archer, Philip Levis, and John Regehr. "Interface Contracts for TinyOS". Proceedings of the International Conference on Information Processing in Sensor Networks (IPSN) 2007, SPOTS track, Cambridge, MA, April 2007. Pages: 158 - 165

Nathan Cooperider, William Archer, Eric Eide, David Gay, John Regehr. "Efficient Memory Safety for TinyOS". In Proceedings of the 5th ACM Conference on Embedded Networked Sensor Systems (SenSys 2007), Sydney, Australia, November 2007. Pages: 271-282

Venkat Chakravarthy, John Regehr, and Eric Eide. "Edicts: Implementing Features with Flexible Binding Times". In Proceedings of the 7th International Conference on Aspect-Oriented Software Development (AOSD), Brussels, Belgium, March 2008. Pages 108-119

Eric Eide and John Regehr. "Volatiles are miscompiled, and what to do about it". In Proceedings of the ACM Conference on Embedded Software (EMSOFT), Atlanta, GA, October 2008. Pages 255-264

J. Regehr, The TinyOS Alliance. "TinyOS 2.1: Adding Threads and Memory Protection to TinyOS". Poster to appear in Proceedings of The 6th ACM Conference on Embedded Networked Sensor Systems (SenSys'08). Raleigh, NC, November 2008 pp. 413-414

### Book Chapters

Safe and Structured Use of Interrupts in Real-Time and Embedded Software. Chapter in Handbook of Real-Time and Embedded Systems, CRC Press, 2007. ISBN: 1584886781

FACULTY

### Other

Usa Sammapun, John Regehr, Insup Lee, and Oleg Sokolsky. "Runtime Verification for Wireless Sensor Network Applications". Proceedings of the Dagstuhl Seminar 07011 on Runtime Verification. 2007. ISSN 1862 - 4405

### 2007 and 2008 Invited Talks and Presentations

"Static Analysis of Interrupt-Driven Embedded C." Invited talk at the Department of Computer Science, University of Virginia, April 7 2008.

"Static Analysis of Interrupt-Driven Embedded C." Invited talk at the Department of Computer Science, Washington University, January 18 2008.

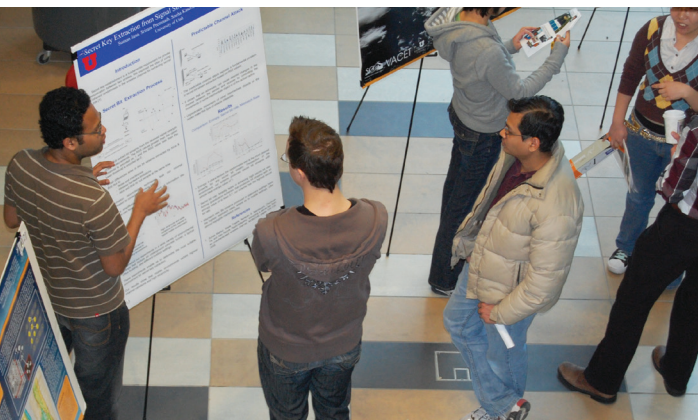
### 2007 and 2008 Professional Participation

#### Program Committee

- International Conference on Embedded Software (EMSOFT)
- Workshop on the Interaction between Compilers and Computer Architecture
- International Conference on Embedded and Real-Time Computing Systems and Architecture
- Workshop on Embedded Sensor Networks (EmNets) 2007
- ACM SIGPLAN/SIGBED 2007 Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES)
- International Conference on High Performance Embedded Architectures (HiPEAC)
- Real-Time Systems Symposium (RTSS) 2007
- Real-Time and Embedded Technology and Applications Symposium (RTAS) 2007 & 2008
- IEEE/IFIP International Conference On Embedded and Ubiquitous Computing (EUC) 2008.
- Real-Time Systems Symposium (RTSS) track on Wireless Sensor Networks 2008
- IEEE 17th International Conference on Computer Communications and Networks (ICCCN) 2008

#### Program Committee Chair

- ACM SIGPLAN/SIGBED 2008 Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES)



Student Poster Session



## Rich Riesenfeld

Professor

[www.cs.utah.edu/~rfr](http://www.cs.utah.edu/~rfr)

[rfr@cs.utah.edu](mailto:rfr@cs.utah.edu)

Having previously served as a two term Chair of Computer Science, Riesenfeld has sustained a large, multi-disciplinary research effort for more than three decades in Geometric Modeling, Manufacturing, and Design. He has published extensively and headed many large funding contracts from various sources like NSF, DARPA, ONR, ARO, in addition to private industrial supporters. From 1998 until it ended in July 2002, he served as Director of the NSF Science and Technology Center for Computer Graphics and Scientific Visualization, a research consortium including Brown University, California Institute of Technology, Cornell University, the University of North Carolina, and University of Utah. He has held faculty appointments in five different academic areas including mechanical engineering, electrical engineering, mathematics, and civil engineering in addition to computer science. The B-spline methods of design, proposed in his doctoral thesis, is now used a worldwide standard for computer aided design of freeform curves and surfaces. Since then he has co-authored several seminal papers, including those on the well known "Oslo Algorithms," on surface subdivision methods, and presenting exact formulations for radiosity calculations. In addition, his co-authored papers in approximation theory include widely referenced work on discrete box splines and cone splines.

In 2001 he co-authored a reference and advanced text book entitled "Geometric Modeling with Splines," that closely ties spline theory and geometric algorithms. The multidisciplinary Geometric Design and Computation Research Group which he co-heads has been investigating a broad spectrum of research problems in computer graphics, geometric modeling, remote collaborative design, and manufacturing within an integrated experimental testbed environment. He heads both the Computer Graphics Laboratory and the Advanced Manufacturing Laboratory at the University of Utah. In 2005 Riesenfeld received the International Gregory Award for lifetime contributions to Computer Aided Geometric Design.

### 2007 and 2008 Publications

#### 2007 Journals

X. Chen, R. F. Riesenfeld, E. Cohen and J. N. Damon, "Theoretically Based Algorithms for Robust Tracking of Intersection Curves of Deforming Parametric Surfaces," *Computer Aided Design*, v. 39, #5, May 2007, pp. 389-397.

X. Chen, R. Riesenfeld, E. Cohen, "Degree Reduction for NURBS Symbolic Computation on Curves," *International Journal of Shape Modeling*, v. 13 #1, pp. 25-49, June, 2007.

#### 2008 Journals

G. Draper and R. F. Riesenfeld. "Who Votes for Whom? An Integrated Visualization for Exploring Opinion Poll Data," *IEEE Transactions on Visualization and Computer Graphics (Proceedings of Visualization 2008)*, Vol. 14, No. 6 (Nov/Dec 2008), pages 1197-1204.

#### 2007 Refereed Conference

X. Chen, R. F. Riesenfeld, and E. Cohen, "Sliding-Windows Algorithm for B-spline Multiplication, Solid and Physical Modeling, 2007, pages 265-276.

#### 2008 Refereed Conference

G. Draper, Y. Livnat, and R. Riesenfeld. "A Visual Query Language for Correlation Discovery and Management," *Proceedings of the 2nd Annual Visual and Iconic Language Conference (ValL 2008)*, pp. 14-23.

G. Draper, R.F. Riesenfeld, "Interactive Fan Charts: A Space-saving Technique for Genealogical Graph Exploration," 8<sup>th</sup> Annual Workshop on Technology for Family History and Genealogical Research (FHTW, Brigham Young University, March 2008).

### 2007 and 2008 Invited Talks and Presentations

Dagstuhl (Germany) Workshop on Computer Geometry, May 2008, "Dynamic Geometric Computation of Interacting Models."

Hampton University, Symposium on Virtual Parts and Engineering, April 2008

### 2007 and 2008 Professional Participation

International Conference on Graphics and Visualization in Engineering (GVE) 2007 – Program Committee

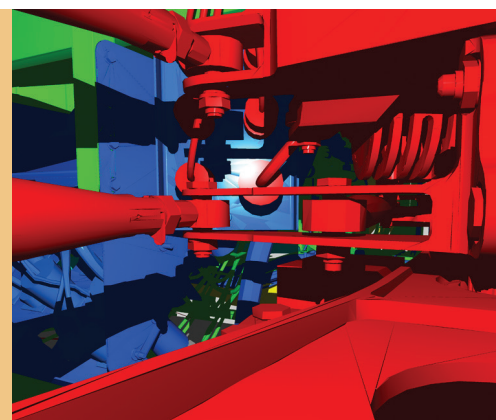
Journal of Computing and Information Science in Engineering (JCISE)  
Editorial Board

National Science Foundation Program Panel, May 2008

Seventh International Conference on Mathematical Methods for Curves and Surfaces Tonsberg, Norway, 2008, Session chair

FACULTY

Mechanical component in a Boeing 777 rendered with Phong shading and shadows. Generated with the Manta Interactive Ray Tracing system. Dataset provided by Boeing Corporation.







**Ellen Riloff**  
Associate Professor  
[www.cs.utah.edu/~riloff](http://www.cs.utah.edu/~riloff)  
[riloff@cs.utah.edu](mailto:riloff@cs.utah.edu)

Professor Riloff's primary research interests are in natural language processing (NLP), although she also has interests in information retrieval, machine learning, and artificial intelligence in general. Recent research projects have tackled the problems of information extraction, opinion analysis, semantic lexicon induction, and coreference resolution. A major emphasis of Prof. Riloff's research involves automatically acquiring the knowledge needed for conceptual natural language processing, and developing bootstrapping methods that can learn from unannotated text with minimal training supervision.

Recent research projects have tackled the problems of information extraction, opinion analysis, semantic lexicon induction, and coreference resolution. A major emphasis of Prof. Riloff's research involves automatically acquiring the knowledge needed for conceptual natural language processing, and developing bootstrapping methods that can learn from unannotated text with minimal training supervision.

**2007 and 2008 Publications**

Patwardhan, S. and Riloff, E. "Effective Information Extraction with Semantic Affinity Patterns and Relevant Regions", Proceedings of the 2007 Conference on Empirical Methods in Natural Language Processing (EMNLP-07) 2007. Pages: 717-727

Phillips, W. and Riloff, E. "Exploiting Role-Identifying Nouns and Expressions for Information Extraction", Proceedings of the 2007 Conference on Recent Advances in Natural Language Processing (RANLP-07) 2007. pp. 468-473

Price, D., Riloff, E., and Zachary, J. "A Study to Evaluate a Natural Language Interface for Computer Science Education", AIED 2007 Workshop on Emerging Technologies for Inquiry-Based Learning in Science. 2007. pp. 49-60.

Kozareva, Z., Riloff, E., and Hovy, E. "Semantic Class Learning from the Web with Hyponym Pattern Linkage Graphs", Proceedings of the 46th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies (ACL-08). 2008. pages 1048-1056

Igo, S. and Riloff, E. "Learning to Identify Reduced Passive Verb Phrases with a Shallow Parser", Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI-08). 2008. pages: 1458-1461

**2007 and 2008 Invited Talks and Presentations**

Keynote Talk at RANLP-07 Conference: Finding Mutual Benefit between Information Extraction and Subjectivity Analysis

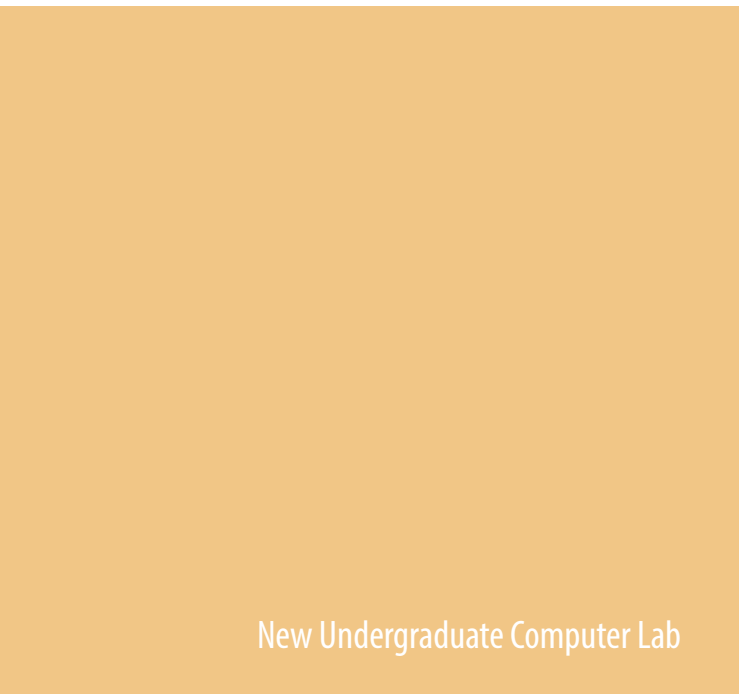
Invited Talk: "Desiderata for Annotating Data to Train and Evaluate Bootstrapping Algorithms" Unified Linguistic Annotation Workshop, University of Colorado, Boulder, CO, March 2008

**2007 and 2008 Professional Participation**

- Editorial Board, Computational Linguistics, January 2007-December 2009.
- Faculty Advisor, Association for Computational Linguistics (ACL) Student Research Workshop, 2007

- *Reviewer for:*  
Journal of Artificial Intelligence Research (JAIR), 2007, 2008  
IEEE Transactions on Software Engineering, 2008

*Program Committee Member:*  
ACL-07, EMNLP-07, KCAP-07, RANLP-07,  
ACL-PASCAL 2007 Workshop on Textual Entailment and Paraphrasing,  
AAAI-08, ACL-08, COLING-08, CoNLL-08,  
COLING-08 Workshops



New Undergraduate Computer Lab







**Kris Sikorski**  
 Professor  
[www.cs.utah.edu/~sikorski](http://www.cs.utah.edu/~sikorski)  
[sikorski@cs.utah.edu](mailto:sikorski@cs.utah.edu)

ematics at the University of Utah.

Professor Sikorski's research interests are in the areas of scientific computation, computational complexity and numerical analysis, with special emphasis on Information Based Complexity. Of special interest are optimal algorithms for fixed points and nonlinear equations, optimal algorithms for signal reconstruction, forward and inverse problems in geophysics, combustion engineering, computational sensor networks, numerical verification and validation of nonlinear solvers as well as nonlinear optimization for inverse problems in urban modeling. Professor Sikorski was awarded First Degree Prize of the Secretary of Education of Poland (jointly with M. Kowalski and F. Stenger) for research leading to the publication of the monograph: Selected Topics in Approximation and Computation (1996). In 2001-2008 he received 6 Dean's letters for excellence in teaching as well as best paper award in 2008. He published 2 research monographs, 1 textbook and numerous papers in wide spread areas from theory of scientific computation and numerical analysis, algorithmic design, through software and hardware design. He is the founding director (2001) of the Master of Science program in Computational Engineering and Science ([www.ces.utah.edu](http://www.ces.utah.edu)) at the University of Utah. He currently directs the MS CES program. He supervised 9 Ph.D. and 24 MS students. His students hold top positions in academia and industry.

**2007 and 2008 Publications**

Ch. Booniasirivat, K. Sikorski and Ch. Xiong, "A Note on two fixed point problems" *Journal of Complexity*, 23, 2007, pp. 952-961.; also in *Festschrift for 60th Birthday of Prof. H. Wozniakowski*, Eds. B. Kacwicz, L. Plaskota and G. Wasilkowski, Elsevier Publishers, 2007.

Petelenz, T.J.; Sikorski, C. "Potential Alternative Signal Sampling and Reconstruction Strategy for Low Power Embedded Sensors" *High Confidence Medical Devices, Software, and Systems and Medical Device Plug-and-Play Interoperability*, 2007. HCMDSS-MDPnP. Joint Workshop on 25-27 June 2007 Page(s):194 - 198

Henderson, T.; Sikorski, C.; Grant, E.; Luthy, K. "Computational sensor networks" *Intelligent Robots and Systems*, 2007. IROS 2007. IEEE/RSJ International Conference on Oct. 29 2007-Nov. 2 2007 Page(s):1997 - 2002

Sawo, F; Henderson, TC.; Sikorski, C; Hanebeck, U D. "Sensor node localization methods based on local observations of distributed natural phenomena" *Multisensor Fusion and Integration for Intelligent Systems*, 2008. MFI 2008. IEEE International Conference on 20-22 Aug. 2008 Page(s):301 - 308

**2007 and 2008 Invited Talks and Presentations**

University of Notre Dame, November 2007, Center for Applied Mathematics, Distinguished Colloquium, "Optimal algorithms and computational complexity of fixed points"

Conference: *Optimal Algorithms and Computational Complexity for Numerical Problems*; Salt Lake City, May 2007; to honor Frank Stenger's retirement, From Poland to Utah in communist times, *Nonlinear Problems/Algorithms* in collaboration with Frank.

University of California at Berkeley, December 2008, Computer Science and Mathematics seminar: "CES program at the University of Utah" and "Optimal Algorithms for Fixed Points".

**2007 and 2008 Professional Participation**

Chair of the organizing committee for the conference: *Optimal Algorithms and Computational Complexity for Numerical Problems*; Salt Lake City, May 2007; to honor Frank Stenger's retirement.

Editor: Special Issue of *Journal of Complexity* devoted to proceedings of the 2007 conference honoring Frank Stenger's retirement.

BET (Bandwidth Expansion Technology, LLC); development of simulations for new technologies expanding bandwidth of analog communication channels; joint with R.R. Johnson and M. Kowalski

**2007 and 2008 Honors and Awards**

Best Paper Award for the paper: "Sensor node localization methods based on local observations of distributed natural phenomena", Sawo, Felix; Henderson, Thomas C.; Sikorski, Christopher; Hanebeck, Uwe D, *Multisensor Fusion and Integration for Intelligent Systems*, 2008. IEEE International Conference on 20-22 Aug. 2008.



**Claudio Silva**  
Associate Professor  
[www.cs.utah.edu/~csilva](http://www.cs.utah.edu/~csilva)  
[csilva@cs.utah.edu](mailto:csilva@cs.utah.edu)

Claudio T. Silva received the BS degree in mathematics from the Federal University of Ceara, Brazil, in 1990, and the PhD degree in computer science from the State University of New York at Stony Brook in 1996. He is an associate professor of computer science and a faculty member of the Scientific Computing and Imaging (SCI) Institute at the University of Utah. Before joining Utah in 2003, he worked in industry (IBM and AT&T), government (Sandia and LLNL), and academia (Stony Brook and OGI). He coauthored more than 130 technical papers and eight U.S. patents, primarily in visualization, geometric computing, and related areas. He is an active member of the visualization, graphics, and geometric computing research communities, having served on more than 60 program committees. He is co-editor of the Visualization Corner of the IEEE Computing in Science and Engineering and on the editorial board of Computer and Graphics. Previously, he was on the editorial board of the IEEE Transactions on Visualization and Computer Graphics. He was papers co-chair for IEEE Visualization conference in 2005 and 2006. He received IBM Faculty Awards in 2005, 2006, and 2007, and best paper awards at IEEE Visualization 2007 and IEEE Shape Modeling International 2008. He is a member of the ACM, Eurographics, and IEEE.

#### 2007 and 2008 Publications

- C. Silva, J. Freire, and S. P. Callahan. "Provenance for Visualization: Reproducibility and Beyond" *Computing in Science and Engineering*, 9(5):82-89, 2007.
- C. E. Scheidegger, H. T. Vo, D. Koop, J. Freire, and C. Silva. "Querying and Creating Visualizations by Analogy" *IEEE Transactions on Visualization and Computer Graphics* (Proceedings of IEEE Visualization 2007), 13(6):1560-1567. Best paper award.
- F. Bernardon, S. Callahan, J. Comba, and C. Silva. "An Adaptive Framework for Visualizing Unstructured Grids with Time-Varying Scalar Fields" *Parallel Computing*, 33(6):391-405, 2007.
- H. Vo, S. Callahan, P. Lindstrom, V. Pascucci, and C. Silva. "Streaming Simplification for Tetrahedral Meshes" *IEEE Transactions on Visualization and Computer Graphics*, 13(1):145-155, 2007.
- J.F. Shepherd, Y. Zhang, C. Tuttle, and C. Silva. "Quality Improvement and Boolean-Like Cutting Operations in Hexahedral Meshes" *Proceedings of the 10th Conference of the International Society of Grid Generation*, 2007. ISBN: 9781604239768
- E. Anderson, S. Callahan, C. Scheidegger, J. Schreiner, and C. Silva. "Hardware-Assisted Point-Based Volume Rendering of Tetrahedral Meshes" *SIBGRAP 2007 - Brazilian Symposium on Computer Graphics and Image Processing*, 2007. Pages 163-172
- H. Vo, S. Callahan, N. Smith, C. Silva, W. Martin, D. Owen, D. Weinstein. "iRun: Interactive Rendering of Large Unstructured Grids" *7th Eurographics Workshop on Parallel Graphics and Visualization (EGPV 2007)*, pages 93-100, 2007.
- J. Daniels, L. Ha, T. Ochotta, and C. Silva. "Robust Smooth Feature Extraction from Point Clouds" *Shape Modeling International 2007*, pages 123-133, 2007. Best paper finalist.
- E. Anderson, G. Preston, and C. Silva. "Towards Development of a Circuit Based Treatment for Impaired Memory: A Multidisciplinary Approach" *IEEE Engineering in Medicine and Biology Conference (EMBS) 2007*. Pages 302-305
- L. Bavoil, S.P. Callahan, A. Lefohn, J.L.D. Comba, and C. Silva. "Multi-Fragment Effects on the GPU using the k-Buffer" *ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games*, pages 97-104, 2007.
- E. W. Bethel, C. Johnson, K. Joy, S. Ahern, V. Pascucci, H. Childs, J. Cohen, M. Duchaineau, B. Hamann, C. Hansen, D. Laney, P. Lindstrom, J. Meredith, G. Ostrouchov, S. Parker, C. Silva, A. Sanderson, and X. Tricoche. "SciDAC visualization and analytics center for enabling technology" *Journal of Physics: Conference Series, SciDAC 2007 Conference*, June 2007. Volume 3 Number 4
- M. Vouk, I. Altintas, R. Barreto, J. Blondin, Z. Cheng, T. Critchlow, A. Khan, S. Klasky, J. Ligon, B. Ludaescher, P. A. Moullem, S. Parker, N. Podhorszki, A. Shoshani, C. Silva, "Automation of Network-Based Scientific Workflows" *International Federation for Information Processing (IFIP)*, Volume 239, *Grid-Based Problem Solving Environments*, 2007.
- E. W. Anderson, S. P. Callahan, D. A. Koop, E. Santos, C. E. Scheidegger, H. T. Vo, J. Freire, and C. Silva. "VisTrails: Using Provenance to Streamline Data Exploration" *Post Proceedings of the International Workshop on Data Integration in the Life Sciences (DILS) 2007*. Page 8
- G. A. Preston, E. W. Anderson, E. Wassermann, T. Goldberg, and C. Silva. Invited for oral presentation. *Effects of 10 Hz rTMS on Alpha Spectral Dynamics and Working Memory Performance*, *Proceedings of Neuroscience Poster Session 2007*.
- E. Bethel, C. Johnson, C. Aragon, Prabhat, O. Rbel, G. Weber, V. Pascucci, H. Childs, P.-T. Bremer, B. Whitlock, S. Ahern, J. Meredith, G. Ostrouchov, K. Joy, B. Hamann, C. Garth, M. Cole, C. Hansen, S. Parker, A. Sanderson, C. Silva, X. Tricoche. *DOE's SciDAC Visualization and Analytics Center for Enabling Technologies - Strategy for Petascale Visual Data Analysis Success*, *CTWatch Quarterly*, Volume 3, Number 4, November 2007. Volume 3 Number 4
- J. Daniels, C. Silva, J. Shepherd, and E. Cohen, "Quadrilateral Mesh Simplification" *ACM Transactions on Graphics* (Proceedings of SIGGRAPH Asia 2008). Article No: 148
- R. M. Kirby and C. Silva. "The Need for Verifiable Visualization" *IEEE Computer Graphics and Applications*, 28(5):78-83, 2008.
- F. Bernardon, L. Ha, S. Callahan, J. Comba, and C. Silva. "Interactive Transfer Function Specification for Direct Volume Rendering of Disparate Volumes" *Computing in Science and Engineering*, 2008. pp. 82-89
- D. Koop, C. Scheidegger, S. Callahan, J. Freire, and C. Silva. "VisComplete: Automating Suggestions for Visualization Pipelines" *IEEE Transactions on Visualization and Computer Graphics* (Proceedings of IEEE Visualization 2008), 14(6):1691-1698, 2008.
- C. Dietrich, J. Comba, L. Nedel, C. Scheidegger, and C. Silva. "Edge Groups: A New Approach to Understanding the Mesh Quality of Marching Methods" *IEEE Transactions on Visualization and Computer Graphics* (Proceedings of IEEE Visualization 2008), 14(6):1651-1658, 2008.
- C. Scheidegger, J. Schreiner, B. Duffy, H. Carr and C. Silva. "Revisiting Histograms and

- Isosurface Statistics" IEEE Transactions on Visualization and Computer Graphics (Proceedings of IEEE Visualization 2008), 14(6):1659-1666, 2008.
- J. Daniels, T. Ochotta, L. Ha, and C. Silva. "Spline-Based Feature Curves from Point-Sampled Geometry" *The Visual Computer*, 24(6):449-462, 2008.
- A. Baptista, B. Howe, J. Freire, D. Maier, and C. Silva. "Scientific Exploration in the Era of Ocean Observatories" *Computing in Science and Engineering*, 10(3):53-58, 2008.
- J. Freire, D. Koop, E. Santos, and C. Silva. "Provenance for Computational Tasks: A Survey" *Computing in Science and Engineering*, 10(3):11-21, 2008.
- E.W. Anderson, J. Ahrens, K. Heitmann, S. Habib, and C. Silva. "Provenance in Comparative Analysis: A Study in Cosmology" *Computing in Science and Engineering*, 10(3):30-37, 2008.
- L. Bavoil, S. Callahan, and C. Silva. "Robust Soft Shadow Mapping with Depth Peeling" *Journal of Graphics Tools*, 13(1):19-30, 2008.
- C. Scheidegger, D. Koop, E. Santos, H. Vo, S. Callahan, J. Freire, and C. Silva. "Tackling the Provenance Challenge One Layer at a Time" *Concurrency And Computation: Practice And Experience*, 20(5):473-483, 2008.
- S. P. Callahan, J. H. Callahan, C. E. Scheidegger, and C. Silva, "Direct Volume Rendering: A 3D Plotting Technique for Scientific Data" *Computing in Science and Engineering*, 10(1):88-92, 2008.
- B. Howe, P. Lawson, R. Bellinger, E. Anderson, E. Santos, J. Freire, C. Scheidegger, A. Baptista, and C. Silva, "End-to-End eScience: Integrating Workflow, Query, Visualization, and Provenance at an Ocean Observatory" *IEEE International Conference on e-Science 2008*. Pages 127-134
- I. Cheng, A. Badalov, C. Silva, and A. Basu. "Effects of Texture and Color on the Perception of Medical Images" *30th IEEE Engineering in Medicine and Biology Society*, 2008. Pages 5897-5900
- E. Santos, L. Lins, J. P. Ahrens, J. Freire, and C. Silva. "A First Study on Clustering Collections of Workflow Graphs" *Second International Provenance and Annotation Workshop (IPAW) 2008*. Pages 160-173
- S. P. Callahan, J. Freire, C. E. Scheidegger, C. Silva, and Huy T. Vo. "Towards Provenance-Enabling ParaView" *Second International Provenance and Annotation Workshop (IPAW) 2008*. Pages 120-127
- T. Ellkvist, D. Koop, E. W. Anderson, J. Freire, and C. Silva. "Using Provenance to Support Real-Time Collaborative Design of Workflows" *Second International Provenance and Annotation Workshop (IPAW) 2008*. Pages 266-279
- L. Lins, D. Koop, E. W. Anderson, S. P. Callahan, E. Santos, C. E. Scheidegger, J. Freire, and C. T. Silva. "Examining Statistics of Workflow Evolution Provenance: A First Study" *Statistical and Scientific Database Management (SSDBM)*, 2008. Pages 573-579
- H. Wang, C. E. Scheidegger, and C. Silva. "Optimal Bandwidth Selection for MLS Surfaces" *IEEE International Conference on Shape Modeling and Applications (SMI)*, 2008. Best paper award. Pages 111-120
- C. E. Scheidegger, H. T. Vo, D. Koop, J. Freire, and C. Silva. "Querying and Re-Using Workflows with VisTrails" *ACM SIGMOD 2008*. Page 1251-1254
- L. Moreau, B. Ludewig, I. Altintas, R. Barga, S. Bowers, S. Callahan, G. Chin Jr., B. Clifford, S. Cohen, S. Cohen-Boulakia, S. Davidson, E. Deelman, L. Digiampietri, I. Foster, J. Freire, J. Frew, J. Futrelle, T. Gibson, Y. Gil, C. Goble, J. Golbeck, P. Groth, D. A. Holland, S. Jiang, J. Kim, D. Koop, A. Krenek, T. McPhillips, G. Mehta, S. Miles, D. Metzger, S. Munroe, J. Myers, B. Plale, N. Podhorszki, V. Ratnakar, E. Santos, C. Scheidegger, K. Schuchardt, M. Seltzer, Y. L. Simmhan, C. Silva, P. Slaughter, E. Stephan, R. Stevens, D. Turi, H. Vo, M. Wilde, J. Zhao, and Y. Zhao. *The First Provenance Challenge, Concurrency and Computation: Practice and Experience*, 2008. Pages 409-418
- C. Silva and J. Tohline. Guest Editorial: Special Issue on Computational Provenance, *Computing in Science and Engineering*, 10(3):9-10, 2008.
- T. Ellkvist, D. Koop, J. Freire, C. Silva, and L. Stromback. "Using Mediation to Achieve Provenance Interoperability" *IEEE International Conference on e-Science 2008* pp. 398-399
- C. Silva and J. Freire. "Software Infrastructure for Exploratory Visualization and Data Analysis: Past, Present, and Future", In *Journal of Physics: Conference Series*, vol. 125, *SciDAC 2008 Conference*, 2008. (pp15)
- M. Lizier, J. F. Shepherd, L. G. Nonato, J. Comba, and C. Silva. "Comparing Techniques for Tetrahedral Mesh Generation" *Inaugural International Conference of the Engineering Mechanics Institute*, 2008.
- J. Freire and C. Silva. "Simplifying the Design of Workflows for Large-Scale Data Exploration and Visualization" *Proceedings of the Microsoft eScience Workshop*, 2008. pages 49-51
- G. A. Preston, E. W. Anderson, E. Wassermann, T. Goldberg, and C. Silva. "Enhanced neuronal efficiency and 10-12Hz spectral dynamics: Results from a concurrent EEG-TMS study" *1st North American Symposium on TMS and Neuroimaging in Cognition and Behaviour*, 2008.
- J. Freire and C. Silva. "Towards Enabling Social Analysis of Scientific Data" *CHI Social Data Analysis Workshop*, 2008. E-pub

#### Tutorials

- Provenance and Scientific Workflows: Supporting Data Exploration and Visualization *IEEE International Conference on e-Science 2008*.
- Visualization and Data Analysis with VisTrails *SciDAC (Scientific Discovery through Advanced Computing) 2008*.

#### 2007 and 2008 Invited Talks and Presentations

- 1) *Introduction to Computational Provenance*, Workshop on Monte Carlo data evaluation, archiving and provenance, Inst. Theor. Physics, ETH, Nov. 2nd, 2008.

*Claudio Silva continued on next page*





**Konrad Slind**  
Assistant Professor  
[www.cs.utah.edu/~slind](http://www.cs.utah.edu/~slind)  
[slind@cs.utah.edu](mailto:slind@cs.utah.edu)

#### **Claudio Silva continued**

- 2) *Introduction to VisTrails*, Workshop on Monte Carlo data evaluation, archiving and provenance, Inst. Theor. Physics, ETH, Nov. 2nd, 2008.
- 3) *VisTrails: Provenance and Data Exploration*, NIH National Biomedical Computation Resource (NBCR) Summer Institute, Aug. 4th, 2008.
- 4) *Software Infrastructure for Exploratory Visualization and Data Analysis: Past, Present and Future*, SciDAC (Scientific Discovery through Advanced Computing) 2008, July 17th
- 5) *Visualization at the University of Utah*, Workshop on Interactive Data Visualization (co-located w/ SIBGRAPI 2007), Oct. 7th, 2007
- 6) *Supporting Data Exploration through Visualization*, Open Grid Forum February 2007.
- 7) *VisTrails: Visualization meets Data Management*, University of North Carolina at Chapel Hill, February 2nd, 2007.

#### **2007 and 2008 Professional Participation**

- Editorial Board, *Computer and Graphics* (2008–).
- Co-Editor, *Visualization Corner*, *Computing in Science and Engineering* magazine (2007–).
- Guest Editor: *Computing in Science and Engineering* theme issue on *Computational Provenance*, 2008.
- General Co-chair, *IEEE Visualization 2010*.
- Co-organizer, CHI 2009 workshop on “The Changing Face of Digital Science: Workshop on New Practices in Scientific Collaborations”

#### *Program Committees*

- ACM Multimedia 2008 Technical Demonstrations
- Knowledge-Assisted Visualization (KAV) 2007 & 2008
- International Symposium on Volume Graphics (VG) 2007 & 2008
- Brazilian Symp on Computer Graphics and Image Processing (SIBGRAPI) 2007 & 2008
- Symposium on 3D Data Processing, Visualization, and Transmission (3DPVT) 2008
- 2nd International Provenance and Annotation Workshop (IPAW 2008)
- ACM SIGGRAPH 2008 Papers Program
- ACM Solid and Physical Modeling Symposium (SPM) 2008
- IEEE International Conference on Shape Modeling and Applications (SMI) 2008
- EuroVis 2008
- International Conference on Computer Animation and Social Agents (CASA) 2008
- Symposium on Geometry Processing 2007 & 2008
- Pacific Graphics 2007
- IEEE Visualization 2007
- 3rd International Symposium on Visual Computing (ISVC 07)
- ACM SIGGRAPH 2007 Sketches & Posters Program
- 7th Eurographics Workshop on Parallel Graphics and Visualization (EGPGV), 2007
- Eurographics 2007

#### **2007 and 2008 Honors and Awards**

- IBM Faculty Award 2007
- IEEE Senior Member (since 2008).
- Best paper award, IEEE Shape Modeling International 2008.
- Best paper award, IEEE Visualization 2007.
- Best paper finalist, IEEE Shape Modeling International 2007.
- Dean’s Teaching Commendation, Spring 2007.

Professor Slind joined the School of Computing at the University of Utah in 2001. His research interests are mainly in formal methods, chiefly applications of higher order logic to system verification and synthesis. He is currently working on compiling subsets of higher order logic to low-level executables: hardware and ARM assembly. Konrad Slind received his PhD from the Technical University of Munich in 1999.

#### **2007 and 2008 Publications**

G. Li, S. Owens, and K. Slind. “Structure of a Proof-Producing Compiler for a subset of Higher Order Logic” *Proceedings of 16th European Symposium on Programming (ESOP) 2007*, Braga, Portugal, March 2007. Springer LNCS 4421.

G. Li and K. Slind. “Compilation as Rewriting in Higher Order Logic” *Automated Deduction - CADE-21*, 21st International Conference on Automated Deduction, Bremen, Germany, July 17-20, 2007. Springer LNCS 4603.

M. Kaufmann and K. Slind. “Proof Pearl: Wellfounded induction on the ordinals up to  $\aleph_{\epsilon_0}$ ” *Proceedings of the 20th Conference on Theorem Proving in Higher Order Logics (TPHOLs) 2007*, Kaiserslautern, September 2007. Springer LNCS 4732.

K. Slind, S. Owens, J. Iyoda, and M. Gordon. “Proof producing synthesis of arithmetic and cryptographic hardware” *Formal Aspects of Computing*, 19(3), 2007, pp. 343-362.

M. Myreen, K. Slind and M. Gordon. “Machine-code verification for multiple architectures: an application of decompilation into logic” *Proceedings of FMCAD*, Portland, 2008.

K. Slind and M. Norrish. “A Brief Overview of HOL4” *Proceedings of the 21st Conference on Theorem Proving in Higher Order Logics 2008*, Montreal, Springer LNCS 5170.

G. Li and K. Slind. “Trusted Source Translation of a Total Function Language” *Tools and Algorithms for the Construction and Analysis of Systems*, 14th International Conference, TACAS 2008, Budapest, 2008. Springer LNCS 4963.

S. Owens and K. Slind. “Adapting Functional Programs to Higher Order Logic” *Higher Order and Symbolic Computation*, 21(4), 2008, pp. 377-419.

#### **2007 and 2008 Invited Talks and Presentations**

- An Overview of HOL-4, TPHOLs 2008, Montreal, August 19 2008. One hour tutorial.
- Compiling from Higher Order Logic, at IFIP WG 2.8 meeting, Park City, June 17, 2008.
- Translation by Proof, Intel Strategic CAD Labs, Portland Oregon, October 25, 2007.
- ARM Verification, J. Hurd, A. Fox, M. Gordon, and K. Slind, NSA Seventh Annual High Confidence Software and Systems Conference, Baltimore, May 8-10, 2007. Talk delivered by Hurd.

#### **2007 and 2008 Professional Participation**

- Co-organizer of *FestSchrift* for Prof. Mike Gordon, March 2008. Royal Society, London.
- Program Committee*
- TPHOLs 2007 and 2008
- ACL2 2007



**William Thompson**  
 Professor  
[www.cs.utah.edu/~thompson](http://www.cs.utah.edu/~thompson)  
[thompson@cs.utah.edu](mailto:thompson@cs.utah.edu)

William Thompson received his ScB., Physics from Brown University in Providence, RI in 1970, his M.S. in Computer Science from the University of Southern California in Los Angeles, California in 1972, and his PhD. in Computer Science from the University of Southern California in Los Angeles, California in 1975.

Prof. Thompson's current research lies at the intersection of computer graphics and visual perception, with the dual aims of making computer graphics more effective at conveying information and using computer graphics as an aid in investigating human perception. This is an intrinsically multi-disciplinary effort involving aspects of computer science, perceptual psychology, and computational vision. Prof. Thompson has also made contributions in the areas of visual motion perception and in the integration of vision and maps for navigation.

**2007 and 2008 Publications**

W.B. Thompson, V. Dilda and S.H. Creem-Regehr, "Absolute Distance Perception To Locations Off the Ground Plane," *Perception*, 36, 1559-1571, 2007

B.J. Mohler, W.B. Thompson, S.H. Creem-Regehr, H.L. Pick, Jr., and W.H. Warren, Jr., "Visual Flow Influences Gait Transition Speed and Preferred Walking Speed," *Experimental Brain Research*, 181(2), 221-228, 2007.

B.J. Mohler, W.B. Thompson, S.H. Creem-Regehr, P. Willemsen, H.L. Pick, Jr., and J.J. Rieser, "Calibration of Locomotion due to Visual Motion in a Treadmill-based Virtual Environment," *ACM Transactions on Applied Perception*, 4(1), 2007.

S.A. Kuhl, W.B. Thompson, and S.H. Creem-Regehr, "HMD calibration an its effects on distance judgments," *Proc. Fifth Symposium on Applied Perception in Graphics and Visualization*, August 2008. pp: 15-22

B.J. Mohler, H.H. Bühlhoff, W.B. Thompson, and S.H. Creem-Regehr, "A full-body ava-

tar improves distance judgments in virtual environments," *Proc. Fifth Symposium on Applied Perception in Graphics and Visualization*, August 2008. pp: 194

T.R. Ziemek, S.H. Creem-Regehr, and W.B. Thompson, "Using Mental Rotation as a Methodology to Evaluate Shape Perception in Computer Graphics," *Proc. Fifth Symposium on Applied Perception in Graphics and Visualization*, August 2008. pp: 201

P. Willemsen, A.A. Gooch, W.B. Thompson, and S.H. Creem-Regehr, "Effects of Stereo Viewing Conditions on Distance Perception in Virtual Environments," *Presence: Teleoperators and Virtual Environments*, 2008 Pages 91-101

S.A. Kuhl, S.H. Creem-Regehr, and W.B. Thompson, "Recalibration of Rotational Locomotion in Immersive Virtual Environments," *ACM Transactions on Applied Perception*, 5(3) Article No. 17 2008

*Other*

Guest Editorial, *ACM Transactions on Applied Perception*, 4(3), 2007.

**2007 and 2008 Invited Talks and Presentations**

Accuracy of Perspective-Based Distance Judgments in the Real and Virtual World, Max Planck Institute for Biological Cybernetics, Tübingen, Germany. Institute Colloquium. September 28, 2007.

Does real walking matter? CyberWalk Workshop, Tübingen, Germany. April 2008.

**2007 and 2008 Professional Participation**

ACM - Associate Editor, *ACM Transactions on Applied Perception*

ACM SIGGRAPH Symposium on Applied Perception in APGV – Program Committee Workshop on Perception of Scale and Spatial Orientation – co-organizer



Treadport



## Suresh Venkatasubramanian

Assistant Professor and John E. and Marva M. Warnock Presidential Endowed Chair for Faculty Innovation

[www.cs.utah.edu/~suresh](http://www.cs.utah.edu/~suresh)

[suresh@cs.utah.edu](mailto:suresh@cs.utah.edu)

FACULTY

Suresh Venkatasubramanian is interested in algorithms of all shapes and sizes. His current interests lie in computational geometry, massive data sets and statistics, and he enjoys

working on problems on the boundary between theory and applications. He comes to the School from AT&T Labs -- Research, where he spent seven years working on a variety of problems in geometry, graphics and databases. He also learned that if your "massive data set" isn't at least a gigabyte, people in the Labs will laugh at you.

Suresh got his Ph.D at Stanford in 1999, working with Rajeev Motwani and Jean-Claude Latombe. At Stanford, he worked on geometric problems arising in the design of pharmaceutical drugs, which allowed him to get up close and personal with cocaine, albeit only on a computer screen. Prior to that, he inhabited the hallowed halls of the Indian Institute of Technology, Kanpur.

In the alternate universe where he has time for hobbies, he enjoys playing classical guitar, skiing, and compulsively redesigning his website. His personal credo is, 'Make the world safe for theory', and to this end writes The Geomblog (<http://geomblog.blogspot.com>), a blog about algorithms, geometry, and technology.

### 2007 and 2008 Publications

#### 2007 Journals

A. Efrat, Q. Fan and S. Venkatasubramanian. "Curve Matching, Time Warping and Light Fields". *Journal of Mathematical Imaging and Vision*, April 2007 vol. 27, no. 3, pp. 203-216

#### 2008 Journals

P. T. Fletcher, S. Venkatasubramanian, and S. Joshi. "The Geometric Median on Riemannian Manifolds with Application to Robust Atlas Estimation". *Neuroimage* (invited to special issue), Nov. 2008 [Epub ahead of print]

A. Buchsbaum, E. Gansner, C.M. Procopiuc and S. Venkatasubramanian. "Rectangular Layouts of Planar Graphs". *ACM Transactions on Algorithms*, 4(1):1-28, 2008

#### 2007 Refereed Conferences

A. Buchsbaum, E. Gansner and S. Venkatasubramanian. "Directed Graphs and Rectangular Layouts." *Asia-Pacific Symposium on Visualization*, 2007. Pages: 61-64

N. Li, T. Li and S. Venkatasubramanian. "t-closeness: Privacy beyond K-anonymity and l-diversity". *Proc. 23rd International Conference on Data Engineering (ICDE)*, 2007. pp. 106-115

A. Buchsbaum, A. Efrat, S. Jain, S. Venkatasubramanian and K. Yi. *Proc "Restricted Strip Packing And The Sensor Cover Problem". 18th ACM-SIAM Symposium on Discrete Algorithms*, 2007. pp. 1056-1063

#### 2008 Refereed Conferences

P. T. Fletcher, S. Venkatasubramanian, and S. Joshi. "Robust statistics on riemannian manifolds via the geometric median". In *Proc. Conference on Vision and Pattern Recognition (CVPR)*, 2008. Pages: 1-8

B.T. Dai, N. Koudas D. Srivastava, A. Tung and S. Venkatasubramanian "Validating Multi-column Schema Matching by Type". *24th International Conference on Data Engineering (ICDE)*, 2008. Pages: 120-129

#### Book Chapters

Suresh Venkatasubramanian. "Clustering on Streams". To appear in the *Encyclopedia of Databases*, Springer, 2008.

Suresh Venkatasubramanian. "Measures of Anonymity". To appear in *Privacy Preserving Data Mining: Models and Applications*. Ed: Charu Agarwal. Kluwer, 2008.

### 2007 and 2008 Invited Talks and Presentations

Non-standard Geometries and Data Analysis. *Emerging Trends in Visual Computing (ETVC'08)*, Paris, France (Nov 2008)

Histograms, Information Distances And Nonparametric Inference. *Indian Institute of Science*, Bangalore, India (Jun 2007)

### 2007 and 2008 Professional Participation

#### Program Committee

33rd International Conference on Very Large Databases  
23rd ACM Symposium on Computational Geometry  
13th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining

### 2007 and 2008 Honors and Awards

Dean's Commendation letter for teaching excellence, Spring 2008.

John E. and Marva M. Warnock Presidential Endowed Chair for Faculty Innovation in Computer Science, 2007.





**Ross Whitaker**  
Associate Professor  
[www.cs.utah.edu/~whitaker](http://www.cs.utah.edu/~whitaker)  
[whitaker@cs.utah.edu](mailto:whitaker@cs.utah.edu)

Ross T. Whitaker received his B.S. in Electrical Engineering and Computer Science/Engineering Physics at Princeton University in 1986 and his M.S. and PhD in Computer Science at the University of North Carolina in 1991 and 1993.

Professor Whitaker works in the Scientific Imaging and Computing Institute, and he runs the Image Processing Laboratory. He conducts research in image processing, computer vision, pattern recognition, and visualization. His approach to problems in these domains is usually based upon my background in differential geometry, differential equations, and signal processing.

### 2007 and 2008 Publications

#### 2007 Journals

G. Kindlmann, D. B. Ennis, R. Whitaker, C.-F. Westin, "Diffusion Tensor Analysis With Invariant Gradients and Rotation Tangents", *IEEE Trans. Med. Imaging*, 26(11): 1483–1499, 2007.

M. Meyer, B. Nelson, R. Kirby, R. Whitaker, "Particle Systems for Efficient and Accurate High-Order Finite Element Visualization", *IEEE Trans. Visualization and Computer Graphics*, 13(5): 1015–1026, 2007.

S. Awate, R. Whitaker, "Feature-Preserving MRI Denoising using a Nonparametric, Empirical-Bayes Approach", *IEEE Trans. Medical Imaging*, 26(9):1242-1255, 2007.

G. Adluru, S. Awate, T. Tasdizen, R. Whitaker, E. Dibella, "Temporally Constrained Reconstruction of Dynamic Cardiac Perfusion MRI", *Magnetic Resonance in Medicine*, 57:1027-1036, 2007.

#### 2007 Refereed Conferences

J. Cates, P.T. Fletcher, M. Styner, M. Shenton, R. Whitaker, "Shape Modeling and Analysis with Entropy-Based Particle Systems", *Proc. Information Processing in Medical Imaging*, 333–345, 2007.

P.T. Fletcher, R. Tao, W.-K. Jeong, R. T. Whitaker, "A Volumetric Approach to Quantifying Region-to-Region White Matter Connectivity in Diffusion Tensor MRI", *Proc. Information Processing in Medical Imaging*, 346–358, 2007.

S. Gerber, T. Tasdizen, R. Whitaker, "Robust non-linear dimensionality reduction using successive 1-dimensional Laplacian Eigenmaps", *Proc. Intl. Conf. on Machine Learning*, 281–288, 2007.

M. Meyer, R. Kirby, R. Whitaker, "Topology, Accuracy, and Quality of Isosurface Meshes Using Dynamic Particles". *Proc. IEEE Visualization*, 1704–1711, 2007.

W.-K. Jeong, P. Fletcher, R. Tao, R. Whitaker, "Interactive Visualization of Volumetric White Matter Connectivity in DT-MRI using a Parallel-Hardware Hamilton-Jacobi Solver", *Proc. IEEE Visualization*, 1480–1487, 2007

#### 2008 Journals

M. Meyer, R. Whitaker, R.M. Kirby, C. Ledergerber, H. Pfister, "Particle-based Sampling and Meshing of Surfaces in Multimaterial Volumes", *IEEE Trans. Visualization and Computer Graphics*, 14(6), pp. 1539-1546, 2008.

O. Nemitz, M.B. Nielsen, M. Rumpf, R. Whitaker, "Finite Element Methods on Very Large, Dynamic Tubular Grid Encoded Implicit Surfaces", *SIAM J. of Scientific Computing*, To appear, 2008 (Online available).

W.-K. Jeong, R. Whitaker, "A fast iterative method for Eikonal equations", *SIAM J. of Scientific Computing*, To appear, 2008 pp. 2512-2534

#### 2008 Refereed Conferences

J. Cates, P.T. Fletcher, M. Styner, H. Hazlett, R. Whitaker, "Particle-based shape analysis of multi-object complexes", *Proc. Int. Conf. on Medical Image Computing and Computer Assisted Intervention (MICCAI '08)*, pp. 477–485, 2008.

L. Jurrus, R. Whitaker, B. Jones, R. Marc, T. Tasdizen, "An optimal-path approach for neural circuit reconstruction", *Proc. IEEE Int. Sym. on Biomedical Imaging (ISBI '08)*, pp. 1609–1612, 2008.

J. Cates, P.T. Fletcher, Z. Warnock, R. Whitaker, "A shape analysis framework for small animal phenotyping with application to mice with a targeted disruption of Hoxd11", *Proc. IEEE Int. Sym. On Biomedical Imaging (ISBI '08)*, pp. 512–516, 2008.

I. Oguz, J. Cates, P. T. Fletcher, R. Whitaker, D. Cool, S. Aylward, M. Styner, "Entropy-based particle systems and local features for cortical correspondence optimization", *Proc. IEEE Int. Sym. on Biomedical Imaging (ISBI '08)*, pp. 1637–1641, 2008.

E. Jurrus, R. Whitaker, B. Jones, R. Marc, T. Tasdizen, "An optimal-path approach for neural circuit reconstruction", *Proc. IEEE Int. Sym. on Biomedical Imaging (ISBI '08)*, pp. 1609–1612, 2008.

### 2007 and 2008 Invited Talks and Presentations

National Institutes of Health, Bioinformatics Working Group Seminar, "NAMIC Highlights: From Algorithms and Software to Biomedical Science", October 2008

Washington University, Computer Science Seminar, "Dynamic Particles Systems for Visualization, Meshing, and Correspondence", September 2008

Howard Hughes Medical Institute at Janelia Farms, Workshop: What Can Computer Vision do for Neuroscience and Vice Versa, "Analysis of Large Three-Dimensional Volumes from Serial-Section Transmission Electron Microscopy", September 2008.

Woods Hole Oceanographic Institute, Neuroinformatics Course, "PDE-Based Image Processing", August 2008.

National Institutes of Health, National Centers for Biomedical Computing All Hands Meeting, "NAMIC Highlights: From Algorithms and Software to Biomedical Science", August 2008.

### 2007 and 2008 Professional Participation

#### Program Committee

IEEE Symposium on Volume Visualization, 2008

"Workshop on Computational Diffusion MRI", MICCAI, 2008

Associated Editor, IEEE TVCG, 2006–present

Guest Editor, *Medical Image Analysis*, Special Issue on "Microscopy Image Analysis"

### 2007 and 2008 Patents

- U-4335: "A Fast Iterative Method for Solving a Class of Hamilton-Jacobi Equations on Massively Parallel Systems", [app. filed and pending]

- "Mesh Formation For Multi-Element Volumes", [app. filed and pending, 2008]

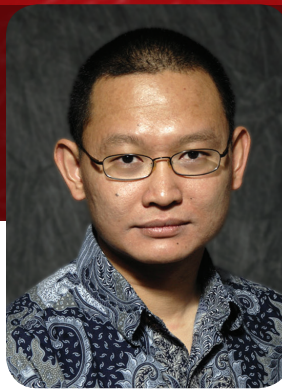
# RESEARCH FACULTY PROFILES



**Sam Drake**  
Research Associate Professor  
[www.cs.utah.edu/~drake](http://www.cs.utah.edu/~drake)  
[drake@cs.utah.edu](mailto:drake@cs.utah.edu)

Samuel Drake received his B.S. in Physics at Massachusetts Institute of Technology in 1965, and his M.S. and PhD in Mechanical Engineering at Massachusetts Institute of Technology in 1970 and 1977.

Professor Drake holds appointments as a research associate professor in Mechanical Engineering and at the School of Computing. His research interests include integrated process planning, computer aided manufacturing, design for manufacturing, design for assemblies and industrial robotics. Professor Drake is also in charge of running the Advanced Manufacturing Laboratory (AML), a lab which allows departmental research into computer vision, computer-aided geometric design, and geometric modeling to produce not only pictures, but solid objects as well.



**Marcel Prastawa**  
Research Assistant Professor  
[www.sci.utah.edu/~prastawa](http://www.sci.utah.edu/~prastawa)  
[prastawa@sci.utah.edu](mailto:prastawa@sci.utah.edu)

Marcel Prastawa received his B.S. in Computer Science and Mathematics from Purdue University in 2001, his M.S. in Computer Science from University of North Carolina at Chapel Hill in 2004, and his Doctor of Philosophy in Computer Science from University of North Carolina at Chapel Hill in 2007.

Marcel Prastawa's research focus is on the analysis of medical images that somehow differ from the norm, particularly those related to pathology or aging. His main research interest is in the application of statistical and physical models for analyzing and modeling normal growth processes or pathological processes. His general research areas are: image processing and analysis, computer vision, machine learning, and biological modeling.

## 2007 and 2008 Publications

### *Journal*

John H. Gilmore, Weili Lin, Marcel W. Prastawa, Christopher B. Looney, Y. Sampath K. Vetsa, Rebecca C. Knickmeyer, Dianne D. Evans, J. Keith Smith, Robert M. Hamer, Jeffrey A. Lieberman, and Guido Gerig. Regional Gray Matter Growth, Sexual Dimorphism, and Cerebral Asymmetry in the Neonatal Brain. *Journal of Neuroscience*. Vol 27, No 6, February 2007, Pages 1255-1260.

### *Conference and workshops*

Marcel Prastawa and Guido Gerig. Brain Lesion Segmentation through Physical Model Estimation. *International Symposium on Visual Computing (ISVC) 2008. Lecture Notes in Computer Science (LNCS) 5358, Pages 562-571.*

Andriy Fedorov, Eric Billet, Marcel Prastawa, Alireza Radmanesh, Guido Gerig, Ron Kikinis, Simon K. Warfield, and Nikos Chrisochoides. Evaluation of Brain MRI Alignment with the Robust Hausdorff Distance Measures. *International Symposium on Visual Computing (ISVC) 2008. Lecture Notes in Computer Science (LNCS) 5358, Pages 594-603.*

Marcel Prastawa and Guido Gerig. Automatic MS Lesion Segmentation by Outlier Detection and Information Theoretic Region Partitioning. *3D Segmentation in the Clinic: A Grand Challenge II Workshop at Medical Image Computing and Computer Assisted Intervention (MICCAI) 2008. Midas Journal. , Springer LNCS Fall 2008. pp. 562-571*

Sylvain Gouttard, Martin Styner, Marcel Prastawa, Weili Lin, John H. Gilmore, and Guido Gerig. Assessment of Reliability of Multi-site Neuroimaging via Traveling Phantom Study. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2008. Lecture Notes in Computer Science (LNCS) 5242, Pages 263-270.*

## 2007 and 2008 Invited Talks and Other Presentations

"Image Analysis for Multiple Sclerosis Research", The Brain Institute at the University of Utah, December 2008.

"Statistical and Physical Models for Generating a Brain Tumor MR Image Validation Database", Mathematical Biosciences Institute at the Ohio State University, June 2008.

## 2007 and 2008 Professional Participation

Program committee for the Medical Image Analysis on Multiple Sclerosis workshop, part of MICCAI 2008.



# CLINICAL FACULTY PROFILES



**H. James de St. Germain**  
Assistant Professor, Clinical  
[www.cs.utah.edu/~germain](http://www.cs.utah.edu/~germain)  
[germain@cs.utah.edu](mailto:germain@cs.utah.edu)

H. James de St. Germain received his B.S. degree from New Mexico State University in 1991 and his PhD in Computer Science at the University of Utah in 2002. His doctorate work was on constraint hypothesis and optimization in the field of Reverse

Engineering of mechanical parts. He has conducted further research into CAD/CAM user interface methods and modeling systems, including work toward a 3D stereo wall for virtual design of mechanical CAD models. In 2005, he joined the faculty at Utah and began extensive teaching of university undergraduates. His current interests include exploring more effective tools and techniques for teaching problem solving and programming skills. Dr. de St. Germain is the current Director of Undergraduate Studies for the School of Computing.



**Erin Parker**  
Assistant Professor, Clinical  
[www.cs.utah.edu/~parker](http://www.cs.utah.edu/~parker)  
[parker@cs.utah.edu](mailto:parker@cs.utah.edu)

Erin Parker received B.S. degrees in Computer Science and Mathematics at the College of William and Mary in 1999. She received an M.S. in Computer Science in 2001 followed by a Ph.D. in Computer Science in

2004 from the University of North Carolina at Chapel Hill. After moving to Utah in late 2004, Erin became an Adjunct Assistant Professor in the School of Computing, teaching variety of courses in systems and introductory computer science. Erin recently became a Clinical Assistant Professor and is excited to continue teaching, as well as, working on undergraduate and diversity issues.



**Peter Jensen**  
Assistant Professor, Clinical  
[www.cs.utah.edu/~pajensen](http://www.cs.utah.edu/~pajensen)  
[pajensen@cs.utah.edu](mailto:pajensen@cs.utah.edu)

Peter A. Jensen received his B.S. and Ph.D. degrees from the University of Utah in 1995 and 2007 respectively. Dr. Jensen began teaching at Utah in 1998 and he received the School of Computing outstanding teaching award in 2007. His research interests include automated

fault localization for tutoring systems, efficiency in teaching, and Boolean techniques for factoring large integers. Dr. Jensen has been professionally involved in education and computer science since 1986. His professional background includes development of educational software and hardware for elementary schools, interactive kiosks, data compression techniques, and high-volume financial transaction processing. Most recently, he helped create an educational display for Clark Planetarium in Salt Lake City. Dr. Jensen is currently a clinical assistant professor in the School of Computing.



**Joseph Zachary**  
Professor, Clinical  
[www.cs.utah.edu/~zachary](http://www.cs.utah.edu/~zachary)  
[zachary@cs.utah.edu](mailto:zachary@cs.utah.edu)

Joe Zachary is a graduate of the Massachusetts Institute of Technology, where he earned a B.S. in Computer Science and Engineering in 1979, an M.S. in Computer Science in 1983, and a Ph.D. in Computer Science in 1987. He has been on the faculty of the School of Computing since 1987.

Prof. Zachary specializes in teaching undergraduates, and has been recognized for outstanding teaching throughout his career. He received the IEEE Computer Society Computer Science and Engineering Undergraduate Teaching Award in 1999, the University of Utah Distinguished Teaching Award in 1997, the Department of Energy Undergraduate Computational Science Education Award in 1996, the University of Presidential Teaching Scholar Award in 1995, and the College of Engineering Outstanding Teaching Award in 1990.

Prof. Zachary's research interests center on the applications of computers to computer science education. He is the author of two versions of the textbook Introduction to Scientific Programming, the creator of five innovative online courses over the last fifteen years, and the author of a variety of computer-based educational tools for teaching introductory programming.



## ADJUNCT FACULTY

John Carter  
Adjunct Associate Professor

Sarah Creem-Regehr  
Adjunct Associate Professor

Paul Hudak  
Adjunct Professor

Stephen Jacobsen  
Research Professor

Robert McDermott  
Adjunct Associate Professor

Chris Myers  
Adjunct Associate Professor

Steve Parker  
Adjunct Associate Professor

Neal Patwari  
Adjunct Assistant Professor

William Provancher  
Adjunct Assistant Professor

Olivia Sheng  
Adjunct Professor

Peter Shirley  
Adjunct Professor

Kenneth Stevens  
Adjunct Associate Professor

Tolga Tasdizen  
Adjunct Assistant Professor

Xavier Tricoche  
Adjunct Research Assistant Professor

Ingo Wald  
Adjunct Research Assistant Professor

## EMERITUS FACULTY

David Hanscom  
Professor Emeritus

Gary Lindstrom  
Professor Emeritus

Robert Johnson  
Professor Emeritus

Kenneth Smith  
Professor Emeritus

Frank Stenger  
Professor Emeritus

## REMEMBERING JAY LEPREAU

Jay Lepreau, Research Professor and Director of the Flux Research Group in the School of Computing, passed away on September 15, 2008 due to complications of his battle with cancer. He was an enthusiastic and productive researcher, a dedicated mentor of students and staff, and an avid participant in activities such as camping and bicycle racing. His seemingly boundless energy was matched only by his kinetic personality, and thus he became well known by simply being unforgettable. His loss will be felt by all who knew him, both within the computer science community and elsewhere.

Jay's career at the University of Utah spanned more than a quarter century. In 1980, he joined the Department of Computer Science as an undergraduate student and programmer, under the direction of Randy Frank. After earning his degree in 1983, Jay became the manager of the systems programming group. He helped introduce Utah to UNIX, and by 1987, Jay was the acting head of the department's computing facility which included 100 or so HP, Apollo, and Sun workstations as well as a few "legacy" VAX computers.

In the late 1980s, Jay received funding from Hewlett-Packard to port BSD UNIX to HP workstations, leading to the first release of "HP BSD 4.3" in 1988. Jay became the Assistant Director of the department's Center for Software Science (CSS) in 1990, where he and his staff continued to receive funding to work on systems software such as the GNU compiler tools and the Mach operating system. The work quickly shifted from engineering to research, and in 1994, Jay received his first major ARPA contract to investigate "Fast and Flexible Mach-based Systems." Also in 1994, Jay served as the program chair for the first-ever OSDI symposium, which he conceived and founded--and which has become one of the premier venues for systems research. In 1995, Jay renamed his group as the Flux Operating Systems Project. The Flux Group was born!

Jay was promoted to Research Assistant Professor in 1997, and his group continued to flourish. Jay led his staff and students through several successful OS research projects including



the Fluke microkernel (lightweight virtual machines), the Flask security architecture (now implemented in SELinux), the OSKit (reusable OS components), Janos (a precursor of Java Isolates), and others. Along the way, Jay was promoted to Research Associate Professor in 2000 and to Research Professor in 2004.

In the late 1990s, Jay's research group developed a networked testbed that they used internally to support their systems work. They quickly assembled a version of this testbed to be used by researchers anywhere, and in 2000 they made their



facility available to the world. Thus, Emulab was invented. The Emulab testbed made it possible for people to configure sizeable networks of real machines in just a handful of minutes, thereby changing the standards for experimentation in the systems research community. Today, the Emulab testbed site at Utah has thousands of users around the world and hosts many thousands of individual experiments every year. In addition, the software that runs Emulab also runs dozens of other testbed sites worldwide. More than 250 papers describe research that was validated on Emulab-based testbeds.

Emulab was the basis of Prof. Lepreau's research for the past several years, and Jay never tired of spreading the word about Emulab and what it could do. Through ongoing and new activities, the Flux Research Group will be carrying Jay's vision into the future.

Jay is survived by his wife, Caroline; children Renee Lepreau, Frank Lepreau, Erica Kueneman, and Jordan Kueneman; father Frank Lepreau Jr.; and sisters Lucy Ann Lepreau, Judy Keller, and Mimi Jose.

In addition to being a passionate computer scientist, Jay was also passionate about Utah and its unspoiled natural landscapes.



## LIVING IN UTAH

The University of Utah is located in Salt Lake City, situated at the foot of the Wasatch Mountains. Salt Lake City is the hub of a large metropolitan area including a major international airport and a population of approximately a million people. The local high technology base is growing steadily.

Salt Lake City offers a wide variety of athletics, cultural events and popular entertainment. Fine dining is abundant, along with many affordable eating and drinking establishments frequented by students. Excellent cultural facilities are available in the city and through out the rest of the state, including The Utah Symphony, Ballet West, and a large number of theater companies. The Sundance Film Festival takes place annual in Park City, a half hour's drive from campus.

The canyon country of southern Utah is unique. The area includes five National Parks and the largest contiguous area of wilderness in the U.S. outside of Alaska. National Forests and Wilderness Areas are scattered throughout the state.

The state of Utah has unsurpassed opportunities for outdoor recreation, many only a few minutes away from the campus. It has the world's best skiing only thirty minutes from campus, along with excellent biking camping and mountain and desert hiking.



Salt Lake City. Photo courtesy Utah Office of Tourism (Steve Greenwood)

- 1) Flaming Gorge. Photo courtesy Utah Office of Tourism (Tom Till)
- 2) Snowboarding Big Cottonwood. Photo courtesy Utah Office of Tourism (Howie Garber)
- 3) Rock climbing
- 4) Sundance Film Festival. Photo courtesy Utah Office of Tourism (Frank Jensen)
- 5) Big Cottonwood Canyon (Chris Coleman)





This publication is a result of the efforts of all School of Computing faculty and numerous staff members. Thanks to all the helped out.

