Deep Learning in AI & Robotics Certificate Program

Motivation

The Deep Learning Certificate Program will provide working knowledge of the use of state-of-the-art deep learning technology as a graduate student certificate program. Deep learning allows the identification of objects in images, translating languages and driving cars autonomously. Deep Learning is rapidly gaining application across all industries due to the availability of adequate computing power (e.g., GPU's) and large data sets to train with. This is true from sensor data processing to database analytics to fraud detection in banks. Utah currently has a large number of unfilled well-paying jobs in this area. Student enrollment in the program is achieved as a stackable certificate on top of a regular graduate degree. Students with appropriate background may be allowed into the program as non-matriculated students. The successful award of the certificate in Deep Learning results from the completion of 15 student credit hours of work at the graduate level. This program provides education in this area to engineering and science graduate students beyond those with computing background. In addition, the certificate program requires a graduate internship project with program's industry partners.

Program Requirements

- Eligible: graduate students and non-matriculated post-BS students
- 15 credit hours
- Full-time students can complete in 2 semesters; part-time students can complete certificate in 3 or more semesters; must complete in 3 years
- Courses: regular courses in AI, Machine Learning, Image Processing, and Deep Learning
- May start in Fall, Spring or Summer

Admission Requirements

- Must have BS from accredited institution
- Minimum 3.0 undergraduate GPA (non-matriculated students); 3.0 GPA in current courses (graduate students).

Course Requirements

Of the 15 required credit hours, 9 must be from regular courses offered by participating departments. Note that 5000 level courses allow graduate students from outside the major to apply the course credits to their Program of Study in their own major.

- Required courses:

- o At least one of (3-6 student credit hours):
    - CS5350 Machine Learning
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    - CS6190 Probabilistic Machine Learning
    - CS6300 Artificial Intelligence
    - CVEEN 7920: Data Science and Machine Learning for Civil Engineering
- o At least one of (3-6 student credit hours):
    - CS5310 Robotics
    - CS5320 Computer Vision
    - CS5640 Digital Image Processing
    - CS6310 Robotics
    - CS6320 Computer Vision
    - CS6640 Digital Image Processing
    - CS7640 Advanced Image Processing
    - CVEEN 6530: Quantitative methods in transportation operation
    - CVEEN 7545: Traffic Network Modeling
    - ECE6532 Digital Image Processing
- o One of (3 student credit hours):
    - CS5353 Deep Learning
    - CS6353 Deep Learning
- o Internship course (3 student credit hours) supervised by Deep Learning faculty and involves working on an industry related problem in a team setting (e.g., real-time road situational analysis [Blyncsy, UDOT]; large-scale problem solving [Nvidia]; trajectory analysis [Cognitech]; autonomous vehicle perceptual analysis [Kairos Autonomi]; where these industry partners will provide specific problems, related course material, and intern/extern feedback/dialog) using the requested pooled GPU deep learning hardware.
    - CS6953 Deep Learning Capstone

Graduation Requirements

For each certificate, the requirements are a subset according to major of a specific set of classes, which is 15 hours of coursework for each certificate, plus the following constraints.

- Receive at least a 3.0 GPA for the entire program.
- Receive a B- or better in each program course.
- Successfully complete the Graduate Internship course.

Advising Plan

The DL_AIR certificate program has a part-time graduate advisor (Lauren Down lauren@cs.utah.edu) who will advise certificate students and participate in generating required reporting documents for the state USHE office. The program faculty director will carry out marketing, promotion of and recruiting for the program.

Learning Outcomes

The DL-AIR certificate program learning outcomes at the individual course level those described for those courses. For the overall certificate, the learning outcomes include:
- To have a productive view of both the theory and fundamental concepts as well as the practice of deep learning in AI & robotics.
- To demonstrate effective practice of deep learning application design and development, specifically, to be able to develop secure, reliable, and robust GPU code.
- To be able to apply deep learning skills to some different application areas.
- To demonstrate critical thinking skills transcending specific problem domains, software languages or applications.
- To have experience working as members of teams for the design and development of deep learning applications in an industry internship context.
- To be able to apply ethical considerations to deep learning application development (covered by learning modules in CS5353/CS6353 Deep Learning).