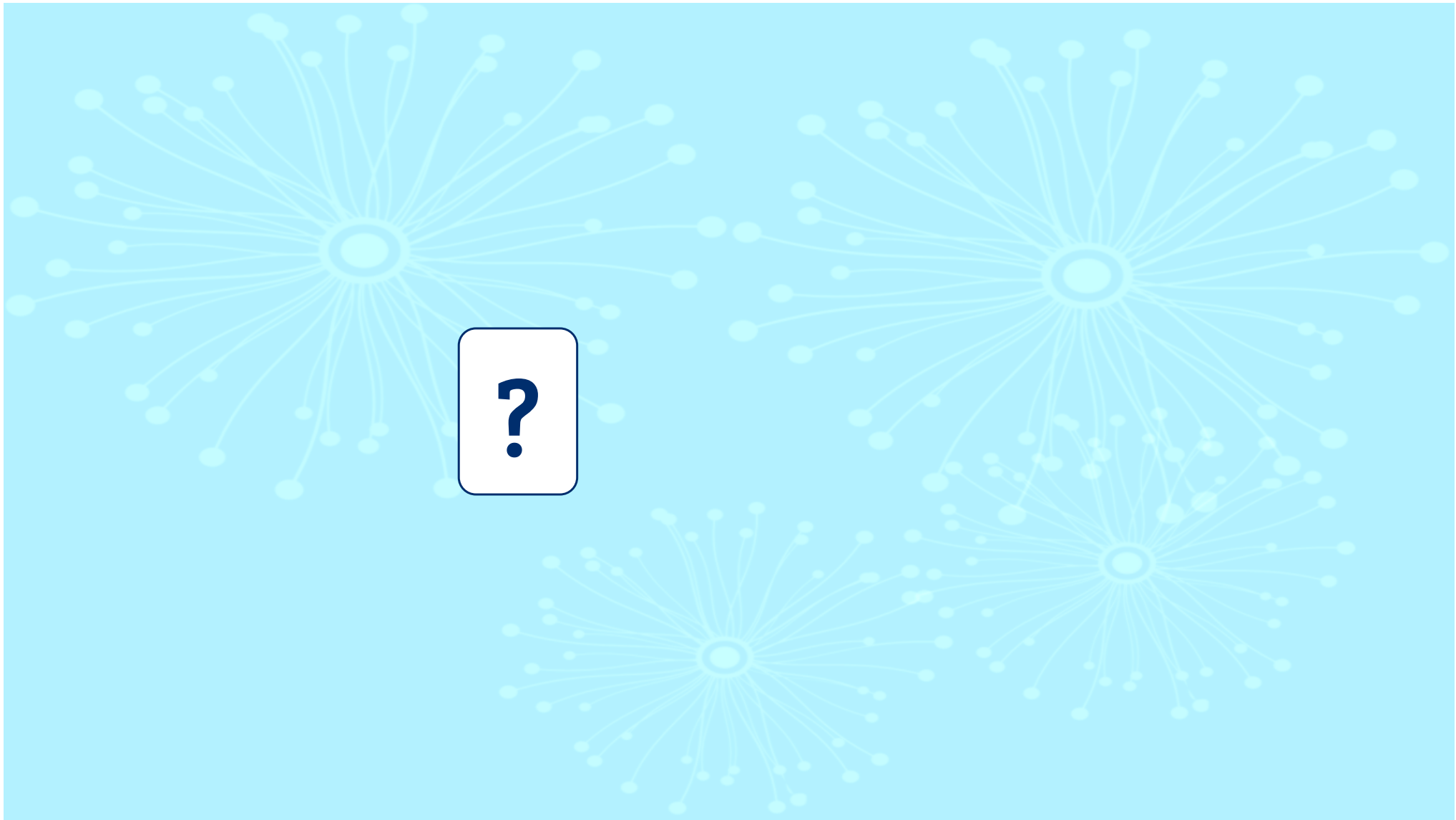




Little Tricky Logics

Ben Greenman Sam Saarinen Siddhartha Prasad
Tim Nelson Shriram Krishnamurthi
Giuseppe De Giacomo Marco Montali





?

Q. Is **LTL** tricky?



?

Q. Is **LTL** tricky?

Q. Is **LTLf** **trickier**?

Lots of opinions!
Where's the data?





Quiz

<https://tinyurl.com/LTLFAAAI>



Quiz

<https://tinyurl.com/LTLFAAAI>

~15 minutes

Go for it!



Little Tricky Logics: Part II

Ben Greenman Sam Saarinen Siddhartha Prasad
Tim Nelson Shriram Krishnamurthi
Giuseppe De Giacomo Marco Montali



+18 responses
Many insightful comments

Thank You!

The background of the slide is a solid light blue color. It features four decorative starburst or radial patterns, each consisting of a central circle with many thin lines radiating outwards to smaller circles. These patterns are arranged in a 2x2 grid. In the center of the slide, there is a white rounded rectangular box with a thin dark border containing the text "Summary & Results".

Summary & Results



Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities



Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

Key Tasks



Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

Targeted Semantic Q's



Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

Abstract Reasoning



Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

Randomly Sampled:

Reject Traces

3 of 5

Match Traces

3 of 6

Describe Formulas

2 of 4

Write Formulas

2 of 5

Check Identities

5 of 7

Pilot test @ Oxford
Thanks Guisepppe!



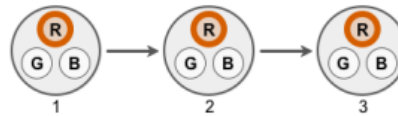


You Did Great!

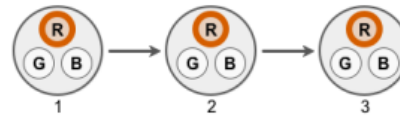


Review

Why does the formula $G(\text{Red}) \ \& \ Xw(Xw(!\text{Red}))$
reject this trace:



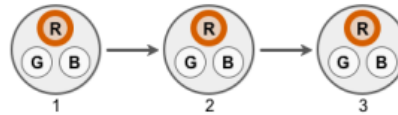
Why does the formula $G(\text{Red}) \ \& \ Xw(Xw(!\text{Red}))$ reject this trace:



Content mismatch

Trace too long

Why does the formula $G(\text{Red}) \ \& \ Xw(Xw(!\text{Red}))$ reject this trace:



X

Content mismatch

✓

Trace too long

Because no trace of length 3 can satisfy



Q. Describe in LTL_f : (Red \cup Blue) & G(Red)



Q. Describe in *LTLf* : (Red U Blue) & G(Red)



Red always, Blue eventually
(same as LTL)



Q. Describe in LTLf : $G(\text{Red} \Rightarrow X(\neg \text{Red} \ \& \ X(\text{Red})))$

Q. Describe in LTLf : $G(\text{Red} \Rightarrow X(\neg \text{Red} \ \& \ X(\text{Red})))$



Never Red

The X 's require an infinite trace



Q. Specify in **LTLf** : Red is on exactly once.



Q. Specify in **LTLf** : Red is on exactly once.



F(Red) & G(Red => Xw(G(!Red)))

Q. Specify in **LTLf** : Red is on exactly once.



$F(\text{Red}) \ \& \ G(\text{Red} \Rightarrow Xw(G(!\text{Red})))$



$F(\text{Red} \ \& \ Xw(G(!\text{Red})))$

Implicit "good" behavior?



The Big Picture

Why study misconceptions?

Goal: Teach **LTLf** quickly & effectively

Turn programmers into **specifiers**



The background of the slide features four starburst or radial patterns. Each pattern consists of a central circular node with numerous thin lines radiating outwards to smaller circular nodes, creating a sunburst or star-like effect. The patterns are arranged in a roughly 2x2 grid. The top-left and top-right patterns are larger, while the bottom-left and bottom-right patterns are smaller. The entire background is a solid light blue color.

Prior Results: **LTL**

Prior Results: LTL

Code Book + Rubric

Bad Prop

Implicit F

Bad State Index

Implicit G

Bad State Quantification

Other Implicit

Exclusive U

Weak U

Prior Results: LTL

Code Book + Rubric

Bad Prop

Implicit F

Bad State Index

Implicit G

Bad State Quantification

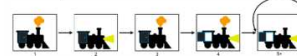
Other Implicit

Exclusive U

Weak U

Test Instruments

Example Question: Is the formula
always (Engine or Light)
satisfied by this trace?



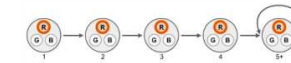
Example Answer: Yes, because either the engine (smoke) or the headlight is on in each state.

Does the example make sense to you?*

Yes

No (please explain)

Q: Is the formula
(Red) until (Blue)
satisfied by this trace?*



Yes

No

Prior Results: LTL

Code Book + Rubric

Bad Prop

Implicit F

Bad State Index

Implicit G

Bad State Quantification

Other Implicit

Exclusive U

Weak U

Test Instruments

Example Question: Is the formula
always (Engine or Light)
satisfied by this trace?



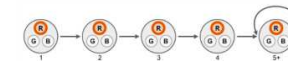
Example Answer: Yes, because either the engine (smoke) or the
headlight is on in each state.

Does the example make sense to you?*

Yes

No (please explain)

Q: Is the formula
(Red) until (Blue)
satisfied by this trace?*



Yes

No

Little Tricky Logic: Misconceptions in the Understanding of LTL

Programming 7.2, 2023



The background of the slide features four starburst or radial network diagrams. Each diagram consists of a central circular node with numerous thin lines radiating outwards to smaller peripheral nodes, creating a star-like or sunburst effect. The diagrams are arranged in a 2x2 grid. The top-left and top-right diagrams are larger, while the bottom-left and bottom-right diagrams are smaller. The entire background is a solid light blue color.

Prior Results: LTL

Prior Results: **LTL**



Tools to discover misconceptions

Siddhartha Prasad @ Brown



Next Up:
Code book & Rubric for **LTLf**



<https://tinyurl.com/LTLFAAAI>

Share with colleagues!



<https://tinyurl.com/LTLFAAAI>

Share with colleagues!

benjamin.l.greenman@gmail.com

Send complaints, receive updates

