

Little Tricky Logics

Ben Greenman

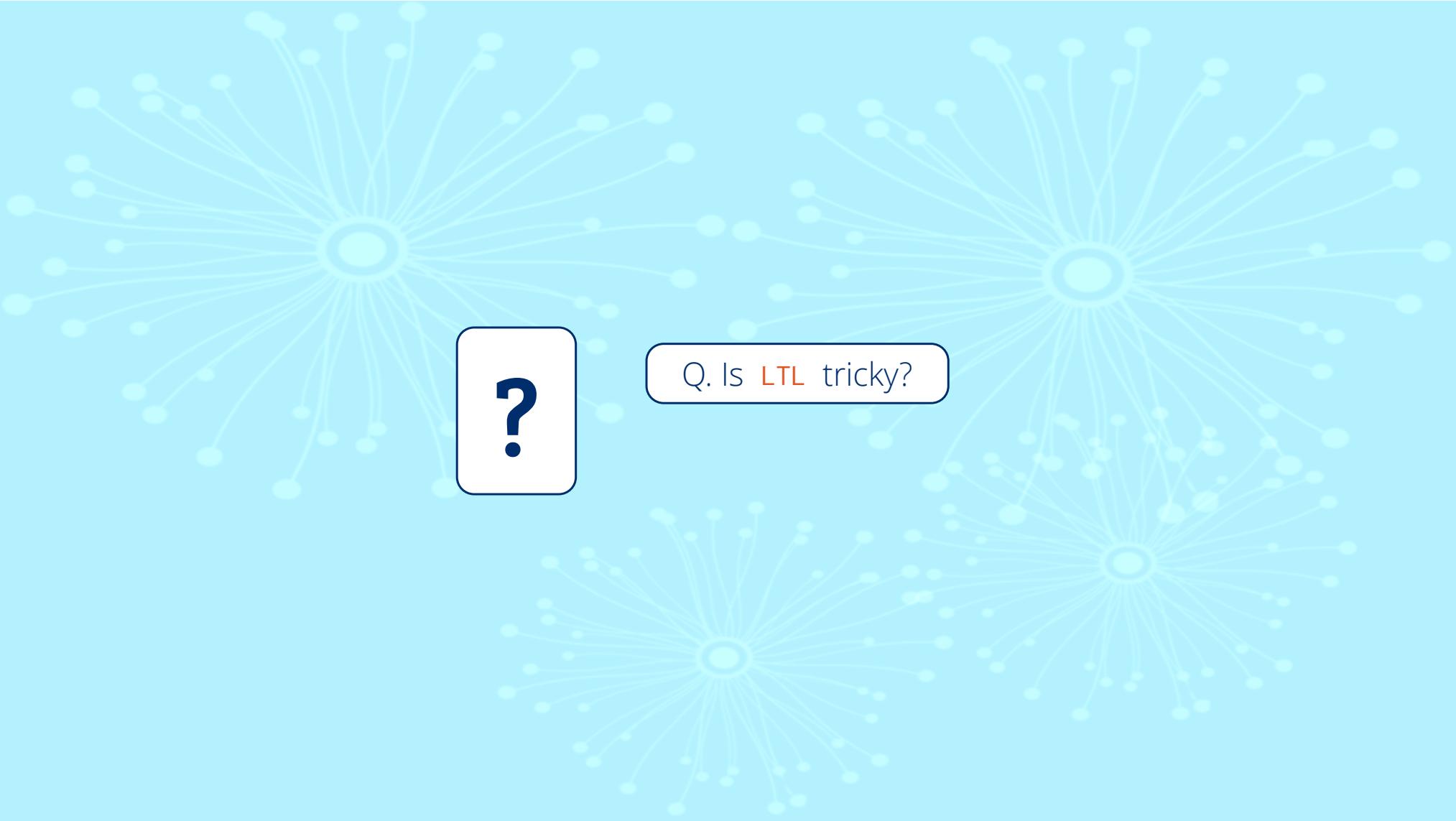
Sam Saarinen

Siddhartha Prasad

Tim Nelson Shriram Krishnamurthi

Guiseppe 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

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+18 responses
Many insightful comments

Thank You!

Summary & Results

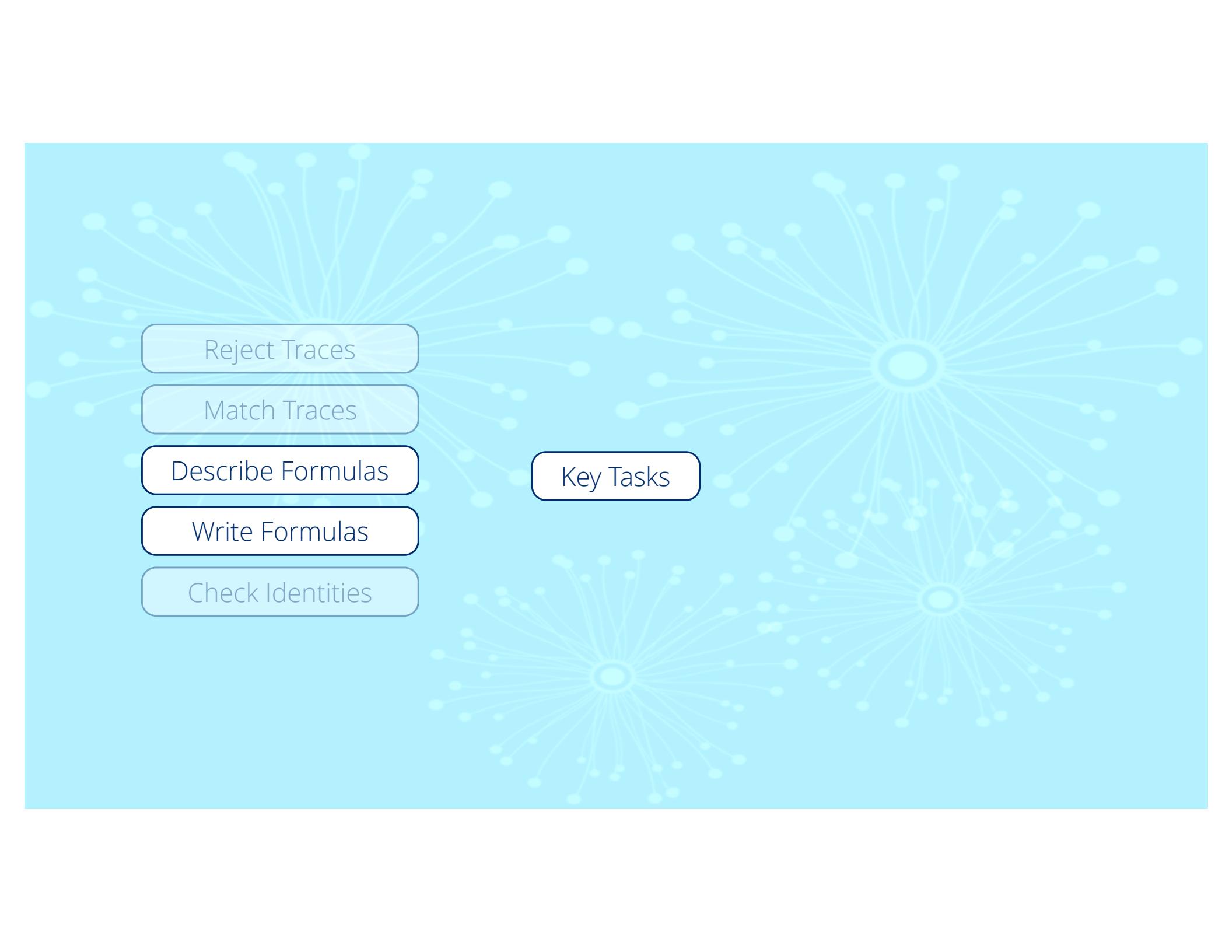
Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

A faint, light-blue network diagram serves as the background for the slide. It consists of several clusters of small, light-blue circular nodes connected by thin, light-blue lines, resembling dandelion seed heads or a complex web.

Reject Traces

Match Traces

Describe Formulas

Write Formulas

Check Identities

Key Tasks

Reject Traces

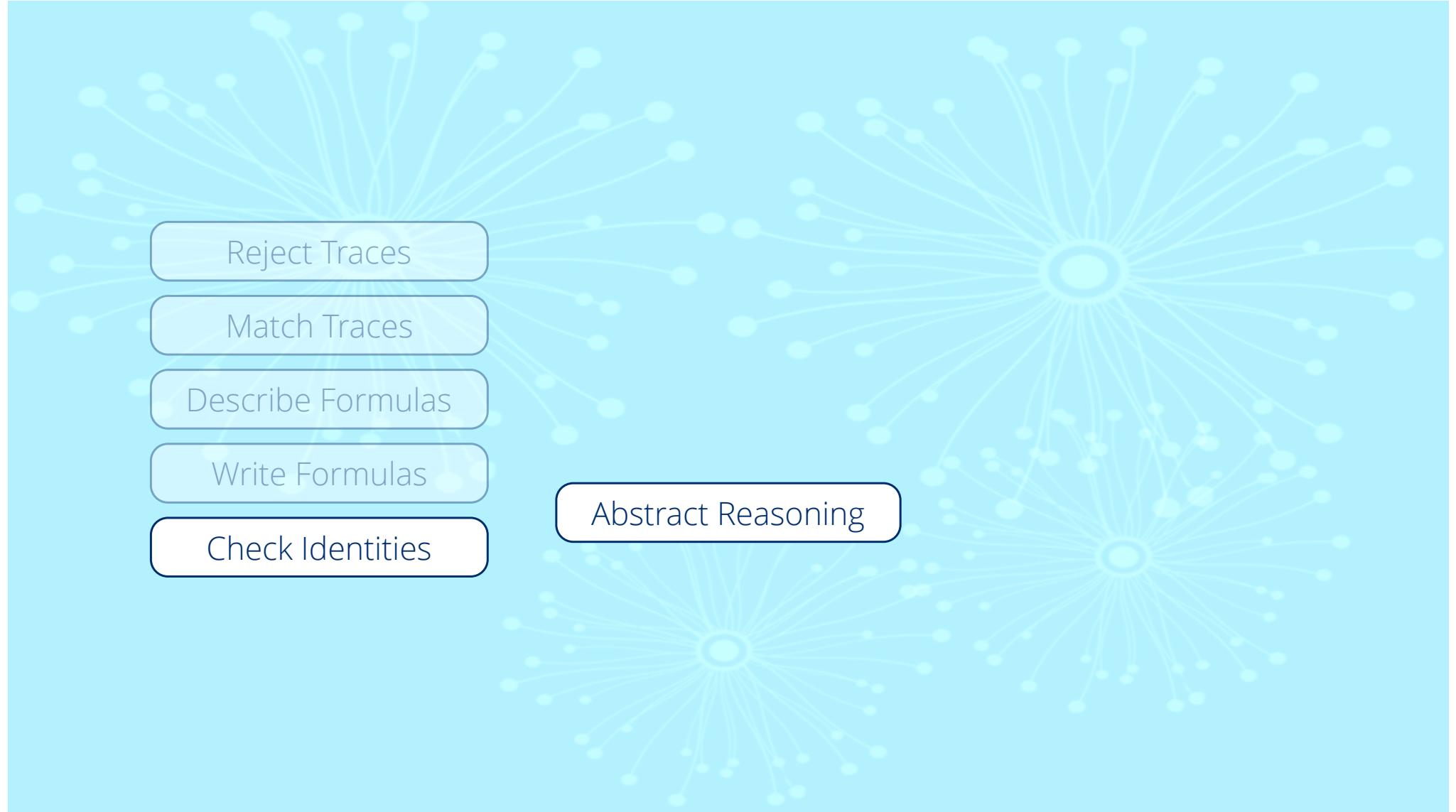
Match Traces

Describe Formulas

Write Formulas

Check Identities

Targeted Semantic Q's

The background of the slide features a light blue circular network pattern resembling a dandelion seed head or a complex web. It consists of numerous small, semi-transparent green dots connected by thin, light blue lines that radiate from a central point. This pattern is repeated in three distinct clusters across the slide.

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

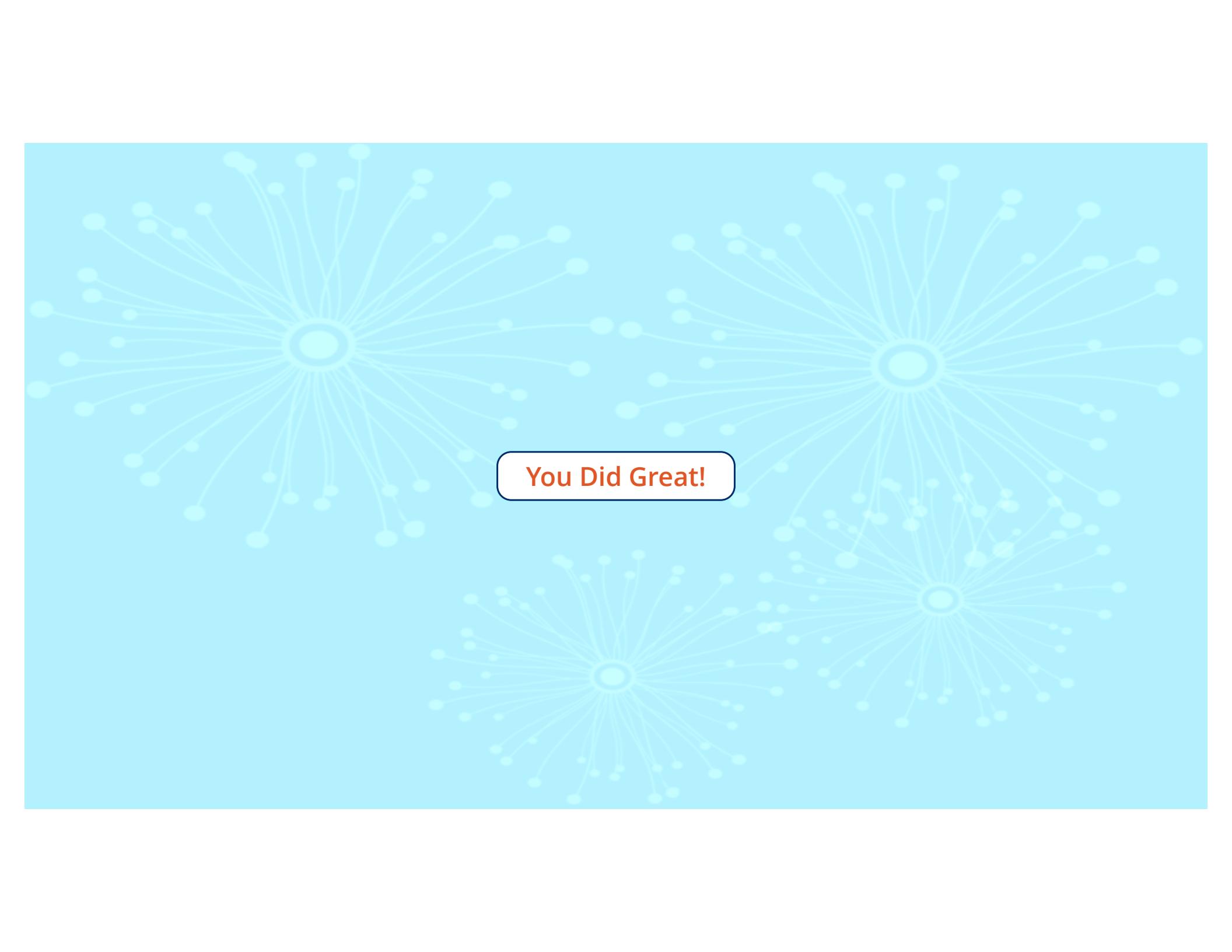
2 of 5

Check Identities

5 of 7

Pilot test @ Oxford
Thanks Guiseppe!



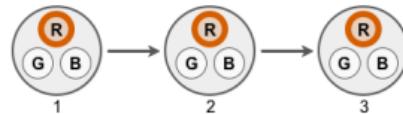


You Did Great!

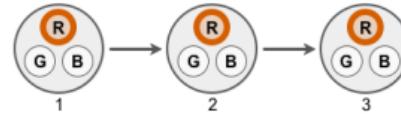
The background of the image features a complex, abstract network graph. It consists of numerous small, light blue circular nodes connected by thin, dark blue lines forming a web-like structure. Three larger, more prominent nodes are located in the upper left, upper right, and lower center areas. These central nodes have many radiating lines extending towards the edges of the frame, creating a sunburst effect.

Review

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



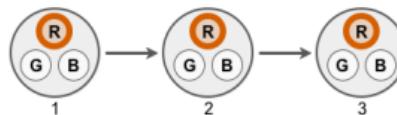
Why does the formula $G(\text{Red}) \ \& \ Xw(Xw(\neg \text{Red}))$ reject this trace:



Content mismatch

Trace too long

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

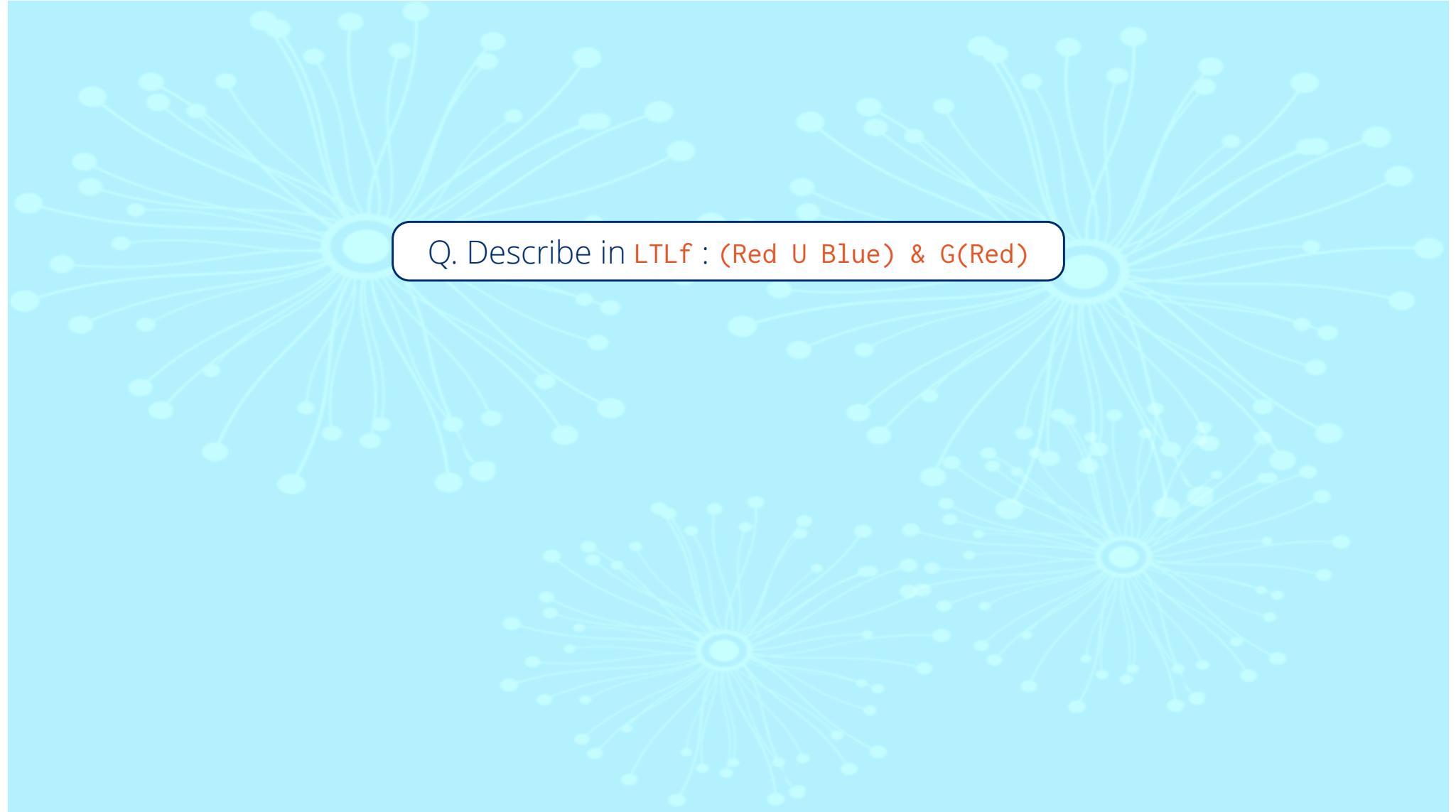


Content mismatch



Trace too long

Because no trace of length 3 can satisfy



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

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



Never Red

The X 's require an infinite trace



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

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



$F(\text{Red}) \And G(\text{Red} \Rightarrow Xw(G(\neg\text{Red})))$

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



$F(\text{Red}) \And G(\text{Red} \Rightarrow Xw(G(\neg\text{Red})))$



$F(\text{Red} \And Xw(G(\neg\text{Red})))$

Implicit "good" behavior?



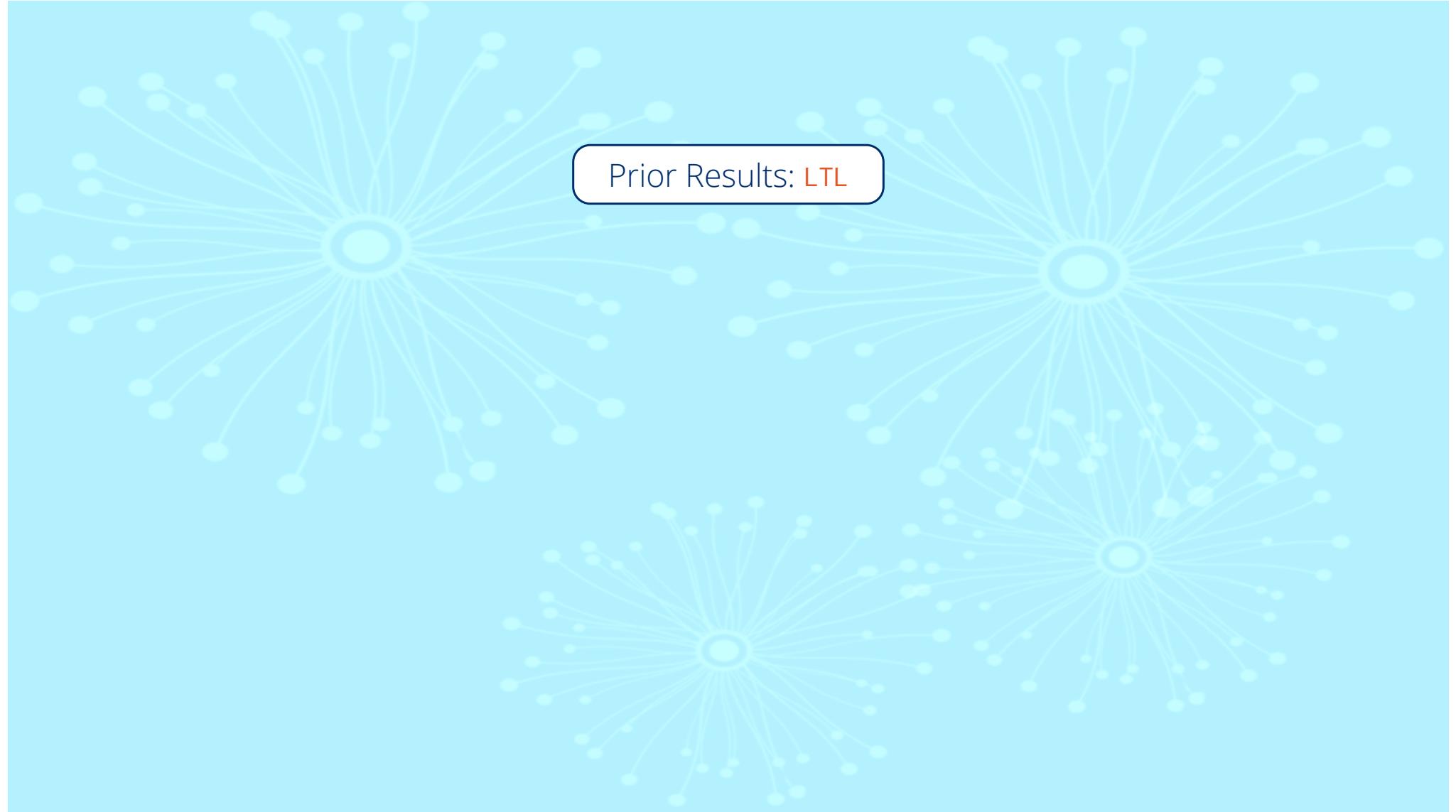
The Big Picture

Why study misconceptions?

Goal: Teach **LTLf** quickly & effectively

Turn programmers into **specifiers**





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

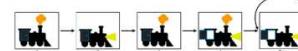
Other Implicit

Exclusive U

Weak U

Test Instruments

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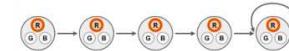
Example Answer: Yes, because either the engine (smoke) or the
headlight is on in each state.

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



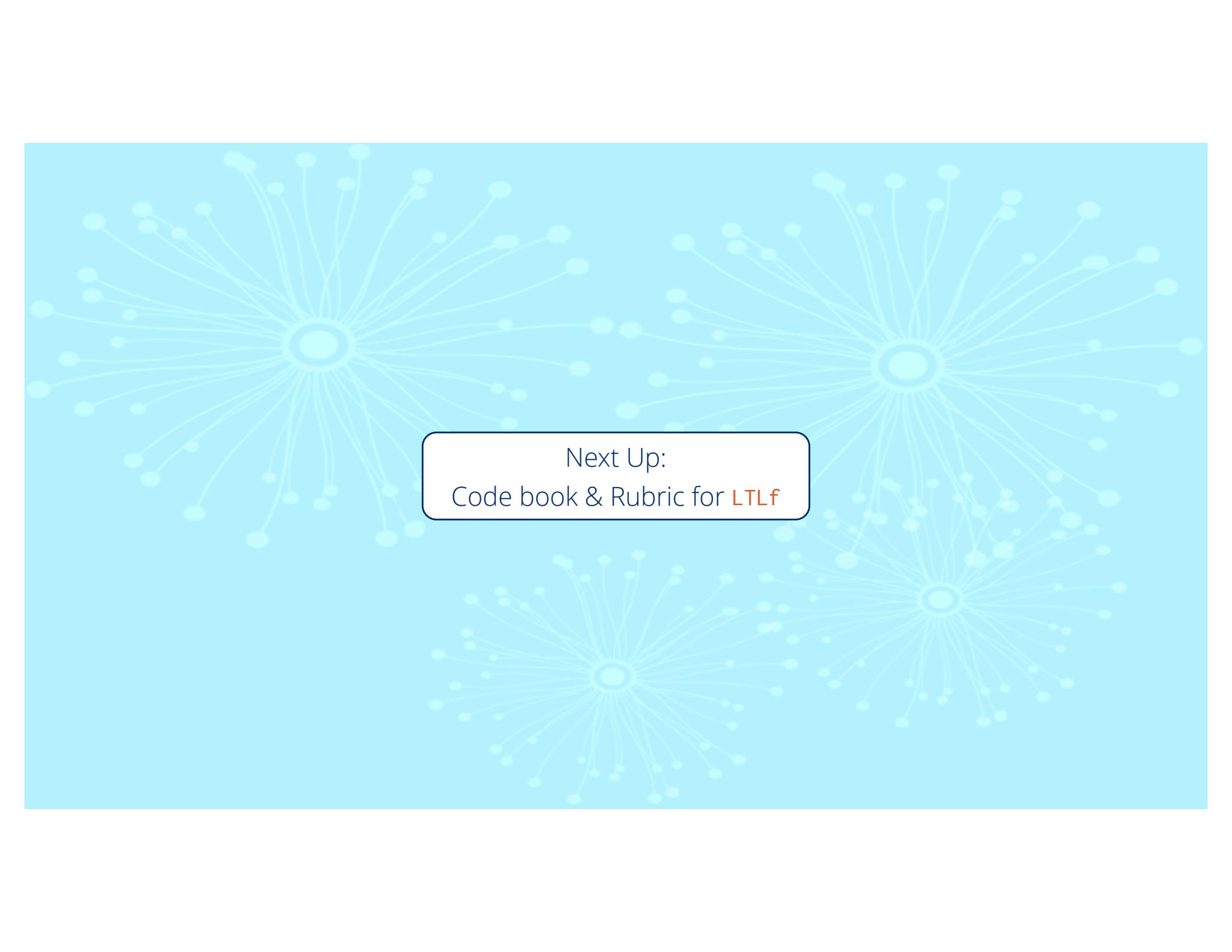


Prior Results: **LTL**

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

