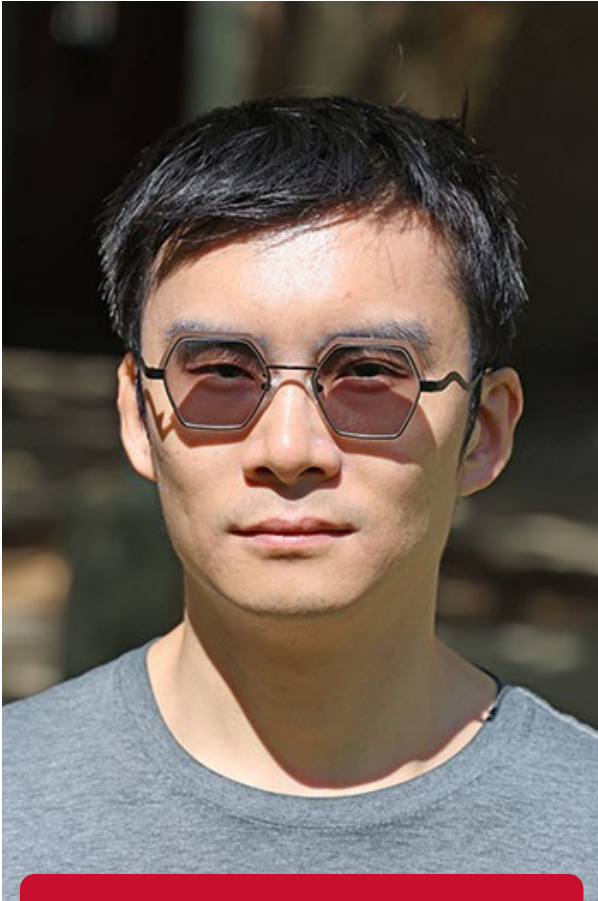




FRESNO STATE · CSCI

USHER × FINISH IN FIVE

# Four problems that connect my research

From mathematical structure to collective intelligence

THEORY

1

SHAPE

Geometry &  
topology

BRIDGE

2

SCIENCE

Theory meets  
application

APPLICATION

3

WORLDS

3D & video  
generation

PRIORITY

4

TEAMS

Agentic AI &  
networks

RECENT: QUANTUM ALGORITHMS

Cheng Xin · Assistant Professor of Computer Science



# How can AI understand the shape of data?

## Geometric & Topological Machine Learning

Complex data may live on graphs, curved spaces, or evolving networks. The goal is to preserve the structure that carries meaning.

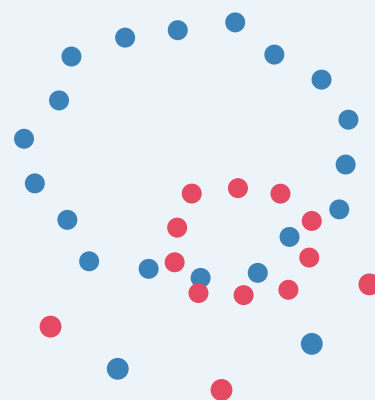
STABLE

INTERPRETABLE

EFFICIENT

*Preserve what matters—even when the data are noisy.*

FROM POINTS



TO SHAPE

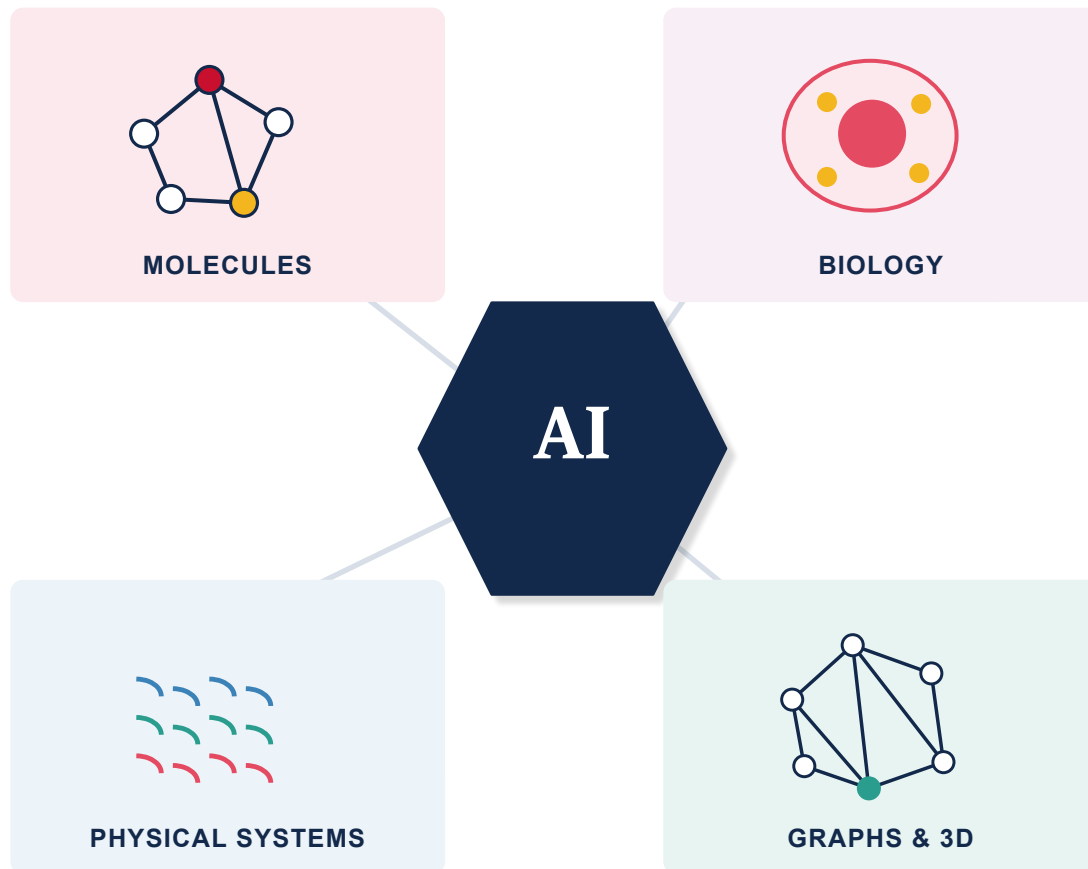


RECENT QUANTUM INTEREST

Can quantum  
computing  
find structure faster?



## SCIENCE HAS STRUCTURE



# How can AI learn from science—and respect its rules?

## AI for Science

Use geometry, topology, and domain knowledge as guides—not afterthoughts.

PATTERNS

+

PRINCIPLES

*Accurate is good. Scientifically meaningful is better.*

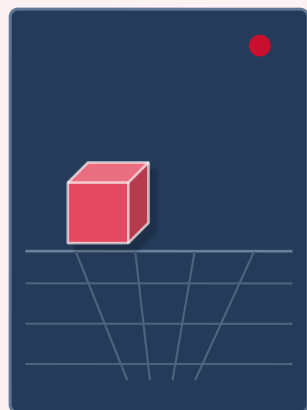
# Can generated worlds stay consistent?

APPLICATION · 03

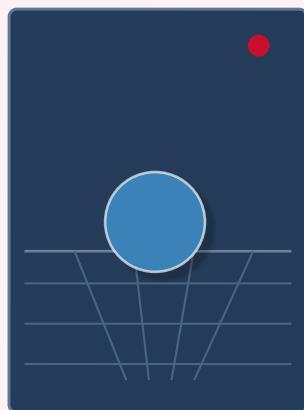
## 3D & Video Generative Models



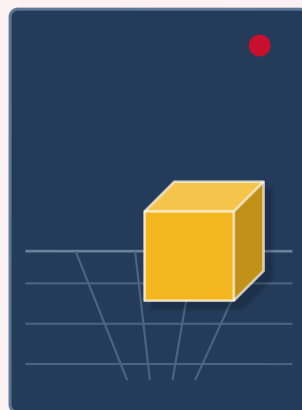
FRAME QUALITY ONLY



t1



t2

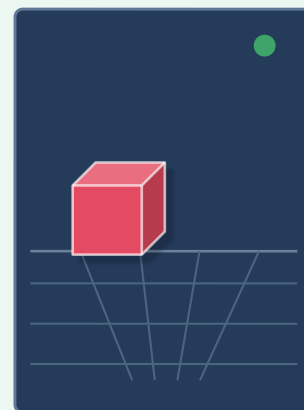


t3

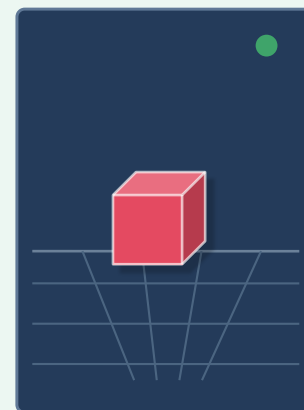
A beautiful frame can still drift, morph, or break.



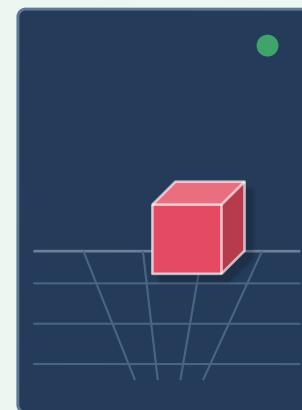
A CONSISTENT WORLD



t1



t2



t3

Geometry, viewpoint, and motion agree across time.

DATASETS

BENCHMARKS

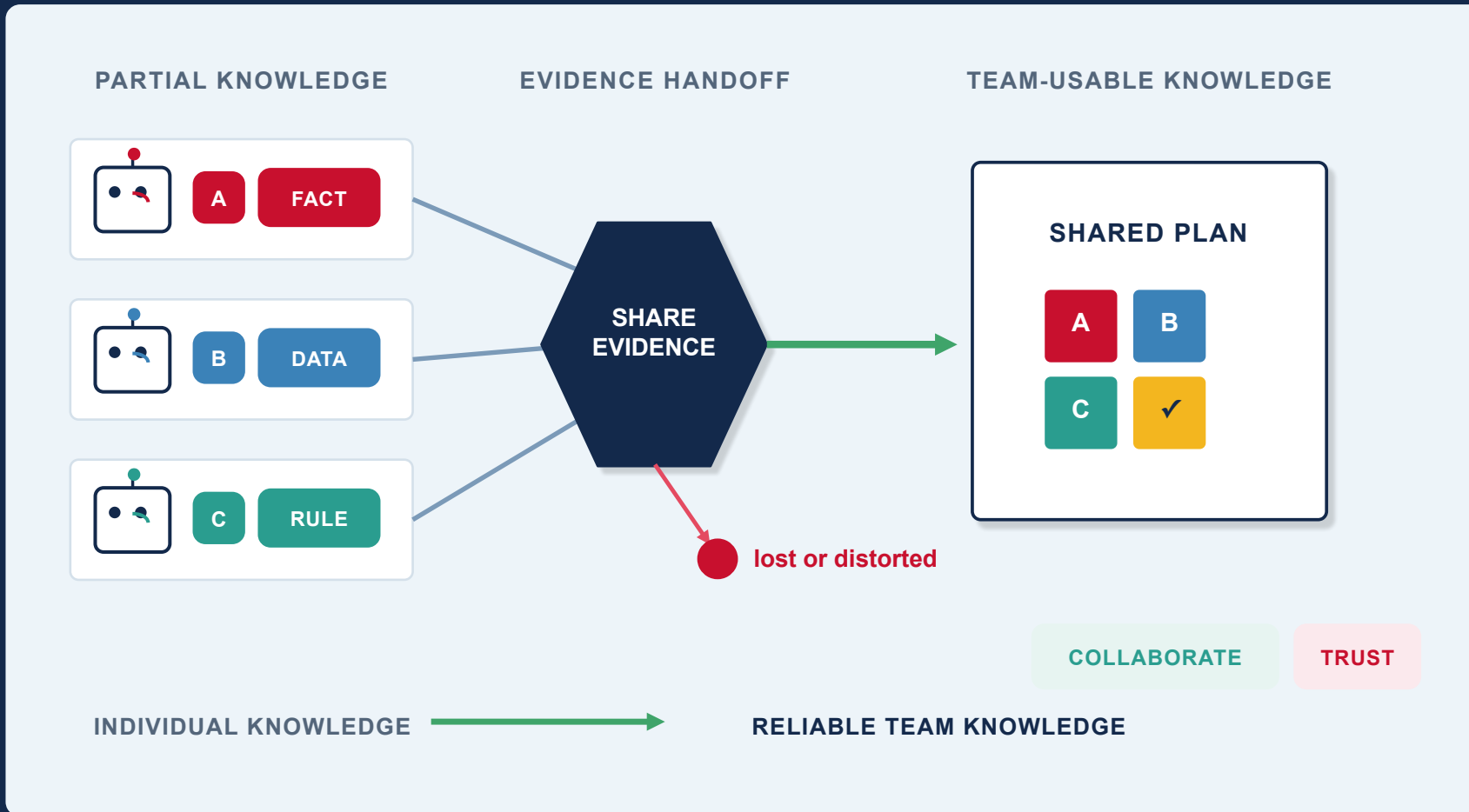
EVALUATION

Quality is not enough: the content should remain the same world.

# Can many AI agents become one reliable team?

CURRENT PRIORITY · 04

## Agentic AI · Multi-Agent Collaboration & Networks



### QUESTIONS?



Explore projects &  
papers

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**Thank you**