

Knowledge Base Evolution via Counterfactual Conversations

15300 Project Proposal

Antian Wang

Contents

Problem and Approach

Challenge and Significance

Mentors

Problem Setting

Workflow problem:

- plan a trip
- do errands
- order a pizza
- find a restaurant

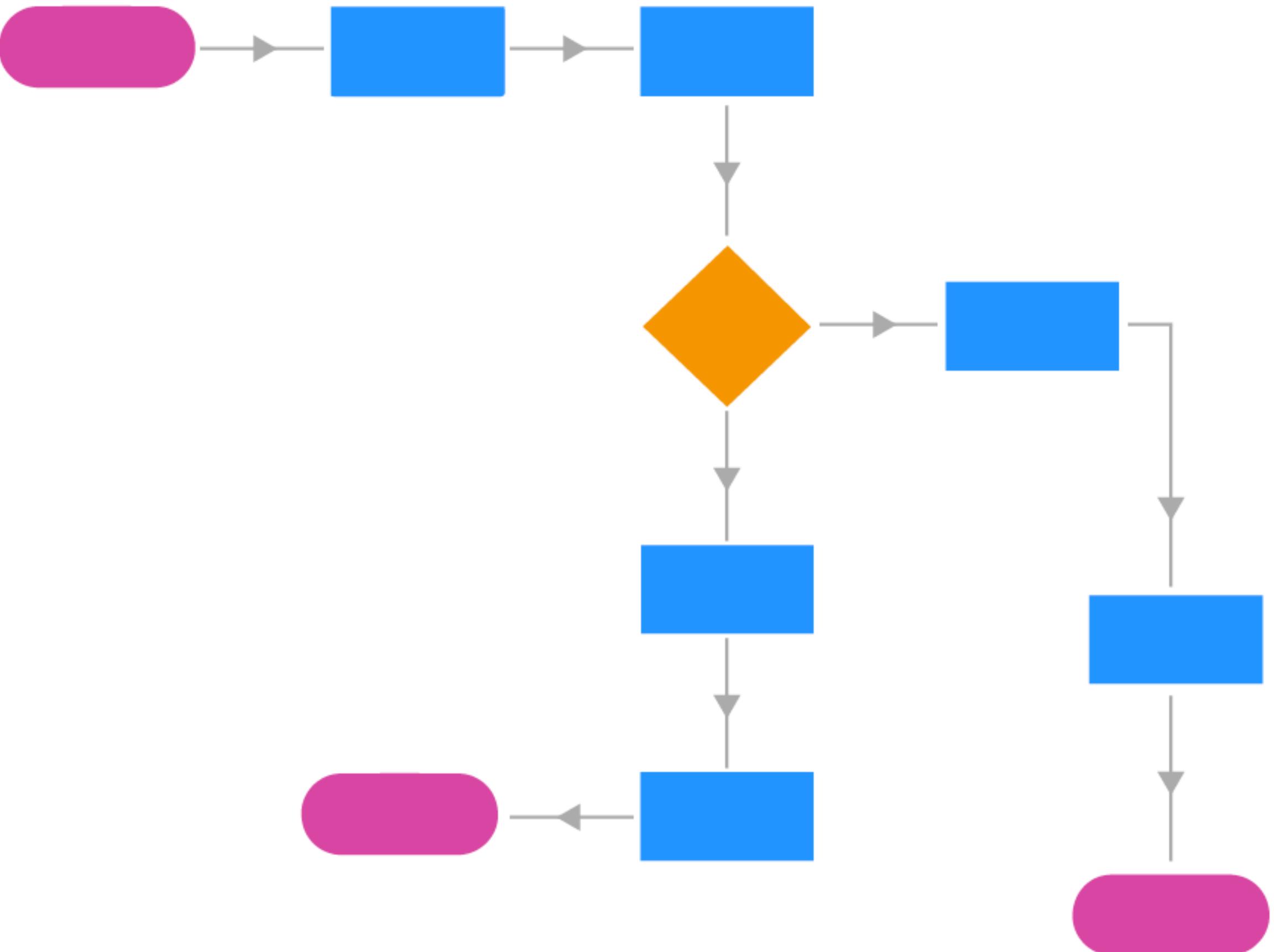


Image credit: kissflow

NLP

- Word embedding
- Intent recognition
- External API
- Disambiguation
- But, what about customized needs?

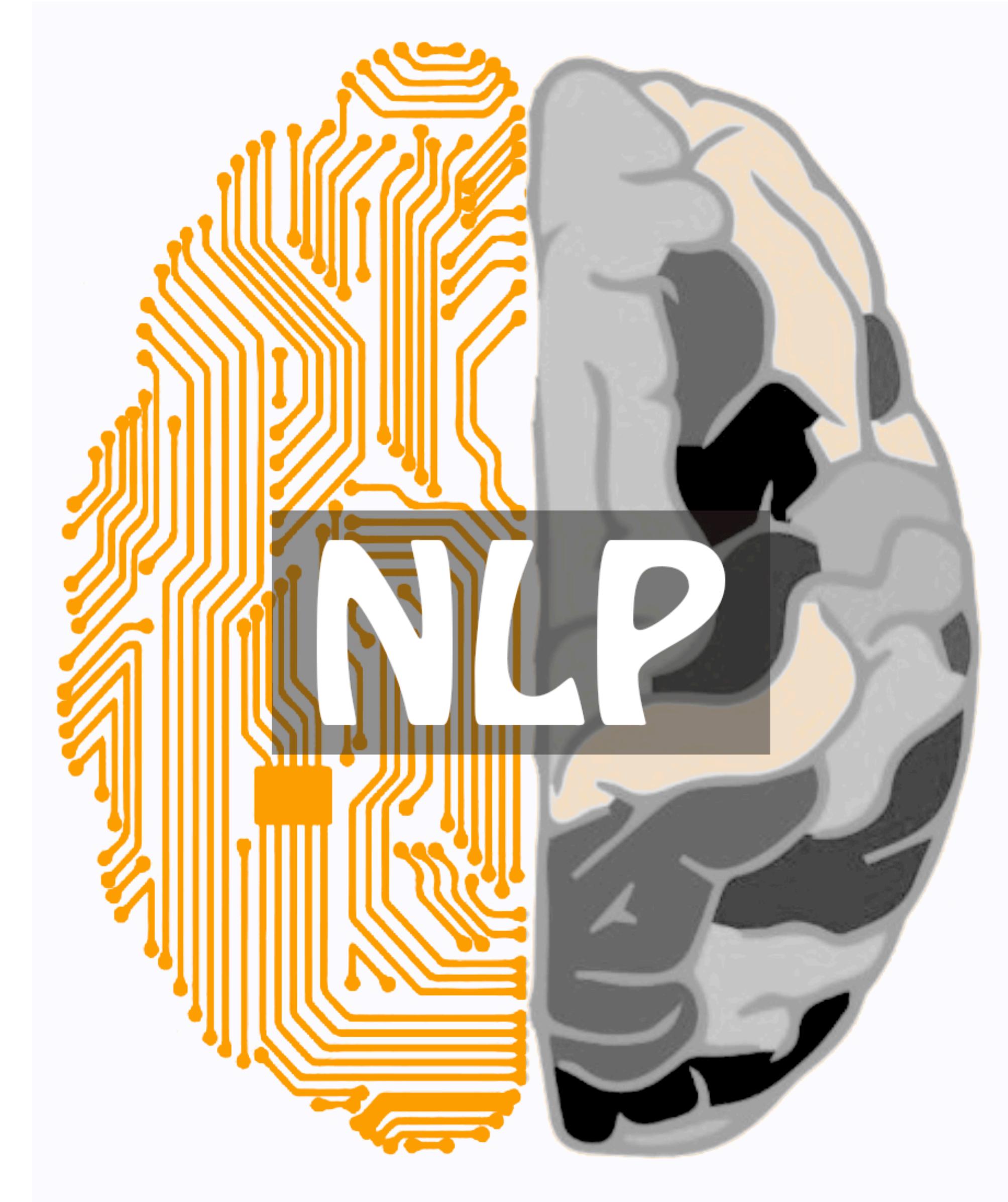


Image credit: piyushrahate

Symbolic Reasoning

Proof system

- Generates a probabilistic proof based on current context and knowledge base
 - Invokes an interaction with the user
 - YES => record **True(Text, Proof)** for training
 - NO => ask the user for **False(Text, Proof)** and update Knowledge Base accordingly
 - How to update?

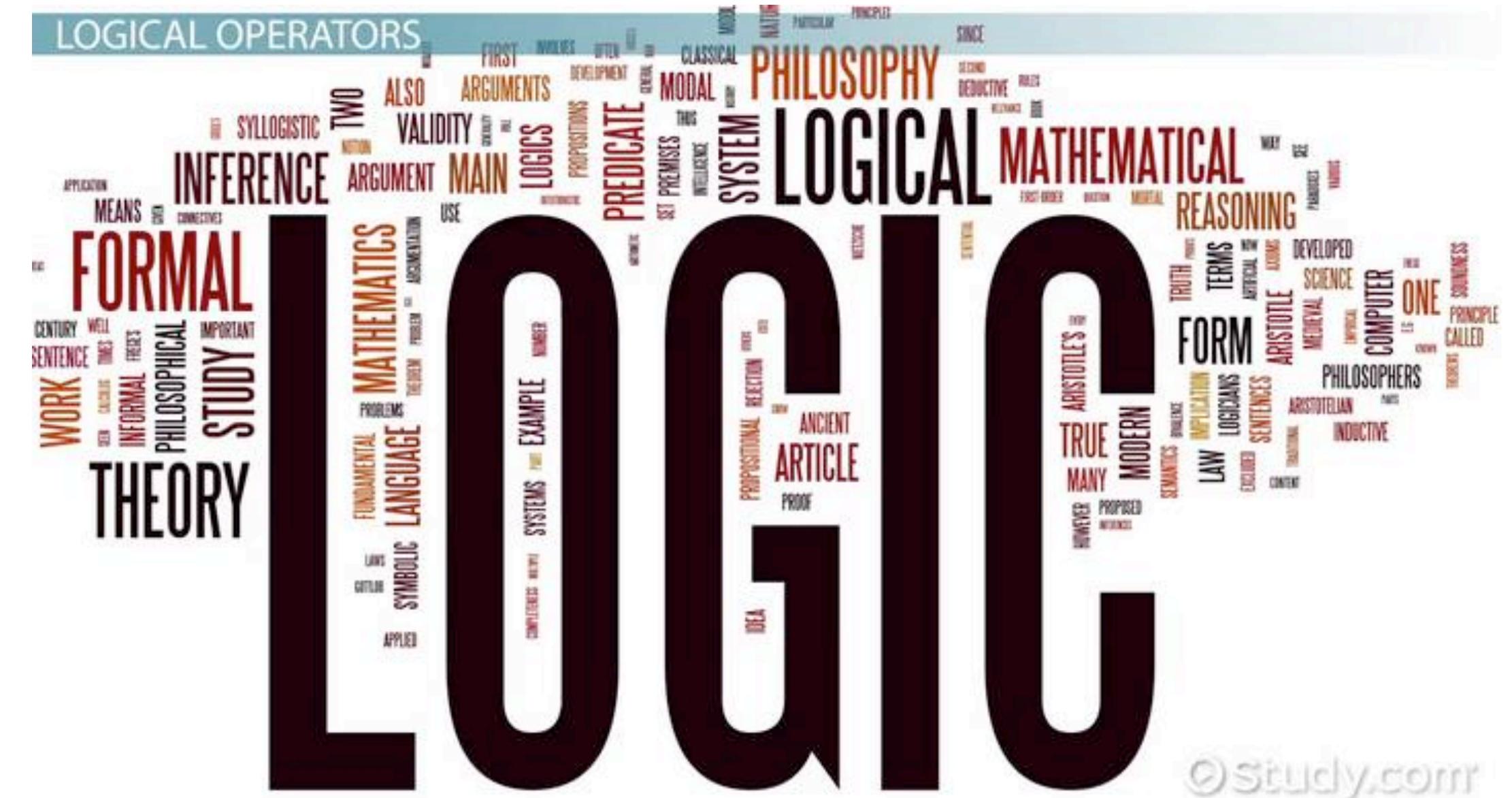


Image credit: study

Symbolic Reasoning

`plan(home, CMU, 8 am)`

- Add an atom, e.g. rainy
- Add an action, e.g. take the Uber
- Add a predicate, e.g. if it is rainy, take the Uber
- Add a rule, e.g. routes with transfer stops
-



Image credit: digg

Contents

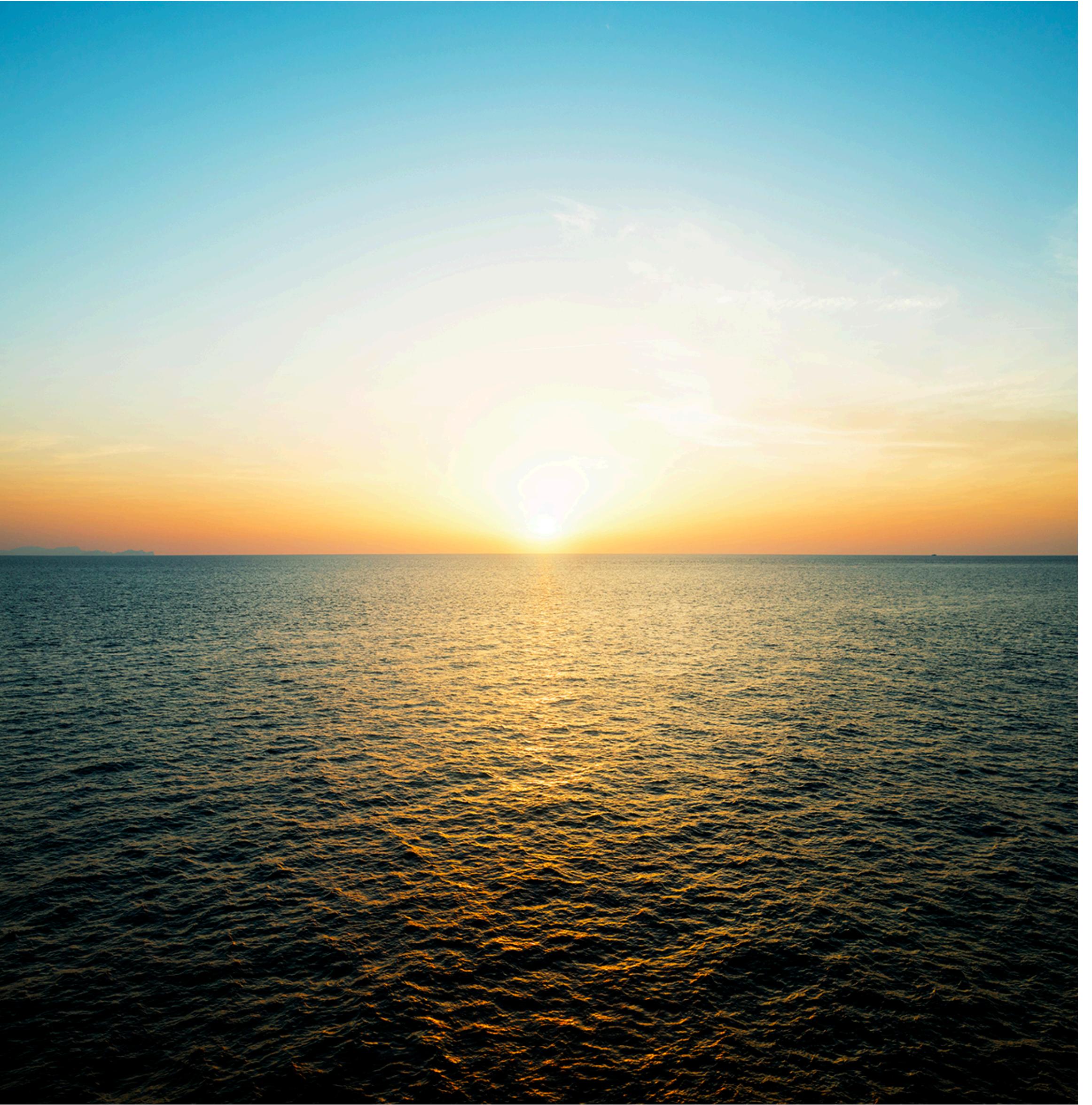
Problem and Approach

Challenge and Significance

Mentors

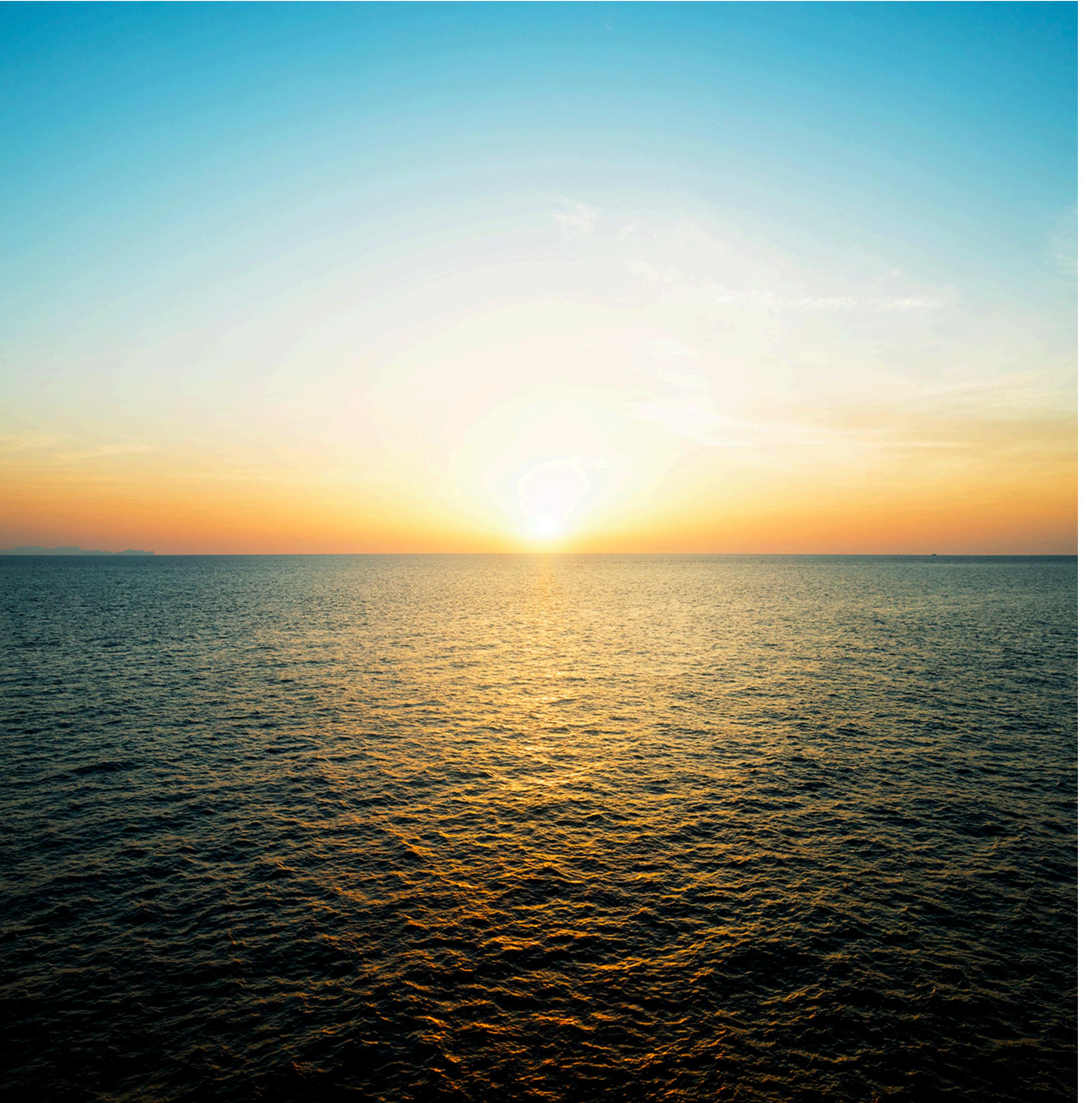
Challenges in NLP

- Entity resolution is a major barrier between natural language and symbolic reasoning.
- Domain-agnostic intent recognition
- Errors in NLP propagates onwards...



Challenges in SR

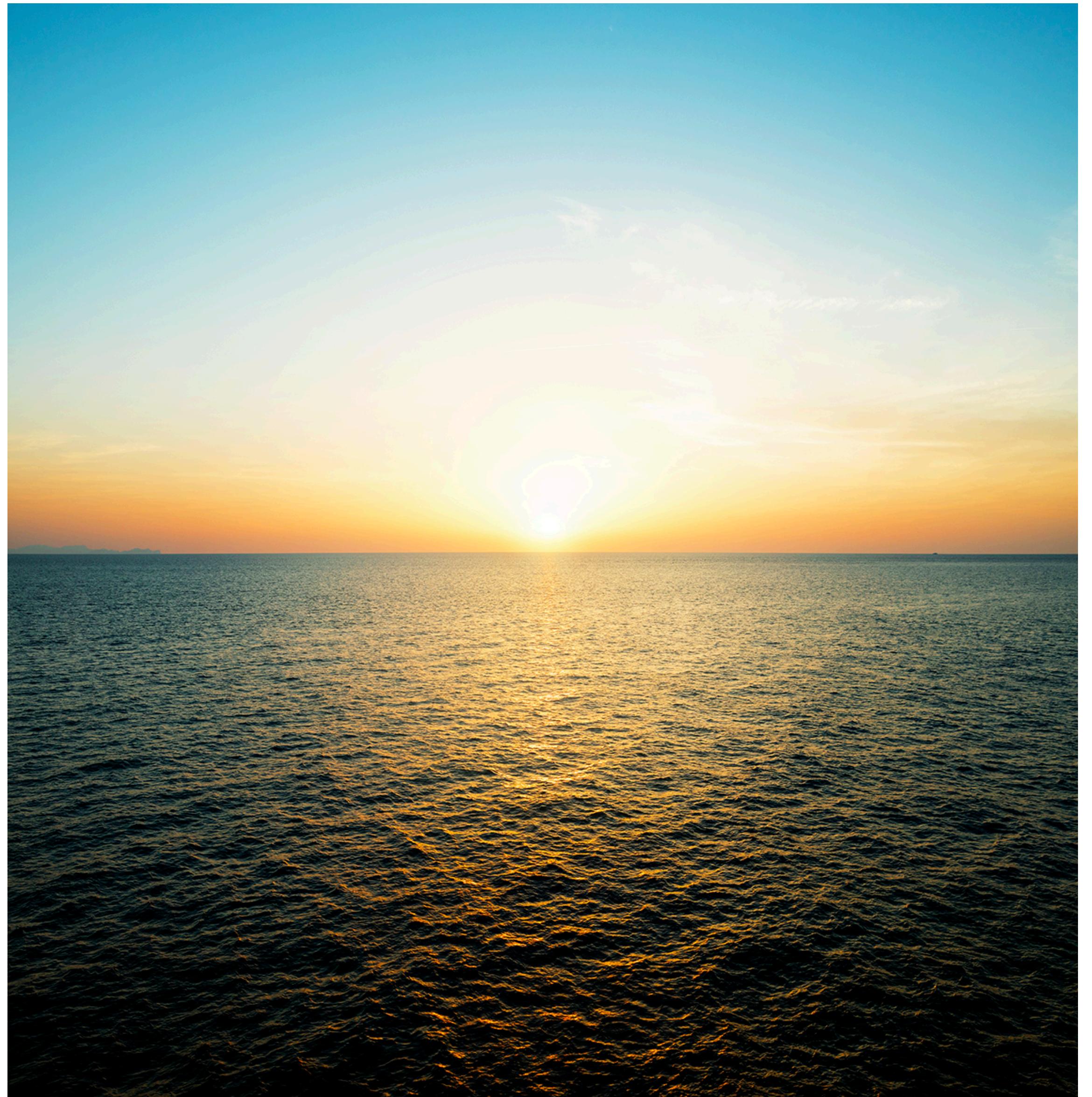
- What degree of freedom should be given to the users? e.g. Originally the pizza ingredients are crust, toppings, and sauce, now the user says “A pizza is composed of a brick, glass and metal.”
- Do the users have infinite patience in providing instructions on updating the Knowledge base?



Potential Contributions

Conversational systems

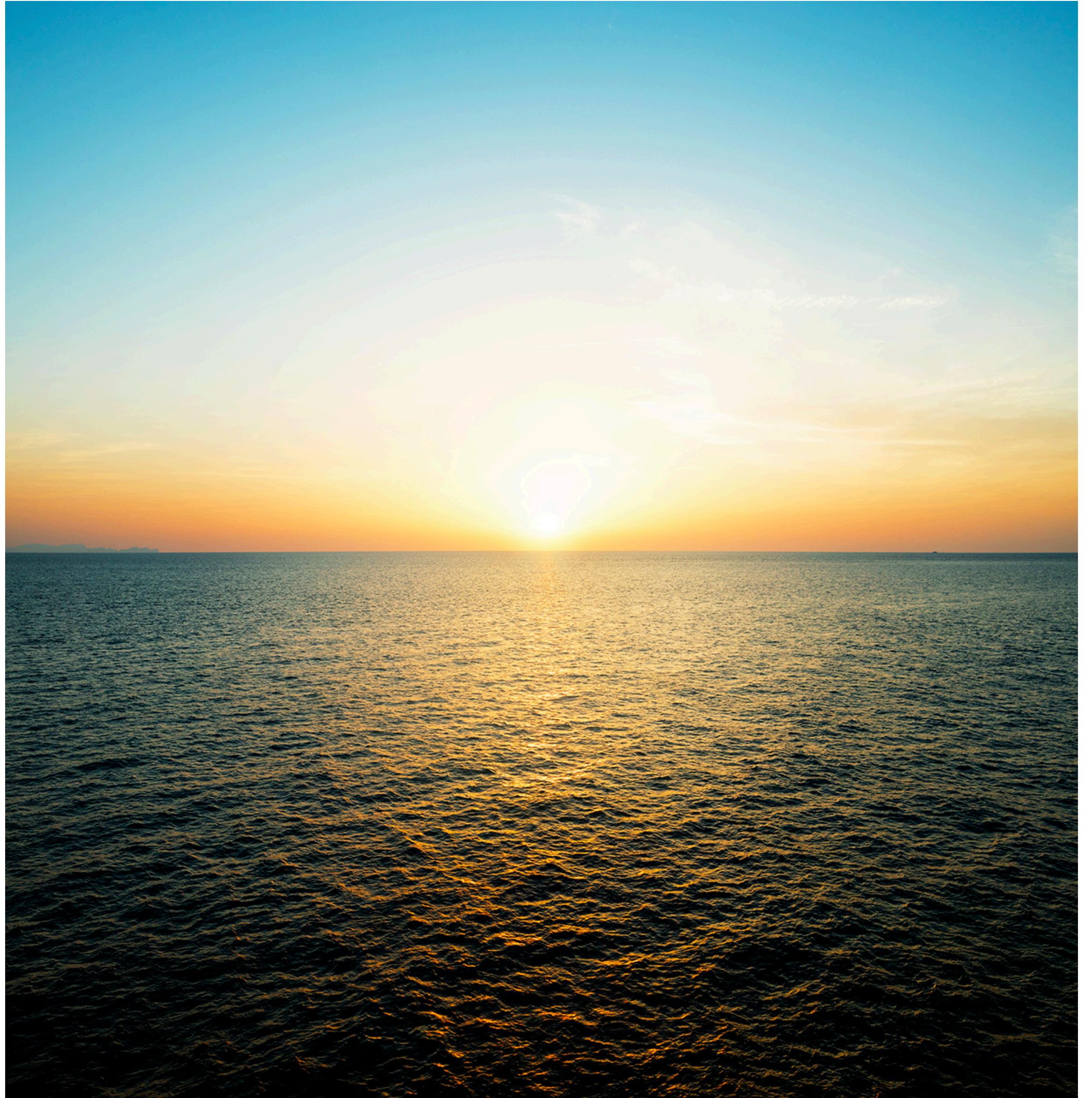
- Conversational systems are useful for hands-free operation.
- A new interaction paradigm that gives the users more power in defining personalized reasoning flows.



Potential Contributions

Knowledge base

- Traditionally the counterfactual worlds are separate.
- To borrow knowledge from other worlds, we use counterfactuals to guide the process of updating the Knowledge base.



Contents

Problem and Approach

Challenge and Significance

Mentors

Aaron Steinfeld

Associate Research Professor, Robotics Institute



Oscar J. Romero

PhD, Research Project Scientist, Robotics Institute



Thank you