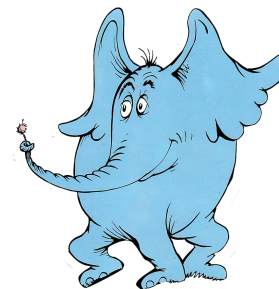# CLIN: Continually Learning From INteractions

Bodhisattwa Prasad Majumder, Bhavana Dalvi Mishra,
Peter Jansen, Oyvind Tafjord, Niket Tandon, Li Zhang,
Chris Callison-Burch, Peter Clark

Sequential Decision Making (SDM)

- Real world decision-making tasks are **sequential** in nature. E.g. nativagion, shopping, communication
- **Text-worlds** are great simulations of real-world phenomena for testing systems ability to do **long-term planning**, **sequential decision making**

ScienceWorld challenges:
- Partially observable world
- Stochasticity in the environment E.g. stove is broken
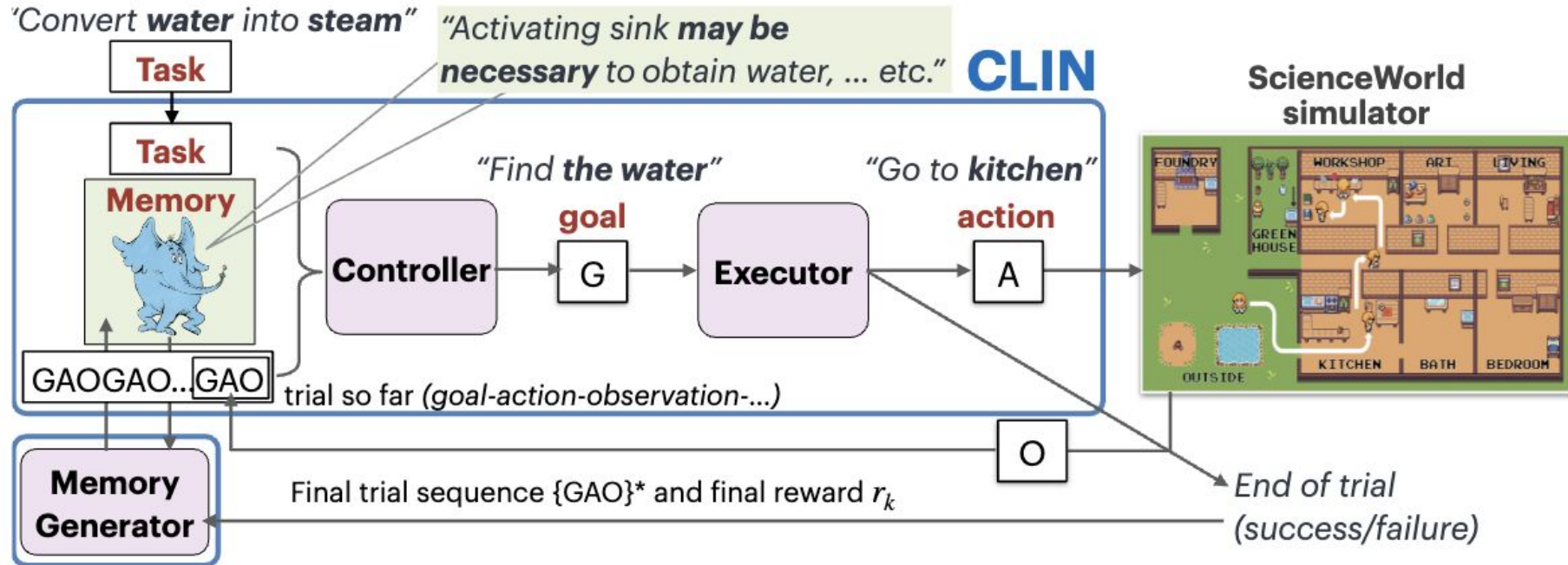- Long/complex tasks E.g. grow an orange

- **Existing methods are limited**
  - Require labeled data (Imitation learning), trained for large number of epochs (Reinforcement learning)
  - Lack of interpretability, generalization

Research Questions
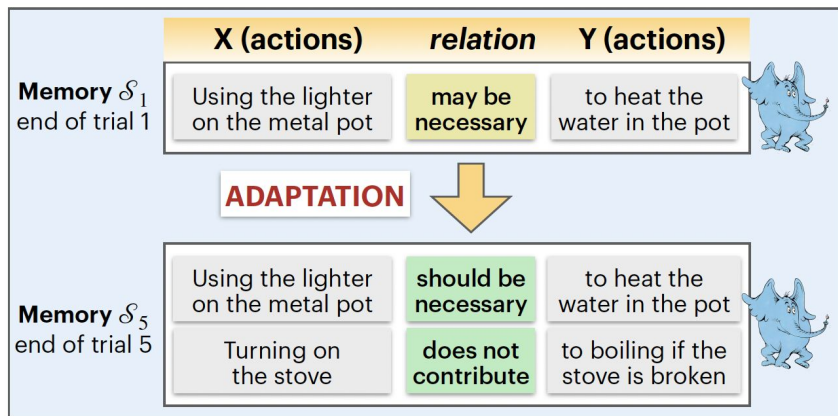
Can we build language agents that can
continually learn
from interacting and observing world changes?

How to **quickly adapt and generalize**
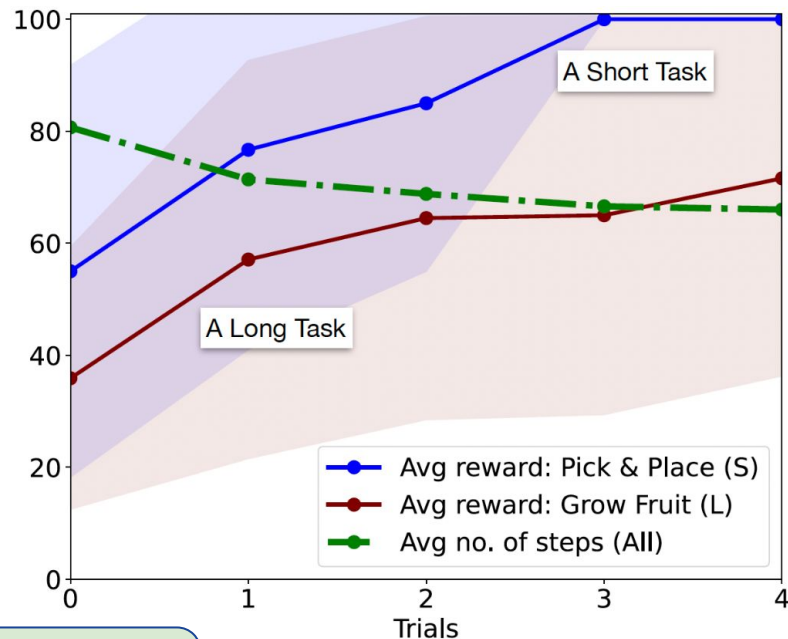to a new task or environment at the test time?

CLIN: Continually Learning from INteractions
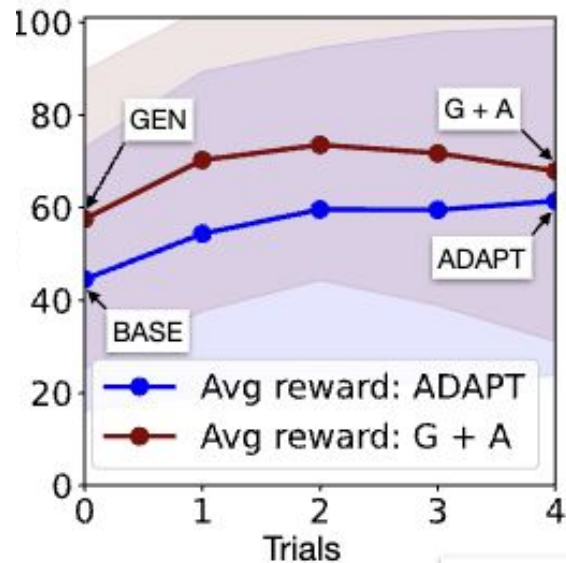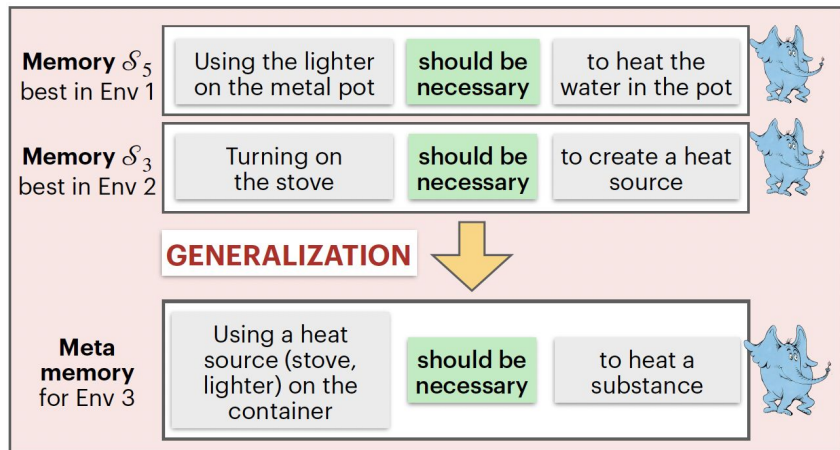
CLIN does Rapid Task Adaptation

X (actions)	*relation*	Y (actions)
Memory $\mathcal{S}_1$ end of trial 1 — Using the lighter on the metal pot	**may be necessary**	to heat the water in the pot

ADAPTATION

X (actions)	*relation*	Y (actions)
Memory $\mathcal{S}_5$ end of trial 5 — Using the lighter on the metal pot	**should be necessary**	to heat the water in the pot
Turning on the stove	**does not contribute**	to boiling if the stove is broken

Quick adaptation, improved efficiency

A Short Task

A Long Task

- Avg reward: Pick & Place (S)
- Avg reward: Grow Fruit (L)
- Avg no. of steps (All)

Trials

- On avg. 17 points improv in reward
- Beats earlier SOTA: ReACT, Reflexion

AI2

CLIN generalizes across tasks

Memory $\mathcal{S}_5$ best in Env 1: Using the lighter on the metal pot | should be necessary | to heat the water in the pot

Memory $\mathcal{S}_3$ best in Env 2: Turning on the stove | should be necessary | to create a heat source

GENERALIZATION

Meta memory for Env 3: Using a heat source (stove, lighter) on the container | should be necessary | to heat a substance

- Performance gain in the first trial of 38% episodes
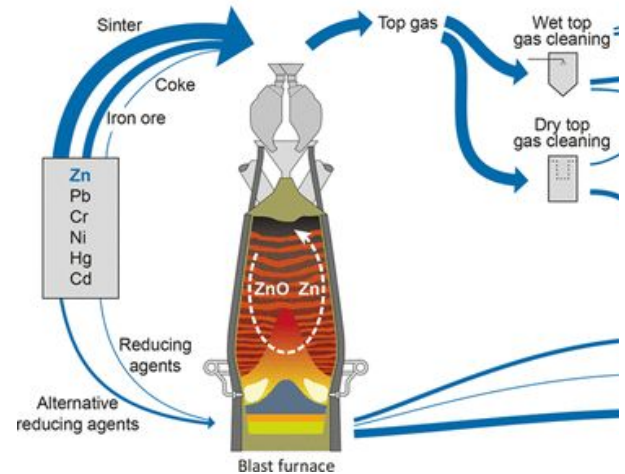- Agent achieves higher scores in lesser #steps

Are learnings always transferable to new tasks?

Roast a marshmallow   →   Melt cadmium
Melt wax

Using a lighter on a substance **should be necessary** to heat the substance

CLIN corrects its own memory over time

CLIN updates its memory
- Delete: 13% items
- Edit: 6% items

new environments	GEN-Env (Trial 0)	G+A (best trial)
No. of insights	100	105
Correct insights	72.0%	**91.4%** ⬆
Final score (on sampled tasks)	39.1	**55.9** ⬆

new tasks	GEN-Task (Trial 0)	G+A (best trial)
No. of insights	98	107
Correct insights	73.9%	**91.1%** ⬆
Final score (on sampled tasks)	43.7	**58.1** ⬆

Ai2

Please visit our poster!

CLIN: Continually Learning From INteractions

Website: https://allenai.github.io/clin/