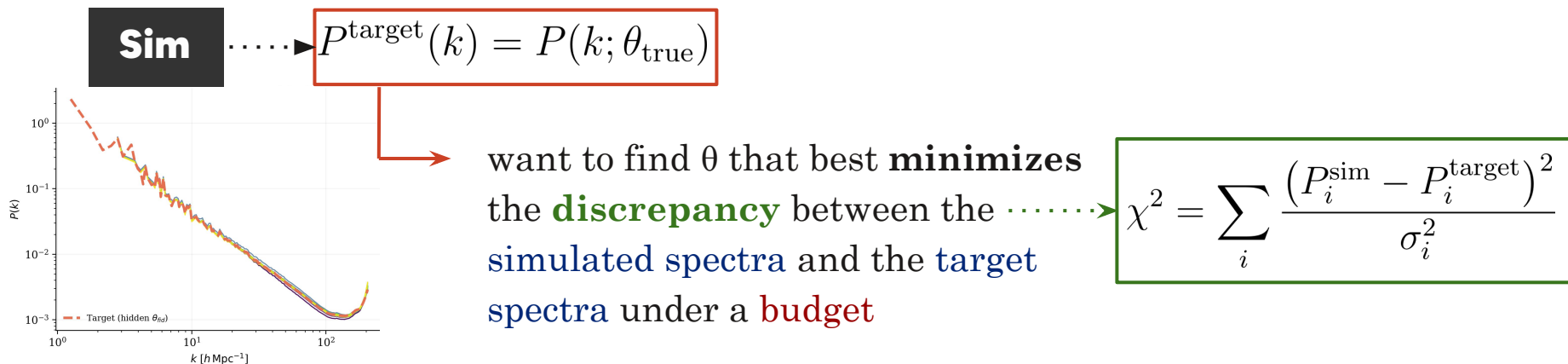


Agentic Systems for Calibrating Cosmological Simulations

Chaipat Tirapongprasert

t.chaipat@columbia.edu, chaipattira.me

Problem Setup: Calibration as Optimization

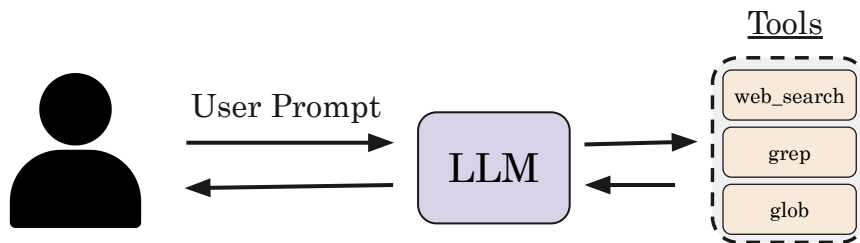


$$\hat{\theta} = \arg \min_{\theta \in \Theta} d(\overset{\text{Simulated data}}{P(k; \theta)}, \overset{\text{Target data}}{P(k; \theta_{\text{true}})})$$

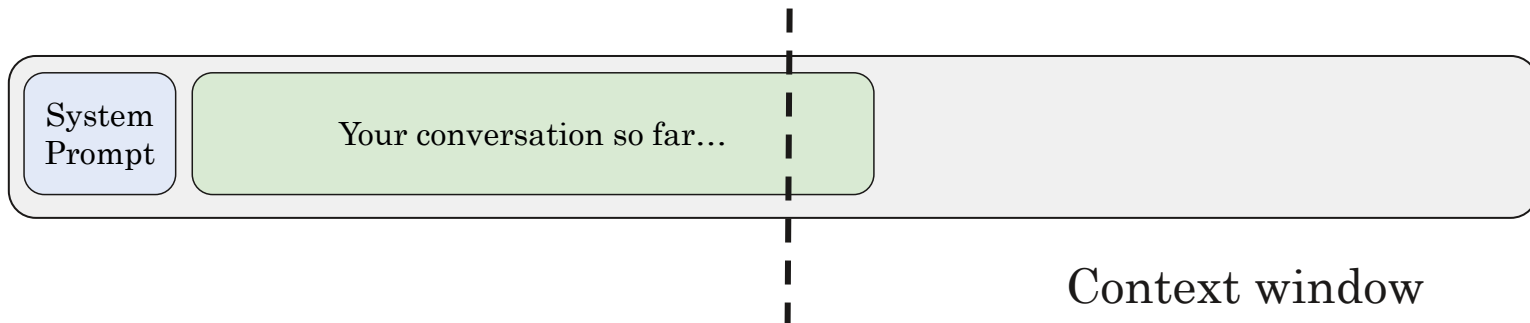
- Standard calibration pipelines use **Bayesian optimization (BO)**

Can we use AI to help us calibrate?

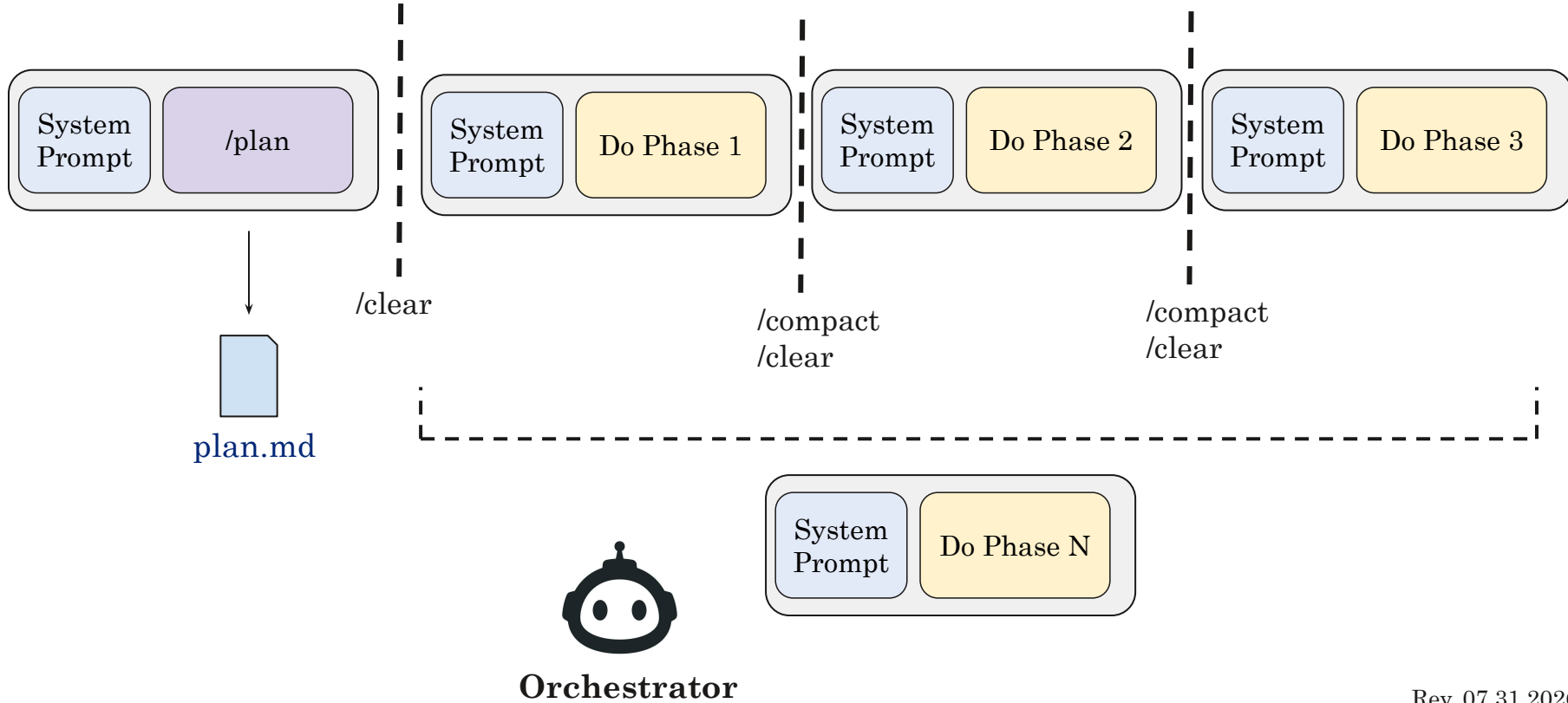
- AIs can now “do things” in the real world (LLM + tool use)



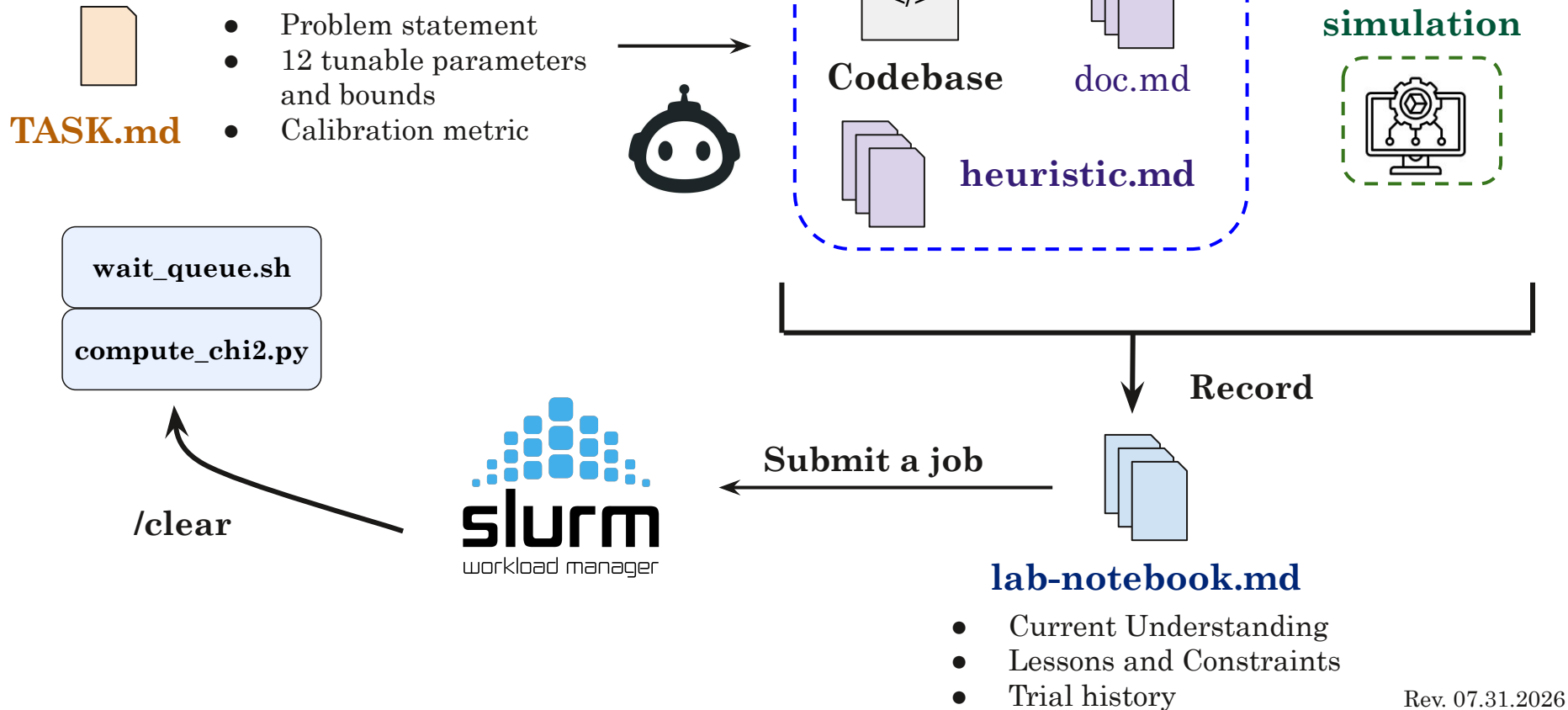
- **Problem:** LLMs become dumber as context grows (i.e., context rot).

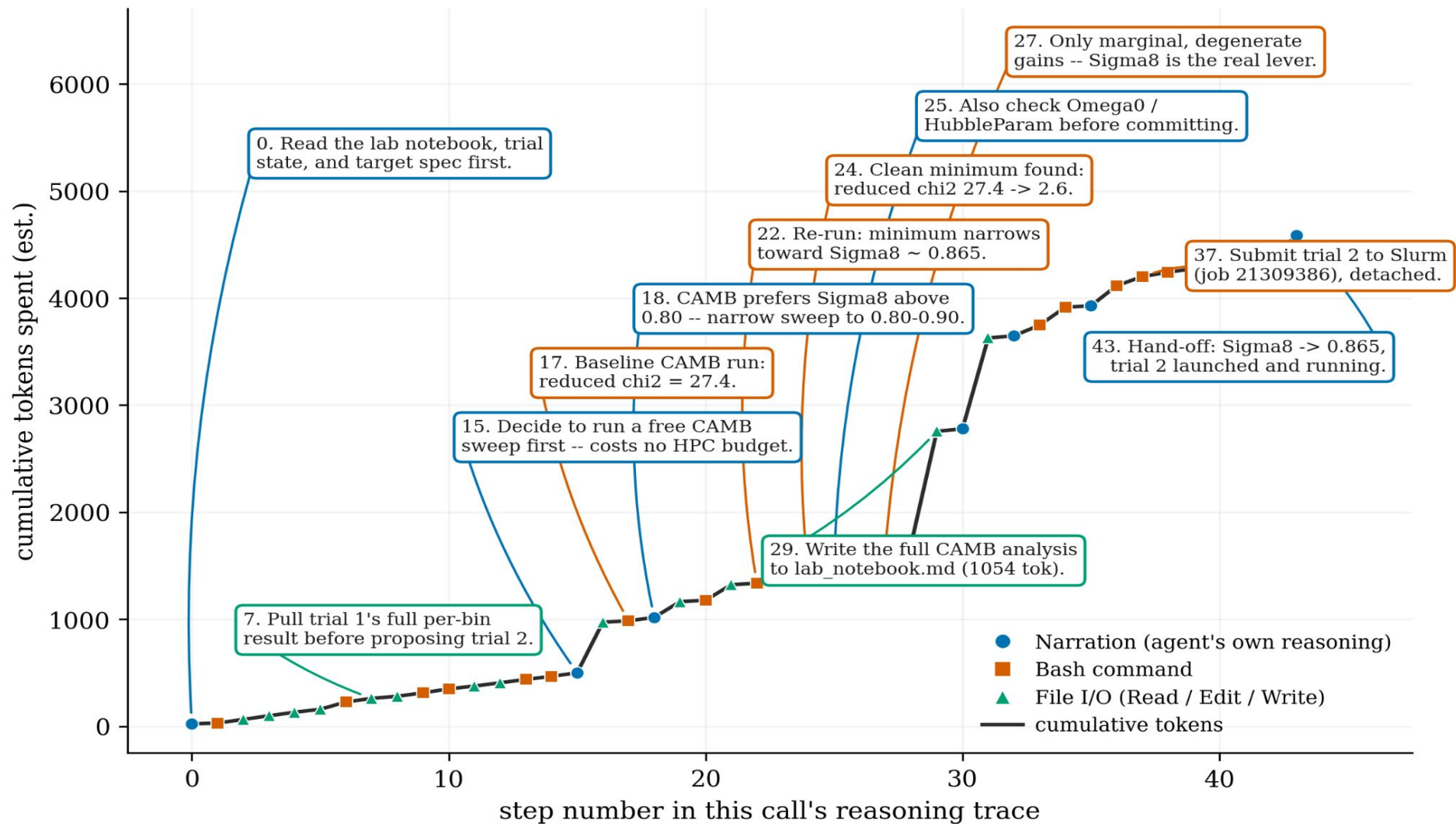


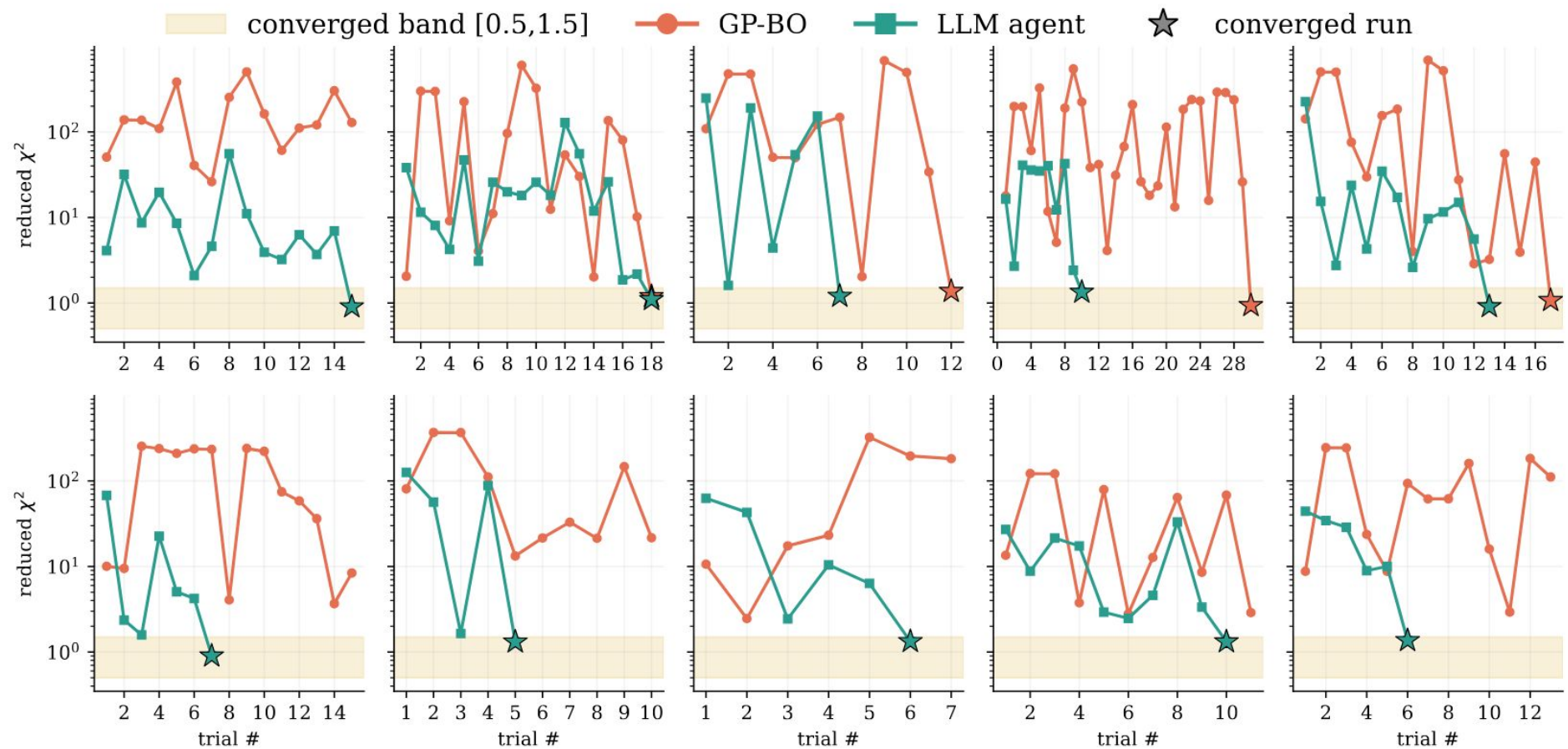
We can break long-horizon tasks into smaller chunks



Agentic Simulator Loop







Questions?

Hit me up at t.chaipat@columbia.edu