



The LLM Economist: Optimizing Policy in Multiagent Generative Simulations



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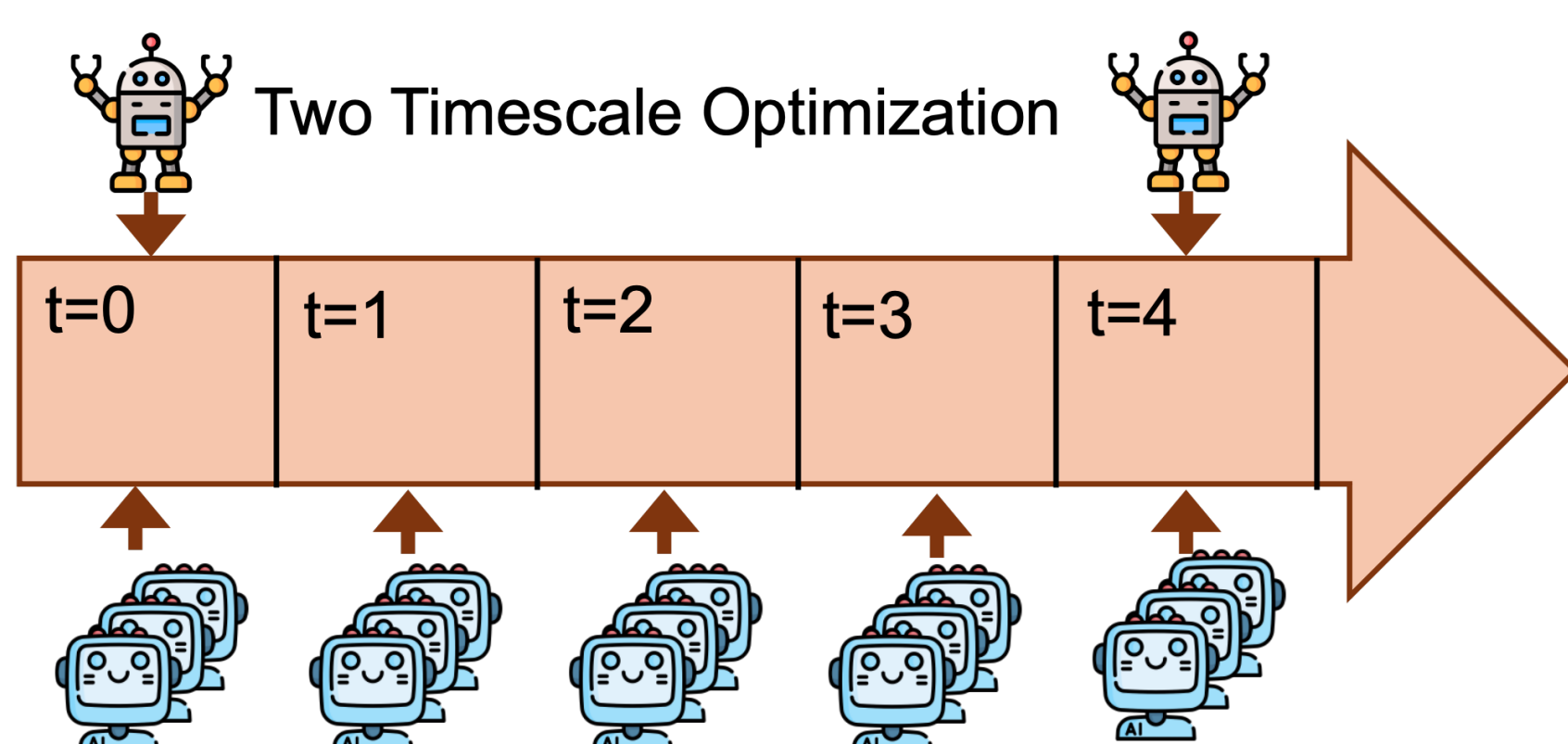
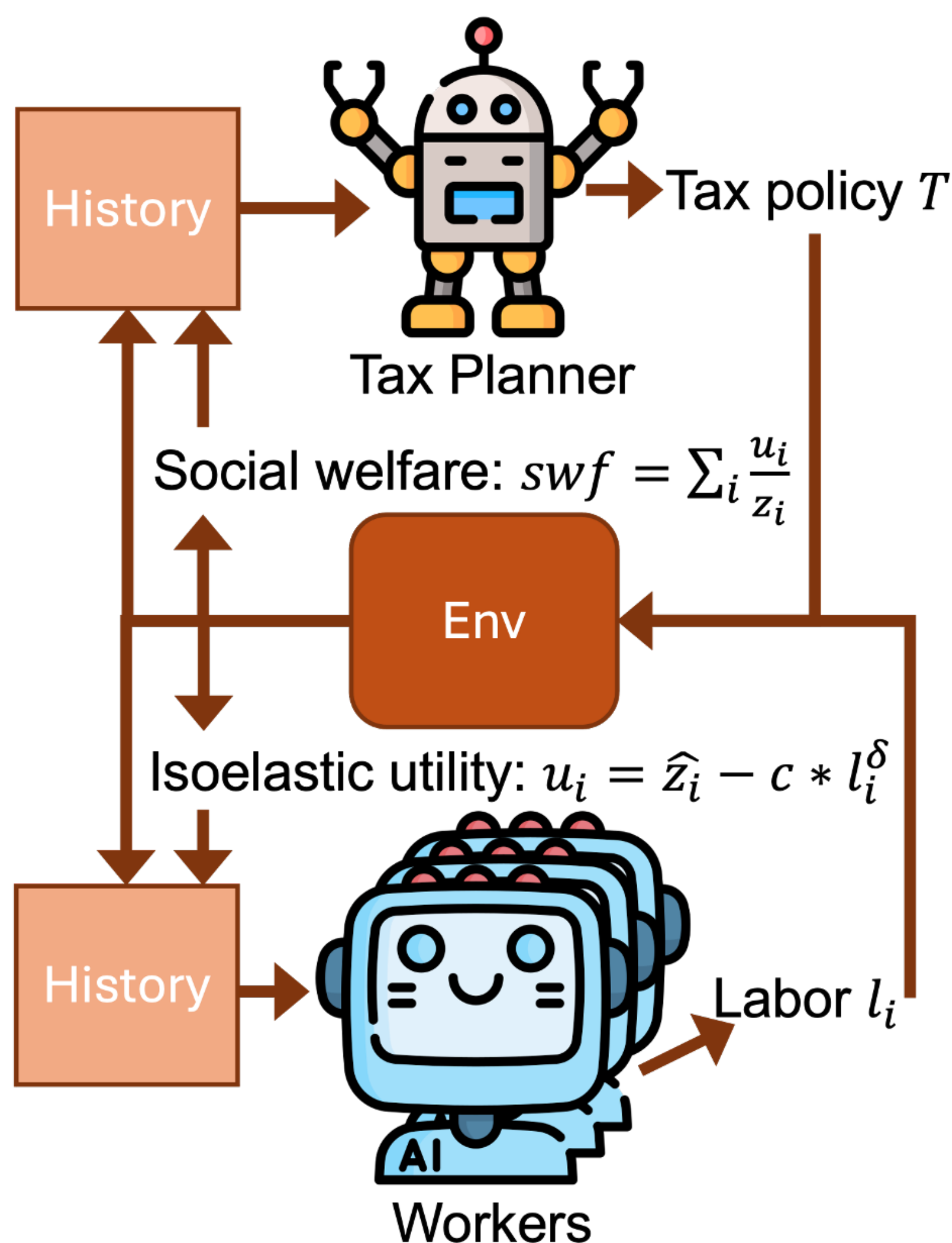
Abstract

Optimizing policy to create beneficial socioeconomic outcomes is difficult due to large multi-agent populations of a mix of rational and nonrational agents. LLMs are trained on large amounts of human data and have recently been shown to mimic human preferences. In this work, we aim to show how LLMs may positively influence a group's social welfare in an economic text game simulation. We use LLMs for three aspects of our economic policy simulation: Optimization, synthetic human data, and mechanism design. An LLM optimizes the system by planning taxes that optimize social welfare, and each synthetic human agent is produced as a generative LLM agent that optimizes internal utility. Our preliminary results show that this method is able to successfully converge to the optimal policy equilibria with rational agents. Going forward, we will use human preference data to change the utility functions of the agents to provide nonrational agents in the simulation. As LLMs get better each of these aspects will further improve the results of this work.

Results: The Rational Case

Planner Type	Workers Type	LLM	# Workers	Steps to Converge	% Max SWF E
Fixed	LLM	GPT 3.5 Turbo	2	10	100.00%
Fixed	LLM	GPT 3.5 Turbo	3	20	100.00%
Fixed	LLM	GPT 3.5 Turbo	5	50	100.00%
LLM	Fixed	GPT 3.5 Turbo	2	10	100.00%
LLM	Fixed	GPT 3.5 Turbo	3	10	100.00%
LLM	Fixed	GPT 3.5 Turbo	5	10	100.00%
LLM	LLM	Llama 3:8b	2	1000	100.00%
LLM	LLM	GPT 3.5 Turbo	2	200	100.00%
LLM	LLM	GPT 4	2	100	100.00%
LLM	LLM	Llama 3:8b	3	DNC	
LLM	LLM	GPT 3.5 Turbo	3	1000	99.28%
LLM	LLM	GPT 4	3	1000	100.00%
LLM	LLM	Llama 3:8b	5	DNC	
LLM	LLM	GPT 3.5 Turbo	5	5000	
LLM	LLM	GPT 4	5	5000	

Methods



Main Takeaway

LLMs can optimize multiagent economic simulations and positively affect group social welfare, but are currently limited by exploration capability.

The Future: NonRational Agents

- Change utility function to account for human preferences.
- Scale number of worker agents to reflect real population sizes.

Acknowledgement

This work was supported by Office of Naval Research N00014-22-1-2253, National Science Foundation Grant NSF-IIS-2107304, and National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-2039656. All findings presented are preprint. Please cite as @unpublished{Karten2024LLM, author = "Karten, Seth and Li, Wenzhe and Ding, Zihan and Bai, Yu and Jin, Chi", title = "The LLM Economist: Optimizing Policy in Multiagent Generative Simulations", month = "June", year = "2024", }