A Framework for Multi-LLM Agent-Based Modeling in Social-Ecological Systems for Environmental Decision-Making through Conversational Experiments

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Abstract

This paper presents a novel Multi-LLM Agent Modeling framework that integrates agent-based modeling with large language models (LLMs) to advance the realism and effectiveness of environmental decision-making experiments within social-ecological systems. By focusing on individual and collective agent behaviors, our framework offers a detailed examination of how diverse sociodemographic factors and environmental beliefs influence sustainable practices. The agents, defined by unique profiles and embedded with predefined values, beliefs, and norms, operate within a controlled virtual environment to simulate real-world dynamics and interactions. Our approach not only enhances the comprehension of environmental decision-making processes but also facilitates the development of targeted interventions aimed at promoting sustainable practices across various community segments. This research contributes to the broader application of agent-based models in environmental policy-making, emphasizing the importance of equity, diversity, and inclusion in modeling efforts and highlighting the potential of LLMs to capture complex dynamics within social-ecological systems.