

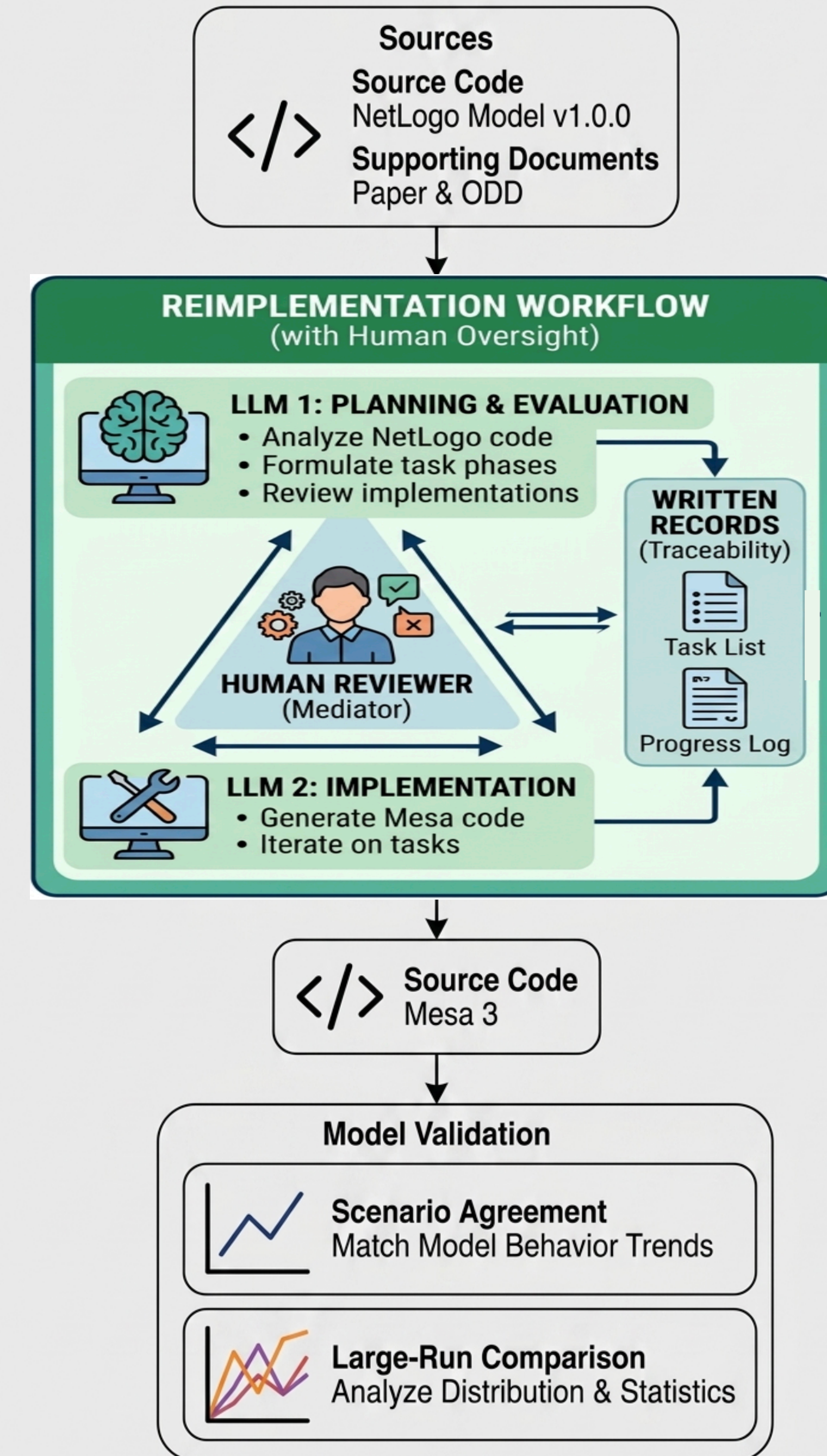
A Dual-LLM Supervised Workflow for Replicating Agent-based Models: From NetLogo to Mesa

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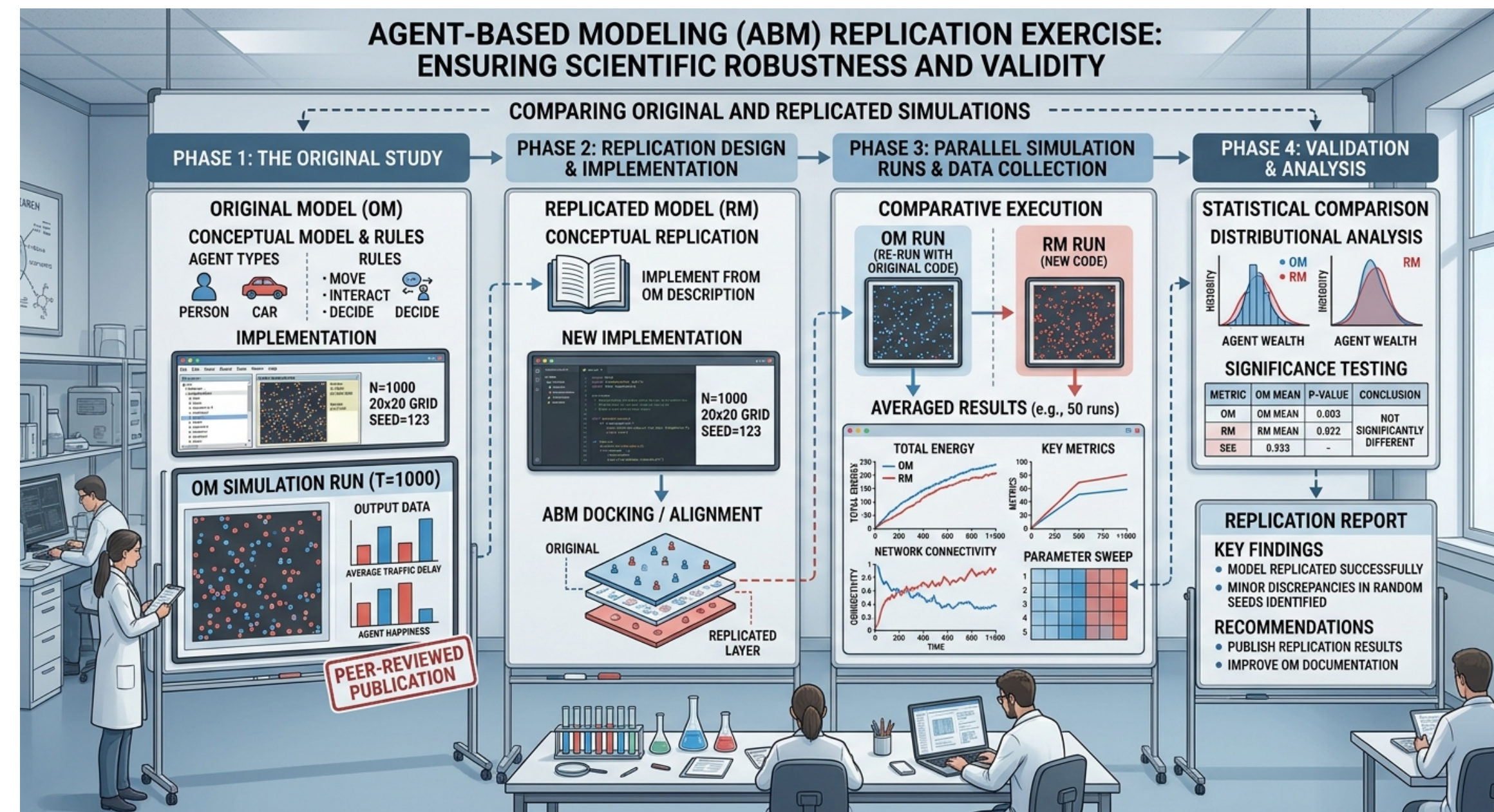
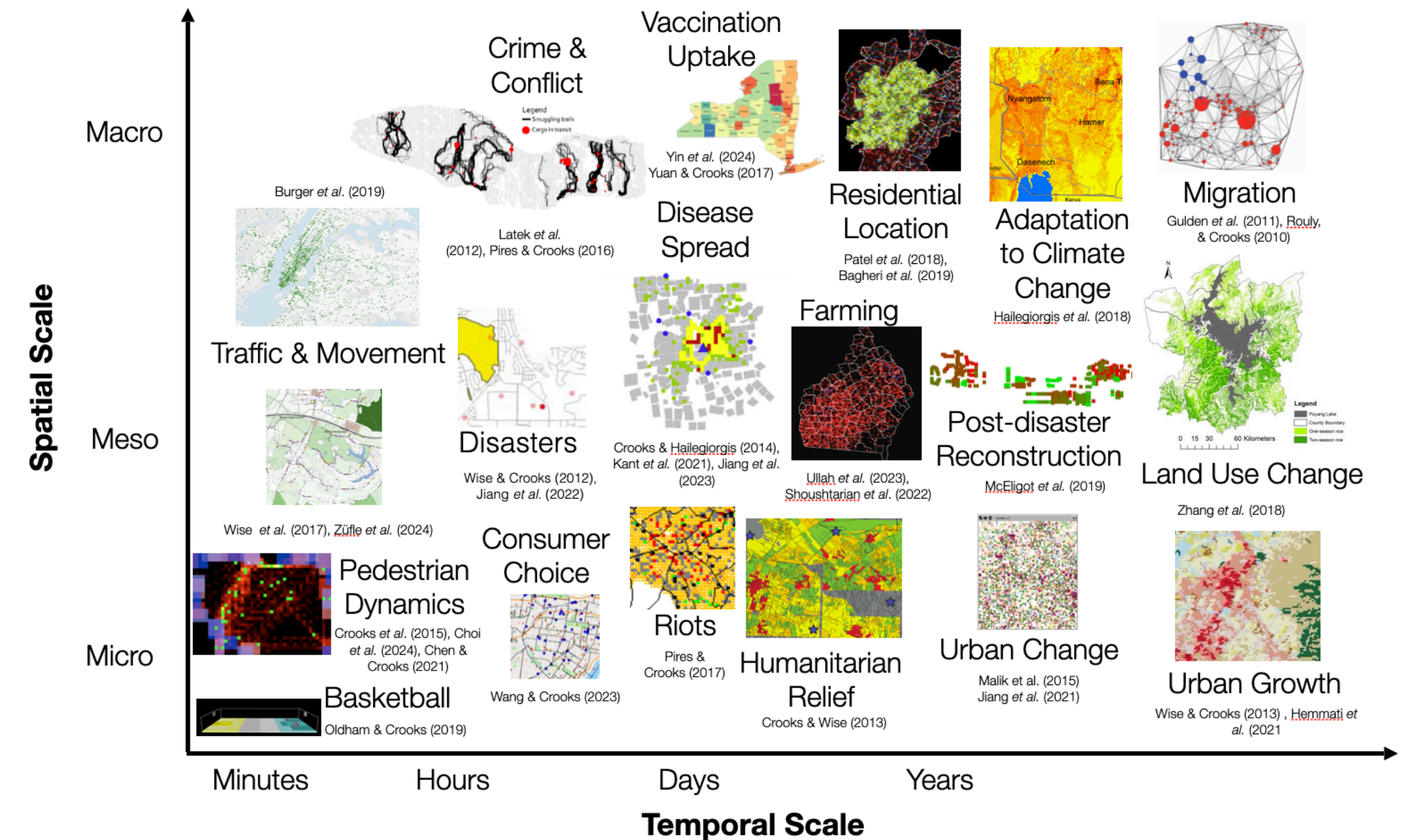
✉ atcrooks@buffalo.edu ● www.gisagents.org ✕ @AndyCrooks

Reimplementation Workflow (with Human Oversight)



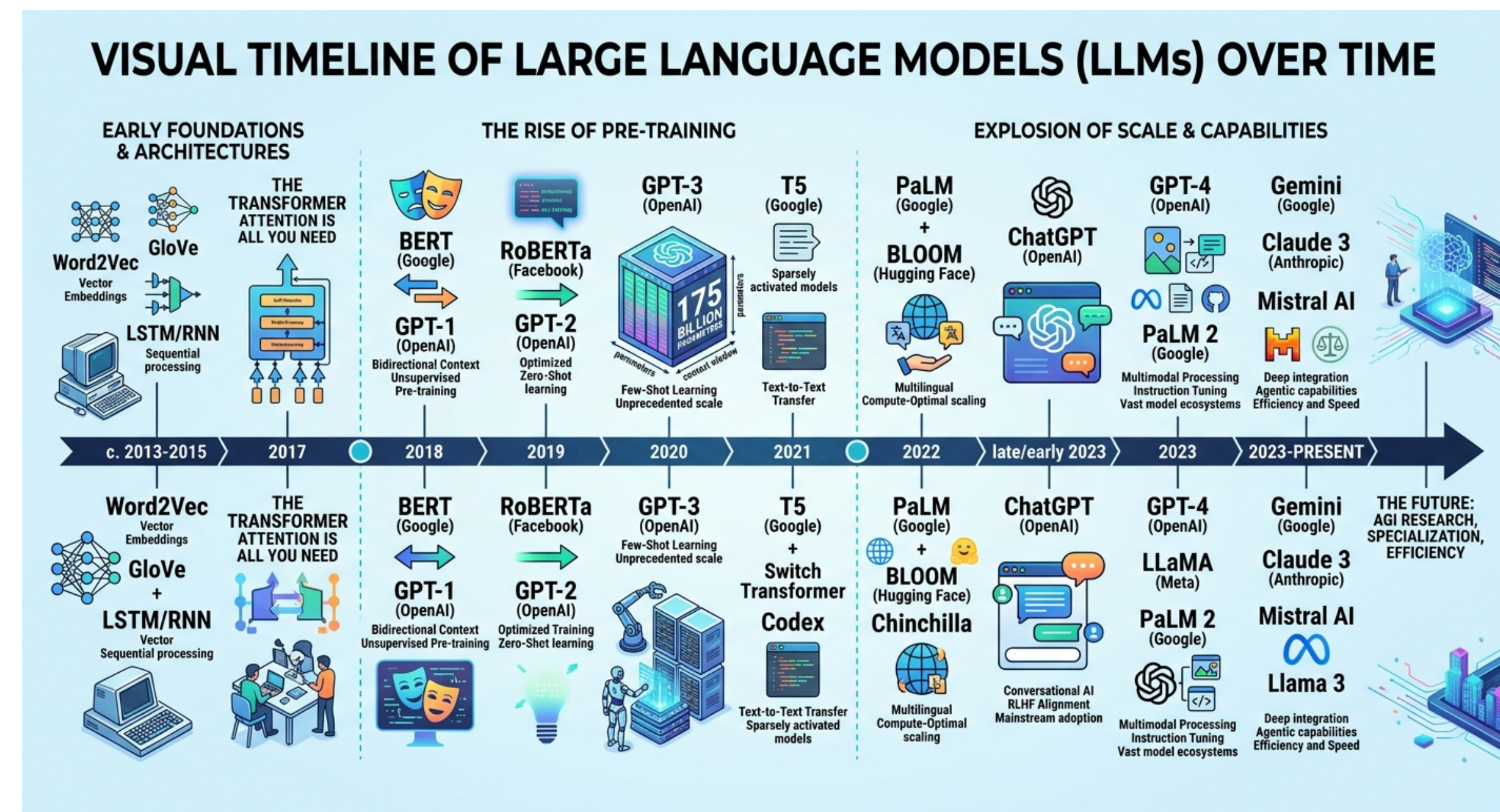
Motivation

- Agent-based models are increasingly used across many domains.
- Developing ABMs presents numerous challenges, including behavior design, validation and **replication**.
- Replication is a **cornerstone of social simulation** and essential for model credibility.
 - Successful replications **enable model extension, theory development, and deeper parameter analysis.**



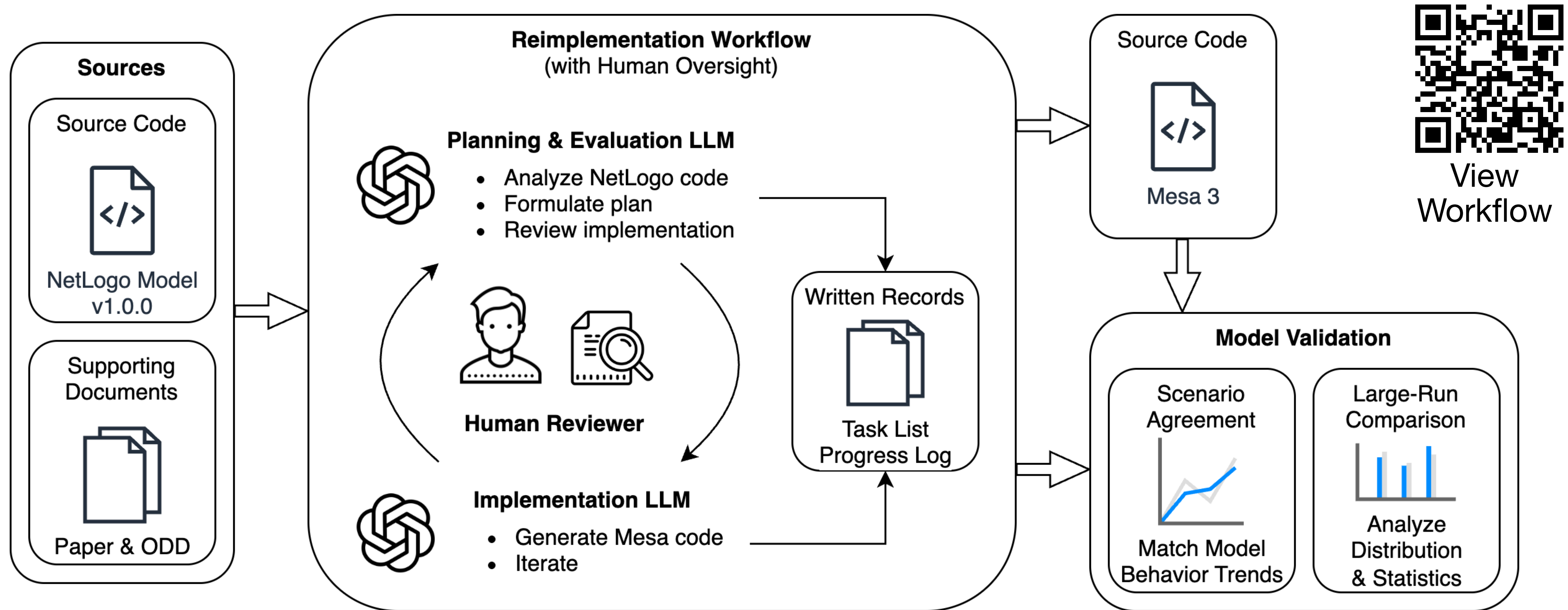
Motivation (continued)

- Replication is **difficult and time-consuming**.
 - Implementations may differ across platforms despite sharing the same conceptual model (Edmonds & Hales 2003)
- LLMs are increasingly used for code generation and agent development (e.g., personas).
 - However, LLM-generated code still requires interpretation, debugging, and oversight.
- Can LLM-based workflows reduce the effort of cross-platform replication and support model reuse, comparison, and extension?



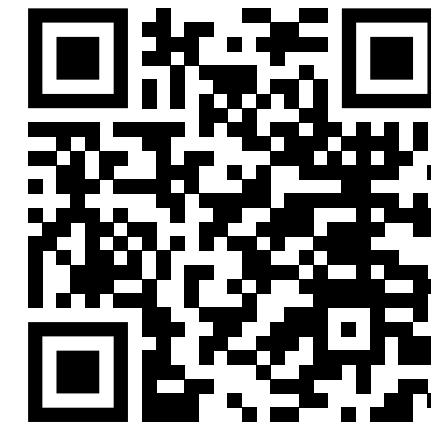
The NetLogo-to-Mesa replication workflow

Utilizing 2 distinct LLM roles in a researcher-mediated workflow



Model

- Explores the interaction of individual and environmental risk on the youth.
- Simulates a youth's day, where they spend time in schools, their neighborhoods, and families.
- Shows how environmental risk and promotive factors play a role in shaping youth outcomes (i.e., recidivism)
- Has OOD, NetLogo Model and detailed results.



Youth and their Artificial Social Environmental Risk and Promotive Scores (Ya-TASERPS): An Agent-based Model of Interactional Theory of Delinquency

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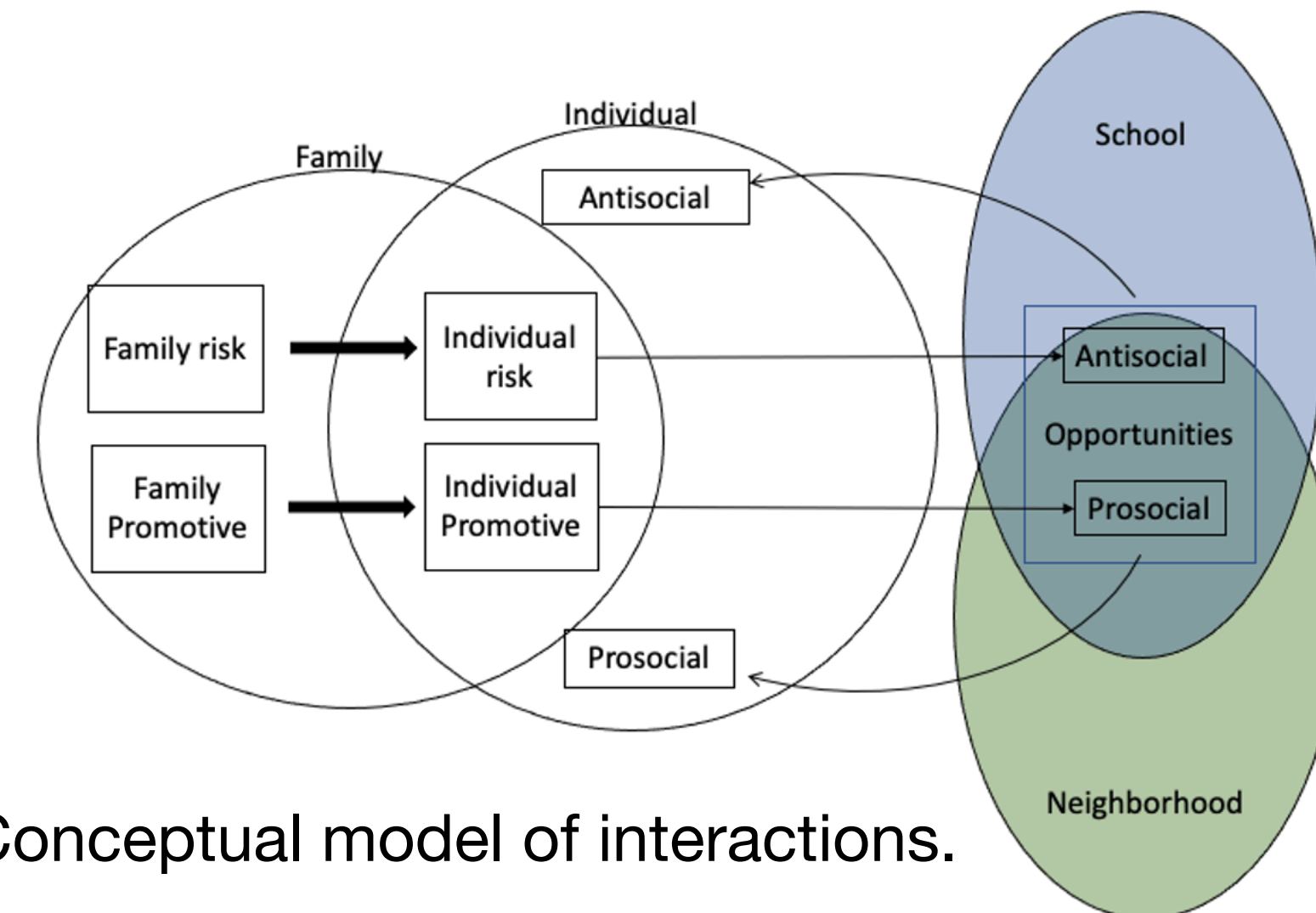
Journal of Artificial Societies and Social Simulation 24(4) 2, 2021

Doi: 10.18564/jasss.4660 Url: <http://jasss.soc.surrey.ac.uk/24/4/2.html>

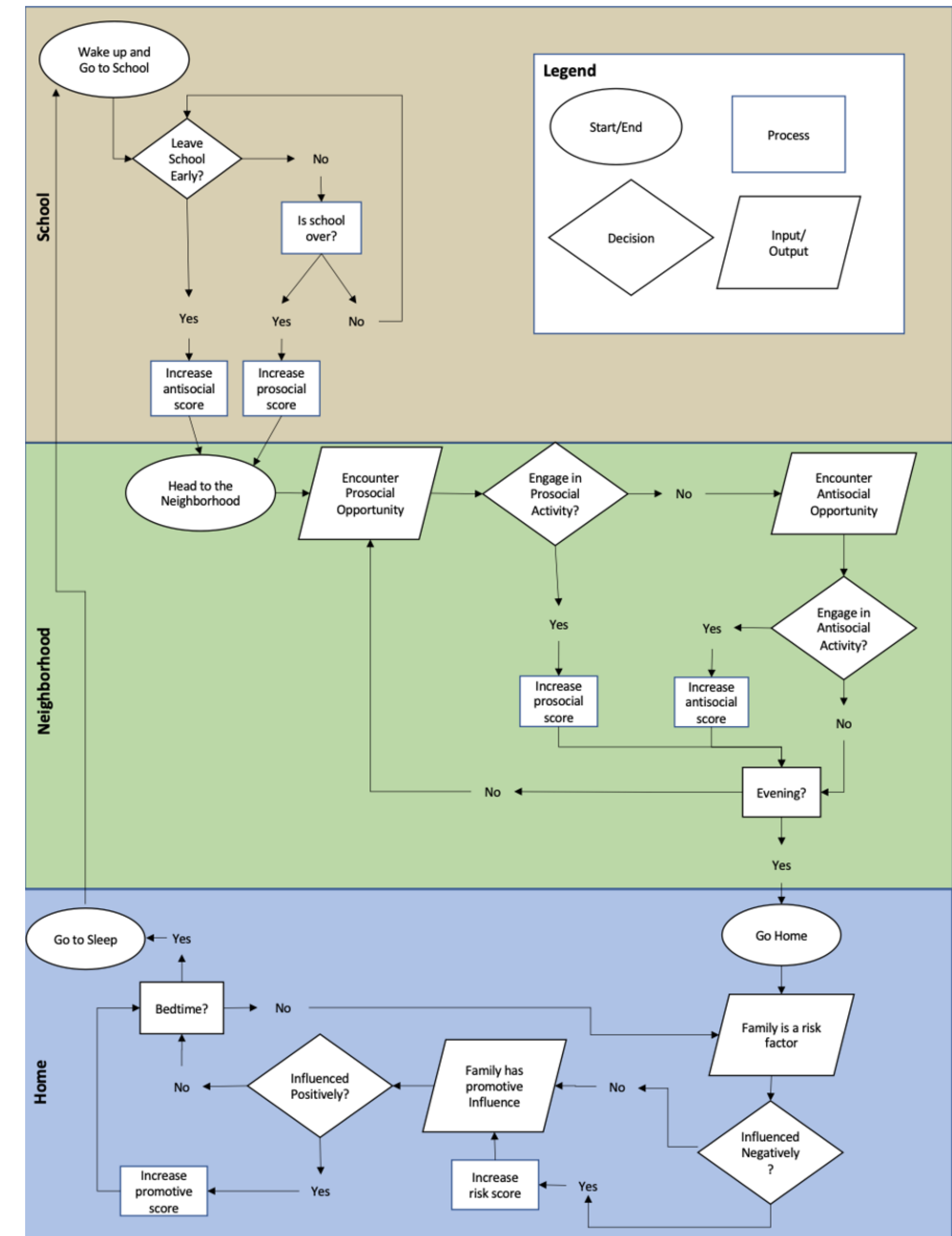
Received: 19-11-2020 Accepted: 05-07-2021 Published: 31-10-2021

Abstract: Risk assessments are designed to measure cumulative risk and promotive factors for delinquency and recidivism, and are used by criminal and juvenile justice systems to inform sanctions and interventions. Yet, these risk assessments tend to focus on individual risk and often fail to capture each individual's environmental risk. This paper presents an agent-based model (ABM) which explores the interaction of individual and environmental risk on the youth. The ABM is based on an interactional theory of delinquency and moves beyond more traditional statistical approaches used to study delinquency that tend to rely on point-in-time measures, and to focus on exploring the dynamics and processes that evolve from interactions between agents (i.e., youths) and their environments. Our ABM simulates a youth's day, where they spend time in schools, their neighborhoods, and families. The youth has proclivities for engaging in prosocial or antisocial behaviors, and their environments have likelihoods of presenting prosocial or antisocial opportunities. Results from systematically adjusting family, school, and neighborhood risk and promotive levels suggest that environmental risk and promotive factors play a role in shaping youth outcomes. As such the model shows promise for increasing our understanding of delinquency.

Keywords: Agent-based Modeling, Antisocial Behaviors, Delinquency, Risk Factors, Youth, Social Work.

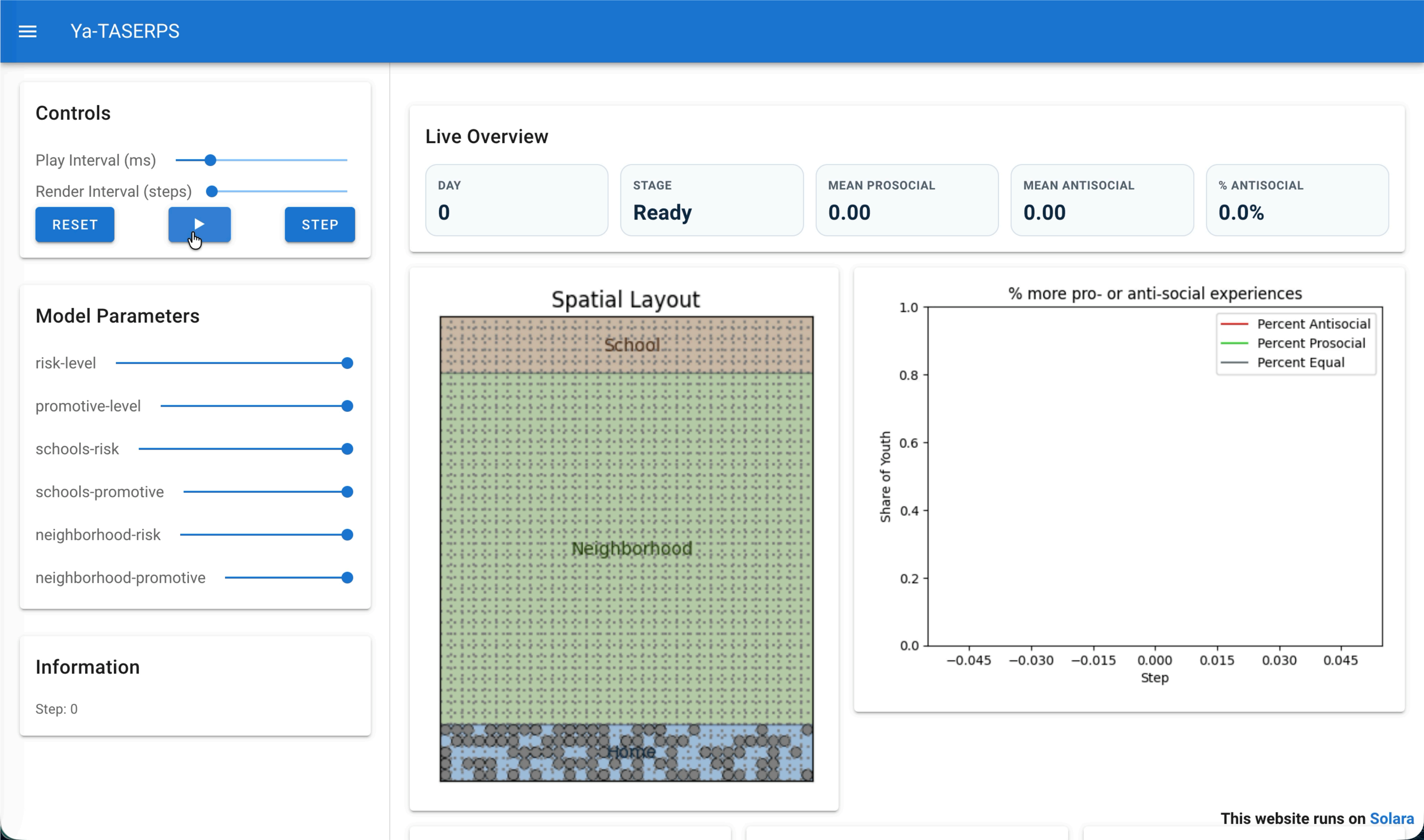


Conceptual model of interactions.



Flow diagram of the overall model logic during the simulation.

Mesa Implementation



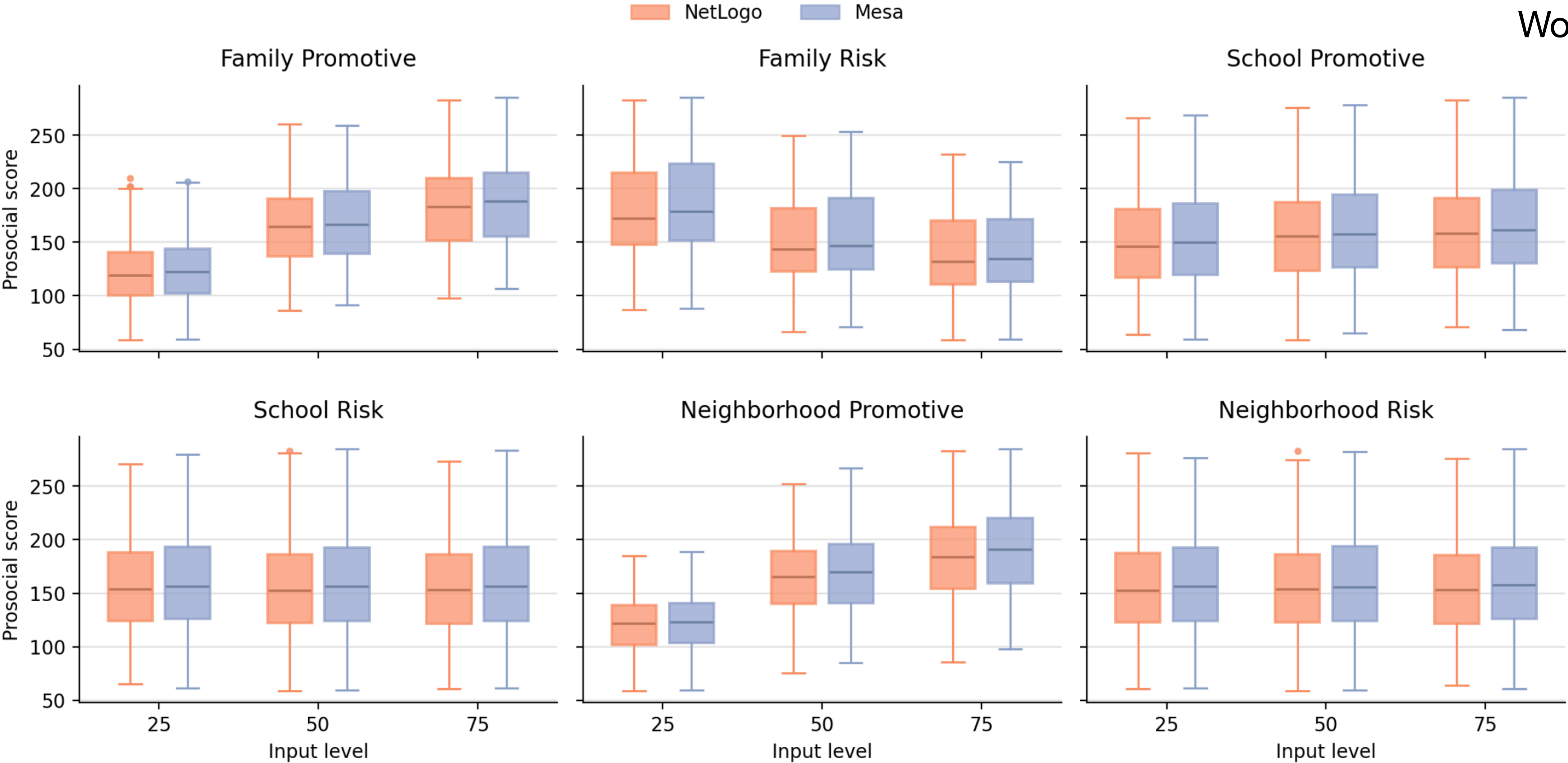
Replication Findings

- Ya-TASERPS replication retained:
 - Original geometry and population structure.
 - Risk and promotive values initialized within the same ranges.
 - Daily sequence: school → after school → evening → step day.
- These features preserved the model's spatial and temporal dynamics.
- Model behavior remained consistent:
 - Higher risk increased antisocial outcomes and reduced prosocial outcomes.
 - Higher promotive influences produced the opposite effect.
 - School- and neighborhood-level changes affected outcomes.
- The Mesa replication preserved the intended links between risk, promotive factors, and youth outcomes.

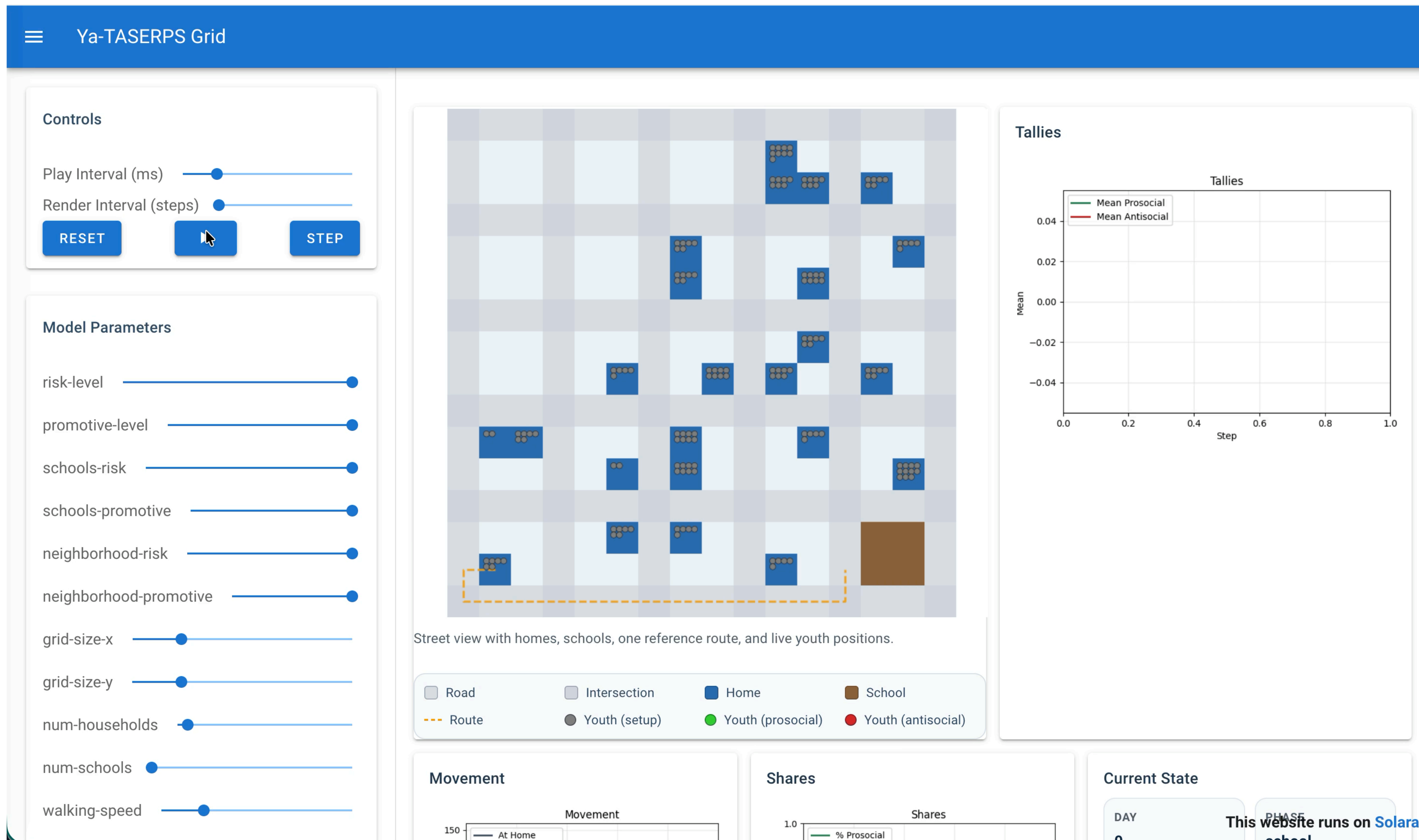
Model Comparison



View
Workflow

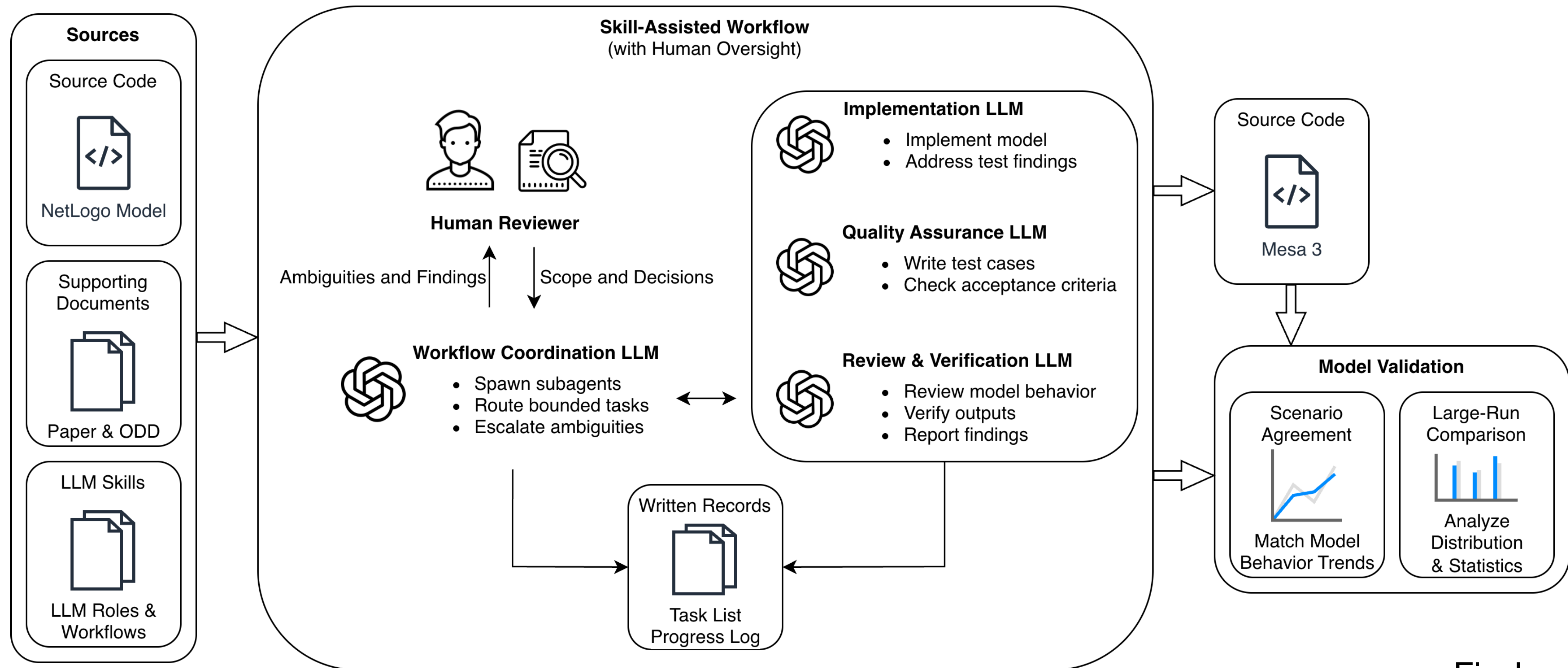


Next Steps: Extending the Ya-TASERPS Model



Next Steps

Moving from a Researcher-mediated to a Skill-assisted Workflow



Wang & Crooks (forthcoming), Large Language Model-Assisted Workflows for Replicating Agent-Based Models.
2026 International Conference of the Computational Social Science Society of the Americas, Santa Fe, NM.

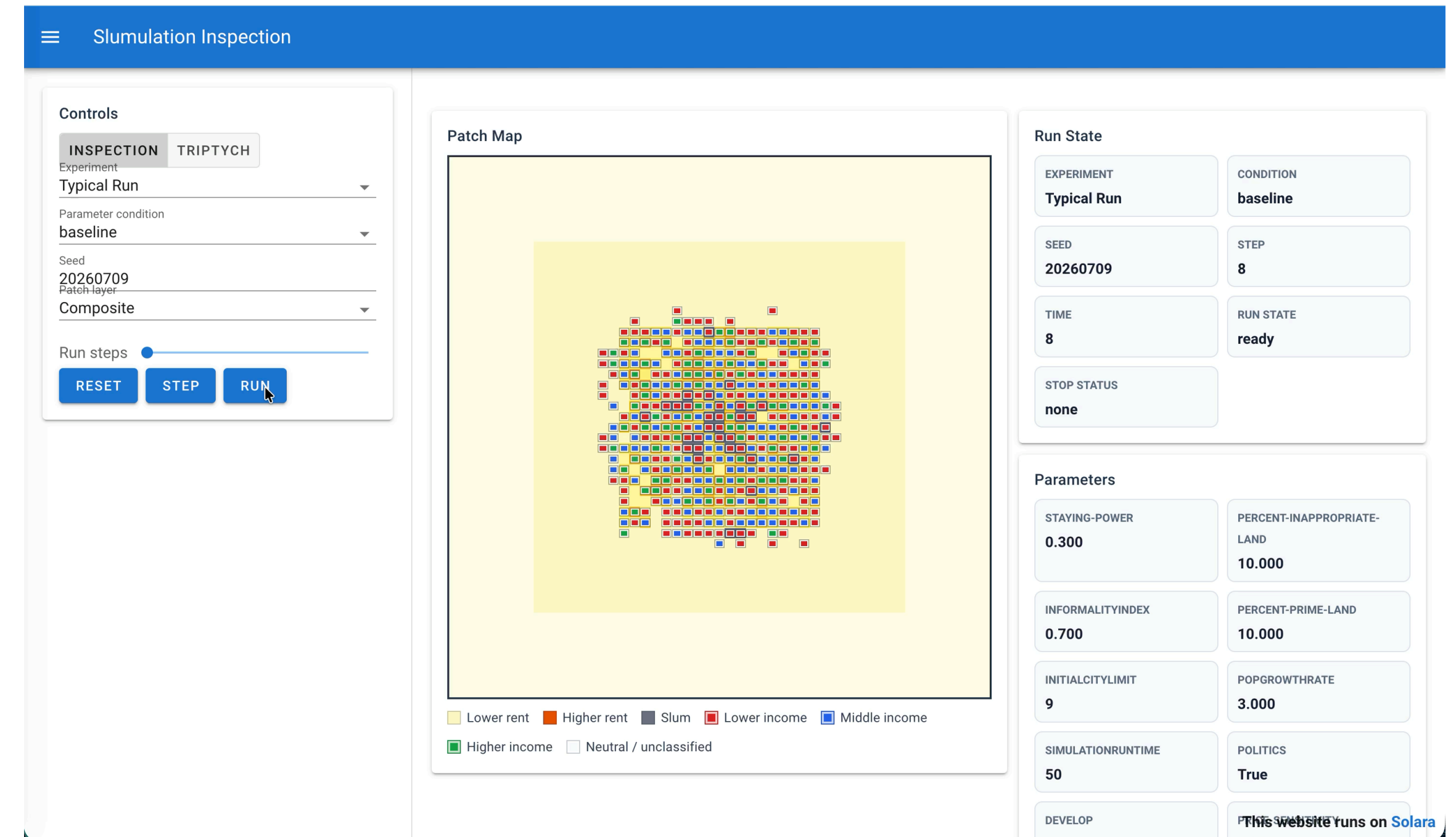
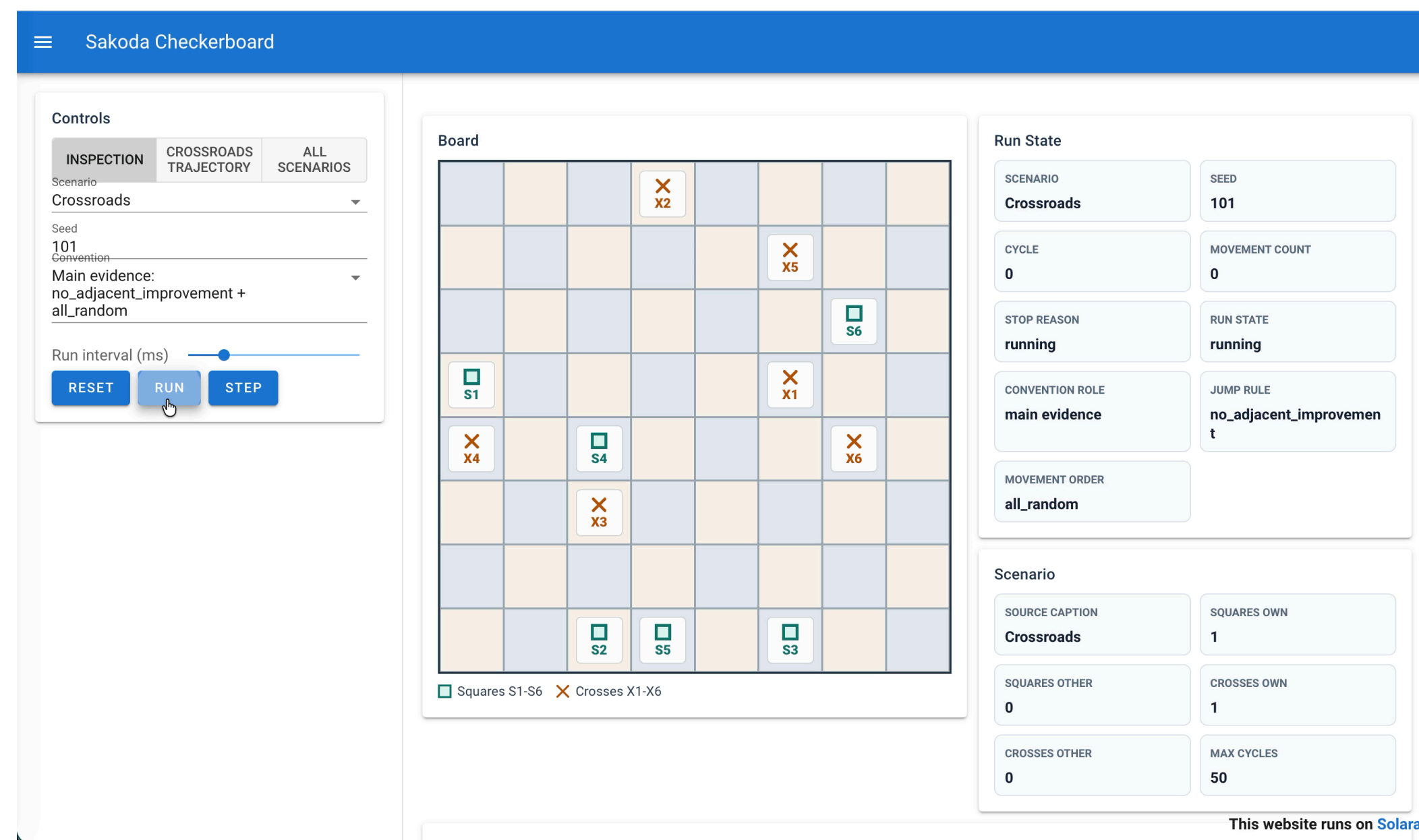
Find out
more



Example Models: Skill-assisted Workflow

Sakoda (1971) Checkerboard Model of Social Interaction

Patel et al. (2012) Slumulation: An ABM approach to slum formations



- The selected models differ in their available sources, model structure, and what could be validated.
 - Only textural description of the model
 - Not Involved in the model
 - Model validation inspected board patterns and supporting measures
- Code and ODD,
- Involved in the model
- Detailed results tables from various parameter combings

Summary and Further Work



View
Workflow

- We found LM-assisted replication can be credible when treated as a methodological process, not just a coding task.
- Separated LLM roles help stabilize the tasks, written records make source-handling and validation decisions inspectable.
 - Emphasis on human review is consistent with broader evidence that code-generation systems can be useful while still requiring substantial interpretation and repair by users
- Limitations: simple examples, and the initial workflow (researcher-mediated) requires human involvement:
 - Need to explore different ABMs, different LLMs etc..

Thank you for listening!
Welcome comments,
questions and suggestions!

