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Bio

BIO

I am a postdoctoral fellow working with Dr. Lei Xing at Stanford University, where I develop trustworthy autonomous AI agents and foundational informatics systems for single-cell biology. My long-term vision is to build auditable computational infrastructure and virtual cell models that transform massive single-cell atlases into reliable, steerable systems for mechanistic discovery across tissues, diseases, and species. My doctoral work with Prof. Xuegong Zhang established my foundation in single-cell bioinformatics and atlas-scale integration, which I have since extended into large-scale representation modeling, AI agent workflows, and LLM-driven scientific discovery. My current work focuses on developing governed, agentic lifecycles for continuous single-cell data curation and foundation model evaluation, while applying these autonomous systems to power cross-organ virtual cell retrieval and simulate immune-tolerance breakdown.

My ongoing efforts build directly upon my prior work in atlas integration and algorithmic development. As the first author of hECA (Chen et al., 2022), I built a unified human cell atlas integrating one million high-quality cells across 38 organs with a logic-expression query interface. This experience exposed the central bottlenecks—such as heterogeneous formats and ontology grounding—that I now address using LLM-powered agents to enable autonomous metadata harmonization and iterative quality control. I am converting manual curation into an autonomous, agent-driven paradigm where new datasets are continuously ingested and versioned in a traceable manner. Furthermore, my co-development of TorchGW for cell state alignment, TFcomb for perturbation prediction, and TransMap for cross-species alignment provides the algorithmic foundation for next-generation cell foundation models and virtual cell simulation.

By integrating these components into trustworthy, benchmarked, and human-in-the-loop AI infrastructure, my research bridges scalable scientific computing with complex biomedical questions. Through close collaboration with Prof. Edgar Engleman, I am utilizing immune-tolerance breakdown—specifically focusing on a tolerogenic dendritic cell program—as a mechanistic testbed to validate our virtual cell simulations. A core focus of my work is ensuring that every agent-generated hypothesis and retrieved state remains bound to the exact data and model checkpoints that produced it, making findings fully re-derivable as the biological knowledge base evolves. Ultimately, I aim to advance the frontier of trustworthy autonomous single-cell informatics, bridging AI agents, virtual cell engineering, and biological discovery.

STANFORD ADVISORS

- Lei Xing, Postdoctoral Faculty Sponsor

Research & Scholarship

LAB AFFILIATIONS

- Lei Xing, Xing Lab (5/21/2024)

Publications

PUBLICATIONS

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