Sizhe (Alex) Xu

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Education

New York University Sept 2024 - June 2026
Master of Science - Urban Data Science

- **Courses**: Urban Computing & AI, Data Science, Deep Learning, Computer Vision, Large Language and Vision Models, Transportation and Logistics, Innovative City Governance, Probability and Stochastic Processes
- **Awards**: NYU Experiential Scholars, Best Technical Contribution Award in Global Data Dive Competition

Publications

[1]. **Sizhe Xu***, Renzhao Liang*, Chenggang Xie, Jingru Chen, Feiyang Ren, Shu Yang, Takahiro Yabe, "Abstain Mask Retain Core: Time Series Prediction by Adaptive Masking Loss", *Advances in Neural Information Processing Systems* (2025) **Spotlight (top 5%)**. * Denotes equal contribution.

[2]. **Sizhe Xu**, Boyang Li, Donghak Lee, Takahiro Yabe, "Thinking on the Move (ToM): A Framework for LLM-Agent-based Reinforcement Learning in Urban Mobility Simulation", *Under Review* (2025).

[3]. Boyang Li, **Sizhe Xu**, Yulin Wu, Takahiro Yabe, "A Generalized RoPE for n-Dimensional Position Embedding", *In Progress* (2025).

Research

Abstain Mask Retain Core: Time Series Prediction by Adaptive Masking Loss
Co-first Author, Neural Information Processing Systems (NeurIPS) 2025 Spotlight Mar 2025 - Aug 2025

- **Theoretical Innovation**: Challenged conventional "long-sequence information gain hypothesis" through systematic experimentation; discovered that appropriately truncating historical data paradoxically enhances prediction accuracy by eliminating redundant features and noise.
- **Methodological Framework**: Developed AMRC (Adaptive Masking Loss with Representation Consistency) framework based on information bottleneck theory; integrated dynamic masking loss for discriminative temporal segment identification and representation consistency constraints for stable mapping relationships.
- **Performance Achievement**: Achieved significant improvements across multiple datasets; over 80% of samples exhibited improved predictive performance while effectively suppressing redundant feature learning.

Thinking on the Move (ToM): A Framework for LLM-RL in Mobility Simulation
Under Review June 2025 - Present

- **LLM-enhanced Agent Modeling**: Integrated Dewey and Cuebiq mobility datasets for Brooklyn Downtown analysis; pioneered LLM-generated user profiles in agent-based modeling to simulate individual decision-making and aggregate mobility behaviors for realistic forecasting.
- **Predictive Analytics Framework**: Established evaluation framework benchmarking LLM-enhanced models against conventional discrete choice and gravity models; developed commercial site selection optimization through predictive mobility analytics.

SnowFox Technology Co., Ltd. Remote
Embedded System Developer (Entrepreneurship) Nov 2022 - Apr 2024

- **Motion Capture & Real-time Processing**: Developed sensor fusion firmware for STM32F4 microcontrollers with MPU9250 9-DoF IMU arrays; implemented multi-rate EKF and quaternion-based orientation estimation with 200Hz sampling and efficient fixed-point computation for power-constrained wearable devices.
- **3D Visual Analytics**: Created real-time biomechanical analysis pipeline with Unity HDRP renderer, IK solver optimization, and TensorFlow Lite for edge-deployed BiRNN movement classification; integrated performance metrics dashboard and RESTful API for cloud synchronization through AWS IoT Core.

Projects

Multi-modal Context-aware RAG System Dec 2024 - June 2025
Developed RAG system handling text, images, and structured data with hybrid search and hallucination detection.
Tech: LangChain, Pinecone, FAISS, HuggingFace Transformers, CLIP

Small Object Image Segmentation Mar 2024 - June 2024
Active contour framework integrating improved YOLOv8, enhancing boundary precision and segmentation accuracy.
Tech: PyTorch, OpenCV, YOLOv8, FPN, EMA, TensorRT, ONNX

Honors and Awards

- Bronze Medal in the China Collegiate Programming Contest (CCPC) - Oct, 2023

References

Takahiro Yabe: Assistant Professor at the Department of Technology Management and Innovation and the Center for Urban Science + Progress, New York University.

Zhaoxi Zhang: Assistant Professor at the College of Design, Construction and Planning, University of Florida (formerly Postdoctoral Researcher at NYU CUSP during the mentorship period).

Tamir Mendel: Postdoctoral Researcher at the Department of Technology Management and Innovation, New York University.