

# 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


**Dalian Jiaotong University** Sept 2020 - June 2024  
Bachelor of Engineering - Electronic Engineering

- **Courses:** Analog Electronics, Object-Oriented Programming, Algorithm Design, Machine Learning


## 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**, Renzhao Liang, Jun Han, Qitong Sun, "A Hybrid Framework for Evaluating and Enhancing Syntactic and Semantic Diversity in Low-Resource Text Generation", *Under Review* (2025).
- [3]. **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", *In Progress* (2025).
- [4]. 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 50% of samples exhibited improved predictive performance while effectively suppressing redundant feature learning.

**A Hybrid Framework for Evaluating and Enhancing Syntactic and Semantic Diversity**   
First Author, Under Review Jan 2025 - July 2025

- **Framework:** Designed and implemented a hybrid framework integrating probabilistic generative models with LLMs for synthetic data generation in low-resource scenarios.
- **Innovation:** Pioneered reference-free metrics for syntactic and semantic diversity evaluation, eliminating dependency on gold standards; leveraged LLMs for realistic text refinement while maintaining semantic integrity.
- **Performance:** Enhanced downstream classification with 13% F1-score improvement; generated text achieved higher human evaluation scores for naturalness and fluency while preserving key linguistic patterns.

**Urban Mobility Prediction for Commercial Site Selection** Guided Study  
NYU Center for Urban Science and Progress (Mentor: *Prof. Takahiro Yabe*) 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.

**Intelligent School District Advisory Service** Guided Study  
NYU Center for Urban Science and Progress (Mentor: *Prof. Zhaoxi Zhang*) Dec 2024 - Apr 2025

- **Data Engineering:** Designed scalable ETL pipeline for processing and integrating 15+ diverse educational datasets; implemented data quality monitoring with Great Expectations and optimized PostGIS queries for spatial joins.
- **Geospatial Analysis:** Developed interactive platform visualizing geographic and school performance data; implemented Gemini-powered recommendation system for personalized school selection advice.

EXPERIENCE

- Global Data Dive Competition - Skyline & Sustainability

New York, NY

Best Technical Contribution Award Winner

Feb 2025

  - Advanced LLM Integration: Implemented LLaMA-3-8B model with custom RAG architecture for real-time building energy efficiency analysis; optimized vector retrieval for 3D building data querying and developed prompt engineering techniques for domain-specific responses.
  - Urban Sustainability Platform: Created interactive 3D visualization of NYC buildings with energy compliance metrics; built end-to-end solution for policymakers and investors to assess sustainability impact through natural language queries and geospatial analytics.
- National College Student Smart Car Competition - Intelligent Vision Group

Dalian, China

Team Leader & Primary Contributor - First Prize Winner

Dec 2022 - July 2023

  - System Integration & Leadership: Led 5-member multidisciplinary team through complete autonomous vehicle development cycle; designed and implemented integrated control algorithms for mechanical structure, embedded systems, and machine learning components.
  - Hardware & Control Systems: Engineered Mecanum wheel-based chassis with 3D-printed modular storage compartments; developed custom PCB with NXP RT1064 microcontroller, DRV8701 motor drivers, and sensor fusion from ICM-20602 gyroscope and 4-directional encoders for precise motion control using Kalman filtering and PID optimization.
  - Computer Vision & Automation: Implemented MobileNetV2-based object classification system with custom dataset captured using OpenART; achieved end-to-end automation for card detection, pickup, sorting, and storage tasks through integrated mechanical arm with SPT5410 servos and electromagnetic actuators.
- 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 (96.4% accuracy); integrated performance metrics dashboard and RESTful API for cloud synchronization through AWS IoT Core.
  - Impact: Deployed at 5 ski resorts, increasing user satisfaction by 50% and expanding customer base over 1,000 users.

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
- Ecological Model for Fungal Biocontrol

Aug 2022 - Mar 2023

Fungal growth management system for optimizing ecological balance and maximizing agricultural profitability.

Tech: Tensorflow, RLib, MADDPG, PSO, PostgreSQL, Optuna, ArcGIS, Folium

SKILLS SUMMARY

- Languages:

Python, Rust, C++, R, SQL, Go, JAVA, LaTeX, Swift
- Frameworks:

Scikit, PyTorch, LangChain, CUDA, Django, Spring Boot, Unity, NodeJS
- Tools:

SolidWorks, Docker, Kubernetes, ArcGIS, vLLM, Git, ONNX
- Platforms:

Ubuntu, Kali, Raspberry Pi, ROS, NVIDIA Jetson, GCP, AWS

HONORS AND AWARDS

- Spotlight Poster Presentation at NeurIPS 2025 - Sept, 2025
- Best Technical Contribution Award - Global Data Dive Competition - Feb, 2025
- Finalist of NYU CUSP Public Data Challenge - Oct, 2024
- NYU CUSP Experiential Scholars - Sept, 2024
- First Prize of National Intelligent Car Competition - Aug, 2023
- 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.