Zhangding Liu

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EDUCATION

Georgia Institute of Technology *Atlanta, Georgia*
Ph.D. Civil Engineering, College of Engineering (3.9/4.0) *8/2023-Present*
M.S. Computational Science and Engineering, College of Computing (4.0/4.0) *8/2023-Present*
Tongji University *Shanghai, China*
B.Eng. Artificial Intelligence in Civil Engineering (93.7/100, rank 4/32) *9/2019-6/2023*

RESEARCH EXPERIENCE

AI-enabled Coastal Community Flood Resilience: Digital Twin Reinforced Emergency Infrastructure Systems *9/2024-now*
Gatech, Atlanta
Supervisors: Dr. John E. Taylor and Dr. Neda Mohammadi

- Knowledge-augmented VLM for Flood Depth Inference: Designed a vision-language framework that combines crowdsourced visual-textual data with structured knowledge graphs to support contextual reasoning and improve the accuracy of road flood depth assessment.
- NLP for Crisis Informatics: Fine-tuned DistilBERT for post-hurricane social media data analysis, identifying community needs and improving humanitarian aid allocation.
- Optimized dynamic EMS vehicle staging during urban floods by integrating real-time road closure and flood impact data.

Multi-level Class-Specific Attention Network for Post-Hurricane Damage Assessment *9/2024-1/2025*
Gatech, Atlanta
Supervisors: Dr. John E. Taylor and Dr. Neda Mohammadi

- Developed a multi-label classification framework combining multiscale feature extraction with a class-specific multi-head residual attention mechanism, enabling fine-grained recognition of co-occurring infrastructure damage types after hurricane.
- Achieved 91.84% mAP on the RescueNet-10 benchmark, outperforming previous SOTA, and contributed to automated disaster impact mapping.

Research Assistant at Lawrence Berkeley National Laboratory *5/2024-8/2024*
Supervisor: Dr. Tianzhen Hong *Berkeley, CA*

- Developed a Heat Vulnerability Index (HVI) map for Oakland, integrating data on weather, demographics, health, and green spaces. Designed a web-based app in CityBES platform to visualize HVI data, enabling better urban heat resilience planning.
- Explored robotics applications in HVAC systems to enhance quality, safety, and efficiency in installation and maintenance processes.

Applying Machine Learning Techniques to Improve Epidemiological Models Accounting for Urban Infrastructure Networks, Human Behavioral Change, and Policy Interventions. (AI.Humanity) *8/2023-5/2024*
Gatech/Emory
Supervisors: Dr. John E. Taylor and Dr. Neda Mohammadi

- Proposed a machine learning–guided framework to calibrate disease transmission parameters by integrating urban infrastructure density and human mobility constraints.
- Reduced early-stage COVID-19 case prediction error (RMSE) by 46%, demonstrating

the model's robustness under sparse and noisy data conditions.

Synthetic Data Augmentation for Construction Site Automation *1/2022-10/2022*

Supervisor: Dr. Yujie Lu *Tongji, Shanghai*

- Leveraged Unreal Engine (UE4) for multi-angle 3D model generation and Swin Transformer for enhanced background feature extraction.
- Designed a context-aware object placement algorithm based on KL divergence and content loss, improving dataset realism and achieving +2.1% mAP over real datasets in object detection tasks.

Multi-Object Tracking for Overlapped Construction Workers *7/2021-1/2022*

Supervisors: Dr. Bin Yang and Dr. Zhihua Wei *Tongji, Shanghai*

- Deployed YOLOv5 for real-time detection of construction workers and PPE compliance in dynamic construction sites.
- Integrated DeepSORT with Kalman filtering and appearance embedding to improve object identity preservation under occlusion and overlap, enabling robust spatiotemporal tracking in high-density scenes.

HONORS & AWARDS

- Gilbert F. "Gil" Amelio Engineering Fellowship. (College of Engineering, GT) *4/2024*
- Outstanding undergraduate student of Tongji University (top 3%) *6/2023*
- First-Class Scholarship of Tongji University (top 15%) *9/2022*
- The Silver Medal of U.S. Physics Modeling Competition (international 15%) *11/2021*
- The first prize of Mathematical Contest in Modeling (national 5%) *10/2021*

PUBLICATIONS

Liu Z., Mohammadi, N., & Taylor, J. E.* MLCSANet: A Residual Attention-Based Multi-Label Classification Method for Post-Hurricane Damage Assessment. *Journal of Computing in Civil Engineering. (submitted)* *3/2025*

Liu Z., Mohammadi, N., & Taylor, J. E.* A Multi-Label Classification Framework for Hurricane Damage Assessment. *2025 International Conference on Computing in Civil Engineering. (Accepted)* *3/2025*

Thomas M. M., **Liu Z.**, Mohammadi, N., & Taylor, J. E.* Adjusting Mechanistic Epidemiological Models to Account for Urban Infrastructure Factors. American Journal of Epidemiology. (Under review) *2/2025*

Lu, Y., Liu, B., Wei, W. *, Xiao, B., **Liu, Z.**, & Li, W. (2025). Generating synthetic images for construction machinery data augmentation utilizing context-aware object placement. Developments in the Built Environment, 21, 100610. https://doi.org/10.1016/j.dibe.2025.100610 *1/2025*

Thomas M. M., **Liu Z.**, Mohammadi, N., & Taylor, J. E.* Epidemiological Models of COVID-19: Controlling for the Impact of Metro Area Crowding. *2024 International Conference on Computing in Civil Engineering. (Accepted)* *7/2024*

Preparation

Liu Z., Mohammadi, N., & Taylor, J. E.* Knowledge-Augmented Vision-Language Models for Multimodal Urban Flood Impact Assessment. *(In preparation)* *2/2025-now*

Liu Z., Li H., Taylor, J. E., & Hong T.* Robotics application for HVAC system: A critical *7/2024-now*

review and future trends. *Automation in construction.* (*In preparation*)

INTERNSHIP

Machine Learning Engineer at Chuangle (Shanghai) Information Technology *5/2022-8/2022*
Shanghai, China

- Developed a worker safety monitoring system using YOLOv5 and OpenCV, achieving 97.6% detection accuracy and reducing on-site safety incidents by 60% through proactive hazard identification.
- Optimized Mask R-CNN semantic segmentation models to detect structural defects from drone-collected imagery, increasing segmentation accuracy by 15.9% and reducing manual inspection workloads by 80%.

SERVICE/LEADERSHIP

Conferences Reviewer *2024/2025*

- I3CE: ASCE International Conference on Computing in Civil Engineering (Top conference in AI for Civil Engineering)

Director of Projects, Innovation Club in Tongji university *9/2020-7/2021*

- Organized the Student Innovation Training Programs and National College Student Innovation Projects.
- Hosted the project proposal, mid-term review, and final evaluation activities.