

Jiaxi YU

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Wuhan, Hubei, China
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EDUCATION

M.S. in Engineering | Sustainable Energy and Environmental Engineering

The University of Osaka

Osaka, Japan

Apr. 2023 – Mar. 2025

GPA: 3.73/4.0

Major Courses: Spatial Design for Symbiotic Environment (S)

Advanced Ecological Engineering of Natural and Social Systems (S)

Frontiers of Sustainability Science (A)

Thesis: Benchmarking Attention Mechanisms and Consistency Regularization Semi-supervised Learning for Post-flood Building Damage Assessment

Advisor: Tomohiro Fukuda

B.S. in Agriculture | Landscape Architecture

China Agricultural University

Beijing, China

Sep. 2017 – Jun. 2021

GPA: 3.48/4.0

Major Courses: Basis of Geology (A+)

Computer Aid Landscape Design (A)

Ecology for Landscape Architecture (A)

Introduction of Remote Sensing and GIS (A)

Thesis: Design of Commercial Renovation Project of Zhongguancun Pedestrian Street

Advisor: Xianfeng Li

TECHNICAL SKILLS

- **Methods:** Deep learning, Computer vision, Remote sensing, GIS, 3D reconstruction
- **Language:** Mandarin (Native), English (TOEIC:775), Japanese (JLPT N2)
- **Programming Languages:** Python, C++, HTML/CSS, JavaScript, React, LaTeX
- **Software:** ArcGIS, ENVI, COLMAP, Unity, Rhino/Grasshopper, AutoCAD, Revit, Adobe Creative Suite

PUBLICATION

- **Yu, J.**, Fukuda, T., & Yabuki, N. (2025). Benchmarking attention mechanisms and consistency regularization semi-supervised learning for post-flood building damage assessment. *International Journal of Disaster Risk Reduction*, 128, Article 105664. <https://doi.org/10.1016/j.ijdr.2025.105664>
- **Yu, J.**, Fukuda, T., & Yabuki, N. (2024). Combining social media images and bitemporal satellite images for automated detection of damaged areas after flooding. In Proceedings of the 29th International Conference of the Association for Computer-Aided Architectural Design Research in Asia (CAADRIA 2024) (Vol. 2, pp. 59–68). <https://doi.org/10.52842/conf.caadria.2024.2.059>

RESEARCH PROJECTS

A Multi-modal Framework for Post-flood Building Damage Assessment Integrating Large Language Models and Semantic Segmentation (Ongoing)

Independent Research Project | Jan. 2025 - present

Research Objective:

To develop a **multimodal deep-learning framework** that improves post-flood building damage assessment by combining visual evidence with disaster-domain contextual knowledge.

Research Background:

Segmentation models capture fine-grained visual patterns, but their predictions can be limited by **ambiguous damage appearance** and **scarce labeled data**. Large language models offer complementary **contextual priors** that may support more robust assessment.

Methodology:

Fine-tuned Qwen2.5-7B on a disaster-specific dataset, integrated it as a text-understanding branch with a segmentation model, and fused textual priors with visual features for final prediction.

Responsibilities:

- Developed and implemented the experimental workflow.
- Fine-tuned the Qwen2.5-7B model.
- Implemented multimodal fusion and conducted evaluation.

Achievements:

- **VLM Adaptation:** Fine-tuned the Qwen2.5-7B text branch within the LLaVA framework, enabling the model to generate structured textual descriptions for building damage assessment, successfully outputting **three out of four damage categories** (Variable).
- **Multimodal Fusion:** Developed a framework integrating the fine-tuned Qwen2.5-7B text branch with a segmentation backbone. In the binary "damaged" classification, it achieved an F1-score of **0.9456** and a Recall of **0.9637**, outperforming the **ChangeMamba** baseline (F1: 0.7608, Recall: 0.7310) by **18.48%** and **23.27%**.
- **Critical Sub-task Performance:** In the 4-class "**major damage**" sub-task, the proposed method achieved a Recall of **0.9223** (a **22.13%** improvement over ChangeMamba's 0.7010), demonstrating a significantly reduced omission rate for severely damaged buildings.

Benchmarking Attention Mechanisms and Consistency Regularization Semi-supervised Learning for Post-flood Building Damage Assessment

Master Thesis | Dec. 2023 - Oct. 2024 | Advisor: Tomohiro Fukuda

Research Objective:

To evaluate **attention mechanisms** and **image-level consistency regularization** for post-flood building damage assessment, and to develop a **semi-supervised** approach that reduces reliance on large labeled datasets.

Research Background:

- Post-flood damage assessment requires timely and reliable building-level labelled data, while pixel-level labels are expensive to obtain.
- The effects of consistency regularization, a semi-supervised learning method, and different attention modules in post-flood damage assessment have not been systematically established.

Methodology:

Benchmarked multiple deep-learning modules for change detection, developed and optimized a **prior-attention module**, and designed experiments to evaluate **image-level** consistency regularization in semi-supervised learning (SSL).

Responsibilities:

- Independently completed the literature review, framework design, implementation, experiments, analysis, and manuscript preparation.

Achievements:

- Pioneered **systematic SSL evaluation** for post-flood DA (140 configs, 5–50% labels), demonstrating pseudo-label consistency yields **+4.84% Kappa** gain over ground truth at 5% annotation and establishing **recall as the optimal metric** for life-critical disaster response.
- Designed SPADANet, a lightweight U-Net variant with a prior attention module, achieving **+9.22% recall improvement** and **29% fewer fatal misclassifications** (destroyed → no damage) against CD baselines, validating task-specific engineering over generic pre-training for post-disaster assessment.
- Published in *International Journal of Disaster Risk Reduction* (**JCR Q1, IF – 4.8**).

Combining Social Media Images and Bitemporal Satellite Images for Automated Detection of Damaged Areas After Flooding

CAADRIA 2024 Paper | Apr. 2023 - Nov. 2023 | Advisor: Tomohiro Fukuda

Research Objective:

To improve automated detection of flood-damaged areas when post-event remote-sensing imagery is sparse.

Research Background:

Satellite images offer broad spatial coverage but may be unavailable immediately after a flood. Social-media images are timely and low-cost, yet are rarely used with bitemporal satellite data.

Methodology:

Developed a model that **fuses bitemporal remote-sensing images** with **social-media images**, using an improved encoder to extract and integrate features from the two data sources.

Responsibilities:

- Independently completed study design, data processing, model development, experiments, analysis, paper writing, and conference presentation.

Achievements:

- Developed a bitemporal image transformer with CNN feature fusion integrating satellite and social media imagery, achieving **+2% F1-score** over baseline on the Midwest-flooding dataset with **3.04M** parameters, demonstrating multi-source data's efficacy in enhancing disaster detection generalization.

- Published and presented at CAADRIA 2024.

Mixed Reality for Remote Inspection Systems

Research Assistant | Mar. 2024

Project Purpose:

To build high-fidelity 3D digital assets that support interaction and analysis for remote building and facility inspection in mixed-reality environments.

Methodology:

Reconstructed image sequences into 3D models with **Structure-from-Motion** (SfM) toolchains (COLMAP and MicMac), and explored **Neural Radiation Field** (NeRF) for high-quality reconstruction and rendering.

Responsibilities:

- Contributed to the execution of the 3D reconstruction pipeline and compared SfM and NeRF outputs.

Achievements:

- Generated multiple high-fidelity 3D models, providing digital assets for the subsequent development of the MR system.
- Conducted a comparative analysis of SfM and NeRF methods, evaluating their differences in reconstruction quality and efficiency.

Design of Commercial Renovation Project of Zhongguancun Pedestrian Street

Bachelor Thesis | 2020 - 2021 | Advisor: Xianfeng Li

Research Objective:

To develop a renovation strategy that reactivates Zhongguancun Pedestrian Street

Methodology:

Conducted site analysis of historical evolution, demographics, and pedestrian flows; used **Rhino** and **Grasshopper** for parametric design exploration; and developed models and visualizations with **SketchUp**, **Revit**, **Lumion**, and **Adobe Creative Suite**.

Responsibilities:

- Independently completed site analysis, developed the design strategy, and produced the final drawings, diagrams, and renderings.

Achievements:

- Delivered a complete renovation proposal and a professional **design portfolio**.

Historical Evolution of Public Art Materials in Beijing

Undergraduate Research Program of China Agricultural University | 2019 - 2020 | Advisor: Xianfeng Li

Research Objective:

To investigate how material choices in public art in central Beijing have changed over time and how they relate to modernization, industrial capacity, and economic development.

Methodology:

Conducted fieldwork and built a **SQL** database capturing artwork dates, materials, and artistic characteristics; applied correlation and statistical-significance analysis in **SPSS** to relate material categories to historical periods.

Responsibilities:

- Led field data collection, data organization, database development, and data analysis.

Achievements:

- Produced a structured database and preliminary evidence linking material use to industrial production capacity and economic development in different historical periods.

WORK EXPERIENCE

Staff, Landscape Project | Phase I project of the Golden Valley government resettlement housing

Shandong, China | Nov. 2021 – Feb. 2022

Supported project management for a 650,000 m² residential development, overseeing the entire process of earthwork operations and landscape planting while coordinating with surveyors and subcontractors.

Staff, Decoration Project | Phase I Project of the Luoyang Olympic Center

Henan, China | Aug. 2021 – Oct. 2021

Participated in managing a 4.6B RMB, 45,000 m² project, overseeing interior fit-out for a 60,000-seat stadium and executing model room construction, while providing technical support for on-site measurements and workmanship.

HONORS & AWARDS

- **Outstanding Staff**, China Construction Eighth Engineering Bureau Second Construction Co. (2021)
- **Third Class Academic Excellence Scholarship**, China Agriculture University (2019)
- **Academic Progress Scholarship**, China Agriculture University (2019)

ACADEMIC & SOCIAL ACTIVITIES

- **Member**, Community-based research, China Agricultural University (2018)
- **Member**, The Magazine Landscape Architecture (China), Stormwater Parametric Management Studio (2019)
- **Student Cadre**, Sports Department, Student Union, China Agricultural University (2017 - 2019)
- **Tutor**, Environmental Design and Information Technology Laboratory, The University of Osaka (2023 - 2024)