Taisei Saida

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EDUCATION

Apr 2021 - present	University of Tsukuba, Japan Engineering Master's Program, Graduate School of Science and Technology
Mar 2021	University of Tsukuba, Japan Bachelor of Engineering, College of Engineering Systems

RESERCH POSITION

Jun 2021 – present	Research Assistant, University of Tsukuba, Japan
May 2019 – Dec 2022	Research Assistant, National Agriculture and Food Research Organization, Japan
Sep 2021	Research Internship, Taisei Company Technology Center, Japan
Aug 2021 – Sep 2021	Research Internship, NTT Access Network Service Systems Laboratories, Japan

RESERCH EXPERIENCE

- Research Assistant, University of Tsukuba
  - ✓ Conducted research on surrogate modeling for structural reliability analysis of bridges under uncertain loads and parameters.
  - ✓ Developed and applied various surrogate models, such as Gaussian process regression and deep neural networks, to estimate the failure probability and sensitivity of bridges.
  - ✓ Acquired machine learning programming skills in Python and PyTorch, and learned how to use various tools and frameworks for data processing, model training, and evaluation.
- Research Assistant, National Agriculture and Food Research Organization
  - ✓ Conducted research on autonomous driving of agricultural machines, such as tractors and harvesters.
  - ✓ Developed and implemented algorithms for path planning and obstacle avoidance of the

machines using point cloud data.

- ✓ Created and tested a simulator for autonomous driving of the machines using Unity game engine and C# programming language.
- ✓ Acquired point clouds of the farmland using UAVs, and integrated them into the simulator to create realistic environments. (Video: https://youtu.be/lGZbcu4cE18?t=4625)
- ✓ Acquired C# programming skills, Unity game engine skills, and point cloud processing skills, and learned how to use various tools and libraries for simulation and visualization.

➢ Research Internship, Taisei Company Technology Center

- ✓ Worked on a project to develop and test a drone delivery system using computer vision.
- ✓ Collaborated with other interns and mentors to develop and test the algorithms for drone flight planning and marker detection using Python and OpenCV.

➢ Research Internship, NTT Access Network Service Systems Laboratories

- ✓ Worked on a project to develop and test a web-based system for visualizing the information of communication pipelines acquired by GNSS and ground penetrating radar.
- ✓ Proposed a system for converting 2D drawings of manholes into 3D drawings using CNNs, and demonstrated its feasibility.
- ✓ Acquired GNSS and ground penetrating radar skills, JavaScript programming skills, and web development skills, and learned how to use various tools and libraries for data acquisition, processing, and visualization.

RESERCH INTERESTS

- ➢ My research motivation is to develop and apply surrogate modeling techniques using Gaussian process regression and deep neural networks to various engineering and scientific problems.
- ➢ Surrogate modeling is a technique that uses faster approximate models by machine learning instead of high-dimensional or high-fidelity simulation models.
- ➢ I am curious about how surrogate modeling can capture the underlying physics and uncertainty of the systems, and how it can improve the performance and reliability of the systems.
- ➢ I am also interested in ensuring the interpretability and explainability of the surrogate models, especially when using complex and nonlinear models such as deep neural networks. I want to understand how the surrogate models make predictions and how they can be trusted and communicated to the stakeholders and decision makers.

PUBLICATIONS

Saida T, Nishio M. “Transfer learning Gaussian process regression surrogate model with explainability for structural reliability analysis under variation in uncertainties.” Computers and Structures. (Major Revision)

Saida T, Rashid M, Nemoto Y, Tsukamoto S, Asai T, Nishio M. “CNN-based segmentation frameworks for structural component and earthquake damage determinations using UAV images.” Earthquake Engineering and Engineering Vibration. (Accepted)

Saida T, Nishio M. “CONSTRUCTION OF GAUSSIAN PROCESS REGRESSION SURROGATE MODEL FOR NONLINEAR SEISMIC RESPONSE ANALYSIS USING ARD KERNEL.” Journal of Japan Society of Civil Engineers (Applied Mechanics). 2021. 77. 2. I_93-I_104. (in Japanese)

CONFERENCE PRESENTATIONS (only INTERNATIONAL)

Saida T. Nishio M. “Gaussian process regression surrogate model for dynamic analysis to account for uncertainties in seismic loading.” SPIE Smart Structures + NDE 2023. Mar 2023.

Okuda T, **Saida T**, Matono G, Nishio M. “Digital twin framework for real-time dynamic analysis visualization with detecting dynamic changes in structures properties using PINN.” SPIE Smart Structures + NDE 2023. Mar 2023.

Saida T, Nishio M. “Gaussian Process Regression Surrogate Modeling with Transfer Learning for Low Computational Cost Structural Reliability Analysis.” 15th World Congress on Computational Mechanics & 8th Asian Pacific Congress on Computational Mechanics. Aug 2022.

Awards

Saida T, Nemoto Y, Tsukamoto S, Rashid M. Honorable Mention. The 2nd International Competition for Structural Health Monitoring. ANCRiSST. 2022.

Saida T. Applied Mechanics Presentation Award. The 24th Symposium on Applied Mechanics. Japan Society of Civil Engineers. 2021.