

Kei Hiroshima

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Citizenship: Japan

Research interests

I am broadly interested in recognition with machine learning models, and in bridging machine learning and optimization. In my PhD, I study how machine learning models can learn continually and efficiently, and how large language models (LLMs) can automate black-box optimization. My research spans two themes: the development of dynamic, preference-aware model merging algorithms for continual learning, and LLM-driven automatic formulation and algorithm selection for black-box optimization. The former addresses knowledge retention across sequential tasks — avoiding catastrophic forgetting — while the latter focuses on identifying the search space of an optimization problem and selecting an appropriate algorithm from natural language descriptions alone.

Artificial Intelligence, Machine Learning, Continual Learning, Large Language Models, Model Merging, Black-Box Optimization, Natural Language Processing

Education

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| 2025 – Present | Yokohama National University – Yokohama, Japan
Ph.D. in Information Science, Graduate School of Environment and Information Sciences, Shirakawa/Uchida Laboratory (Supervisors: Prof. Shinichi Shirakawa, Asst. Prof. Kento Uchida).
<i>Expected graduation: Spring 2028.</i> |
| 2023 | University of Technology Sydney (UTS) – Sydney, Australia
Exchange Student, Faculty of Engineering and Information Technology
<i>January – December 2023.</i> |
| 2022 – 2025 | Yokohama National University – Yokohama, Japan
M.S. in Informatics, Graduate School of Environment and Information Sciences |

2018 – 2022 **Yokohama National University** – Yokohama, Japan
B.E. in Electrical and Computer Engineering, College of Engineering Science Department of Mathematics, Physics, Electrical Engineering and Computer Science

Fellowships

2025 – 2028 **JST SPRING**
Support for Pioneering Research Initiated by the Next Generation (SPRING), Japan Science and Technology Agency (JST).

Research experience

2022 – Present **Graduate Researcher, Shirakawa/Uchida Laboratory** (Yokohama National University)
Supervisors: Prof. Shinichi Shirakawa, Asst. Prof. Kento Uchida.

Industry experience

Jan 2024 – Aug 2025 **AI Engineer Intern (Long-term)** – IDAJ Co., Ltd., Yokohama, Japan
Conducted machine-learning research to inform and prototype engineering solutions for industrial clients. The areas I researched were:

- Recognition models for 3D point-cloud data.
- Reinforcement-learning agents for energy distribution control.

Teaching experience

2025 – 2026 **Part-time Lecturer – Introduction to Mathematics, Data Science and AI**
Yokohama National University, Yokohama, Japan.

Publications

- 2026 **Tunable MAGMAX: Preference-Aware Model Merging for Continual Learning**
K. Hiroshima, K. Uchida, and S. Shirakawa.
Proceedings of the 28th International Conference on Pattern Recognition (ICPR 2026), Lyon, France. *To appear*.
- 2026 **BBOWP-Bench: Evaluating LLMs on Black-Box Optimization Word Problems**
Y. Yamada, K. Hiroshima, N. Yoshinari, K. Uchida, and S. Shirakawa.
Advances in Neural Information Processing Systems (NeurIPS 2026), Sydney, Australia.
Under review.
- 2026 **Autoformulation Benchmark Suite of Black-Box Optimization Problems Described in Natural Language**
Y. Yamada, K. Hiroshima, N. Yoshinari, K. Uchida, and S. Shirakawa.
The 40th Annual Conference of the Japanese Society for Artificial Intelligence, 2026, Gunma, Japan.
- 2025 **Enhancing Atherosclerosis Risk Prediction with Strategic Feature and Case Selections in Large Language Model**
H. Murase, K. Hiroshima, K. Uchida, M. Ohashi, N. Kashihara, A. J. Viera, H. Daida, S. Shirakawa, and Y. Yano.
ESC Congress 2025, Madrid, Spain.
- 2025 **Controlling Forgetting via Model Merging in Continual Learning**
K. Hiroshima, K. Uchida, and S. Shirakawa.
39th SSI 2025, Iwate, Japan.
[SSI Excellent Presentation Award]

Honors and awards

- 2025 **SSI Excellent Presentation Award**
SSI 2025 – SICE Symposium on Systems and Information, Iwate, Japan.
Awarded for the presentation “Controlling Forgetting via Model Merging in Continual Learning.”

Technical skills

Programming languages

Proficient in: Python, R

Frameworks and libraries

PyTorch, Keras, scikit-learn, OpenCV, Hugging Face

Tools and infrastructure

Git, Docker

Languages

Japanese (native), English (TOEIC 860 / IELTS 6.5: L 6.0 / R 7.0 / W 6.0 / S 6.0)