Shuhei Watanabe

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Education

Oct 2020 – Oct 2023	**University of Freiburg**, Freiburg, Germany. MSc in Computer Science. Supervisor: Prof. Frank Hutter. Overall GPA: 1.1/5.0 (1.0 is the best grade).
Sep 2015 – Mar 2020	**The University of Tokyo**, Tokyo, Japan. BSc in Systems Innovation. Graduated with **the Best GPA** out of 37 students.
Apr 2014 – Aug 2015	**The University of Tokyo**, Tokyo, Japan. Bachelor of College of Arts and Science, Natural Science 1.

Employment

Jun 2024 – Present	**National Institute of Advanced Industrial Science and Technology (AIST)**, Tokyo, Japan. (Part Time Visiting Researcher at Social Intelligence Research (SIR) Team) Mentored Chisa Mori & Kaichi Irie (see below for more details).
Oct 2023 – Dec 2025	**Preferred Networks Inc.**, Tokyo, Japan. (Full Time Research Engineer) Core Optuna developer. Delivered significant speedup of `TPESampler` (300x), the default sampler in Optuna, and `GPSampler` (10x faster than BoTorch). Led the development of `GPSampler` and its extensions. Worked on revenue applications of Optuna for materials & physics simulations. (summarized achievements)
Dec 2020 – Sep 2023	**Machine Learning Lab**, Freiburg, Germany. Development of Auto-PyTorch, an AutoML tool.
Sep 2018 – Sep 2020	**AIST**, Tokyo, Japan. (Full Time Technical Staff at SIR Team) Co-first authored "Warm Starting CMA-ES for Hyperparameter Optimization" (AAAI'21). Conducted a large-scale experiment on a cluster.
Apr 2018 – Aug 2018	**M3, Inc.**, Tokyo, Japan. (Full-Time Internship) Genome Business Consulting.

Awards / Honors

Sep 2023	**AutoML 2023 Travel Awards** (500 EUR).
Aug 2023	**IJCAI-AIJ 2023 Travel and Accessibility Grant Program** (1,000 USD).
Oct 2022	**NeurIPS 2022 Complimentary Registration** (350 USD).
Oct 2022	**ELIZA MSc Scholarship** (12,000 EUR, 4 students selected from the University).
Oct 2022	**Deutschlandstipendium** (3,600 EUR).
Jul 2022	**1st Prize in AutoML2022: Multiobjective Hyperparameter Optimization for Transformers**

Sep 2020	**ITO Foundation for International Education Exchange** (48,000 USD, AR: 6.7%).
Mar 2020	**Hatakeyama Award from the Japan Society of Mechanical Engineers**. Awarded for the distinctive grades at the University of Tokyo (AR: 5/340=1.5%).
May 2019	**PRMU 2018 Yearly Research Encouragement Award**. For "*Speed Up of Hyper-Parameter Tuning with Nelder-Mead Method by Parallel Computing*" (AR: 3/170=1.8%).
Oct 2014	**1st Prize in the Freshman Team Hokei in the National Intercollegiate Taido Tournament**. Taido is one of the Japanese traditional martial arts.

Publications & Talks

AR, ◯, and ♣ refer to the acceptance rate, the presenter and the equally contributed authors, respectively. The total citations on Google Scholar is **1000+** as of October 2025.

Theses

1. ◯ **S. Watanabe** (2023). Significant Runtime Reduction for Asynchronous Multi-Fidelity Optimization on Zero-Cost Benchmarks. Master thesis at the University of Freiburg.

2. ◯ **S. Watanabe** (2018). A Study on the Spontaneously Emerged Cooperation in a Collective Game with AI Type Agents. Bachelor thesis at the University of Tokyo.

Referred Conference Publications

1. ◯ C. Mori, **S. Watanabe**, M. Onishi, Takayuki Itoh (2025). User Preference-Based Parallel Coordinate Plots: Its Application in Guidance Planning. International Conference on Pedestrian and Evacuation Dynamics (PED).

2. ◯ ♣ C. Mori, ♣ **S. Watanabe**, M. Onishi, Takayuki Itoh (2025). Preference-Optimal Multi-Metric Weighting for Parallel Coordinate Plots. International Conference Information Visualisation (iV).

3. ◯ **S. Watanabe**, N. Mallik, E. Bergman, F. Hutter (2024). Fast Benchmarking of Asynchronous Multi-Fidelity Optimization on Zero-Cost Benchmarks. AutoML Conference.

4. ◯ **S. Watanabe**, F. Hutter (2023). c-TPE: Tree-Structured Parzen Estimator with Inequality Constraints for Expensive Hyperparameter Optimization. International Joint Conference on Artificial Intelligence (IJCAI) (AR: 644/4566≈14%).

5. ◯ **S. Watanabe**, N. Awad, M. Onishi, F. Hutter (2023). Speeding Up Multi-Objective Hyperparameter Optimization by Task Similarity-Based Meta-Learning for the Tree-Structured Parzen Estimator. International Joint Conference on Artificial Intelligence (IJCAI) (AR: 644/4566≈14%).

6. ◯ **S. Watanabe**, A. Bansal, F. Hutter (2023). PED-ANOVA: Efficiently Quantifying Hyperparameter Importance in Arbitrary Subspaces. International Joint Conference on Artificial Intelligence (IJCAI) (AR: 644/4566≈14%).

7. **S. Watanabe**, A. Bansal, F. Hutter (2023). PED-ANOVA: Efficiently Quantifying Hyperparameter Importance in Arbitrary Subspaces. International Joint Conference on Artificial Intelligence (IJCAI). (**The default algorithm in Optuna Dashboard**)

8. ⃝ S. Shigenaka, S. Takami, **S. Watanabe**, Y. Tanigaki, Y. Ozaki, M. Onishi (2021). MAS-Bench: Parameter Optimization Benchmark for Multi-Agent Crowd Simulation. International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS).

9. ⃝ ♣ M. Nomura, ♣ **S. Watanabe**, Y. Akimoto, Y. Ozaki, M. Onishi (2021). Warm Starting CMA-ES for Hyperparameter Optimization. AAAI Conference on Artificial Intelligence (AAAI). (AR: 1692/9034=19%).

10. ⃝ S. Takenaga, **S. Watanabe**, M. Nomura, Y. Ozaki, M. Onishi, H. Habe (2020). Evaluating Initialization of Nelder–Mead Method for Hyperparameter Optimization in Deep Learning. International Conference on Pattern Recognition (ICPR). Oral Presentation.

11. ⃝ Y. Ozaki, Y. Tanigaki, **S. Watanabe**, M. Onishi (2020). Multiobjective Tree-Structured Parzen Estimator for Computationally Expensive Optimization Problems. The Genetic and Evolutionary Computation Conference (GECCO).

12. ⃝ **S. Watanabe**, Y. Ozaki, Y. Bando, M. Onishi (2019). Speeding Up of the Nelder–Mead Method by Data–Driven Speculative Execution. Asian Conference on Pattern Recognition (ACPR). Oral Presentation. (AR: 128/273=46%, **Oral presentation: 36/273=13%**)

Referred Journal Publications

1. ⃝ S. Shigenaka, S. Takami, **S. Watanabe**, Y. Tanigaki, M. Onishi (2024). MAS-Bench: A Benchmarking for Parameter Calibration of Multi-Agent Crowd Simulation. Journal of Computational Social Science.

2. ⃝ Y. Ozaki, Y. Tanigaki, **S. Watanabe**, M. Nomura, M. Onishi (2022). Multiobjective Tree-Structured Parzen Estimator. Journal of Artificial Intelligence Research (JAIR).

Referred Workshop Publications

1. ⃝ K. Irie, **S. Watanabe**, M. Onishi (2026). Batch Acquisition Function Evaluations and Decouple Optimizer Updates for Faster Bayesian Optimization. Workshop on AI to Accelerate Science and Engineering (AI2ASE) at AAAI.

2. ⃝ **S. Watanabe** (2023). Python Wrapper for Simulating Multi-Fidelity Optimization on HPO Benchmarks without Any Wait. AutoML Conference Workshop Track.

3. ⃝ **S. Watanabe**, N. Awad, M. Onishi, F. Hutter (2022). Multi-Objective Tree-Structured Parzen Estimator Meets Meta-learning. Workshop on Meta-Learning (MetaLearn) at NeurIPS.

4. ⃝ **S. Watanabe**, F. Hutter (2022). c-TPE: Generalizing Tree-Structured Parzen Estimator with Inequality Constraints for Continuous and Categorical Hyperparameter Optimization. Workshop on Gaussian Processes, Spatiotemporal Modeling, and Decision-Making Systems (GPSMDM) at NeurIPS.

5. ⃝ ♣ M. Nomura, ♣ **S. Watanabe**, Y. Ozaki, M. Onishi (2019). Warm Starting Method for CMA-ES. Workshop on Meta-Learning (MetaLearn) at NeurIPS.

6. ⃝ Y. Ozaki, ⃝ **S. Watanabe**, M. Onishi (2019). Accelerating the Nelder–Mead Method with Predictive Evaluation. Workshop on Automated Machine Learning (AutoML) at ICML.

Preprints

1. **S. Watanabe** (2025). Approximation of Box Decomposition Algorithm for Fast Hypervolume-Based Multi-Objective Optimization. arXiv:2512.05825.

2. ♣ Y. Ozaki, ♣ **S. Watanabe**, T. Yanase (2025). OptunaHub: A Platform for Black-Box Optimization. arXiv:2510.02798.

3. K. Abe, Y. Wang, **S. Watanabe** (2025). Tree-Structured Parzen Estimator Can Solve Black-Box Combinatorial Optimization More Efficiently. arXiv:2507.08053.

4. **S. Watanabe** (2025). Derivation of Output Correlation Inferences for Multi-Output (aka Multi-Task) Gaussian Process. arXiv:2501.07964.

5. **S. Watanabe** (2024). Derivation of Closed Form of Expected Improvement for Gaussian Process Trained on Log-Transformed Objective. arXiv:2411.18095.

6. **S. Watanabe** (2023). Python Tool for Visualizing Variability of Pareto Fronts over Multiple Runs. arXiv:2305.08852.

7. **S. Watanabe** (2023). Tree-Structured Parzen Estimator: Understanding Its Algorithm Components and Their Roles for Better Empirical Performance. arXiv:2304.11127. (**400+ citations on Google Scholar**, the first detailed paper about the Optuna default sampler)

8. ◯ **S. Watanabe**, M. Nomura, M. Onishi (2020). The Characteristics Required in Hyperparameter Optimization of Deep Learning Algorithms. Japanese Society of Artificial Intelligence (JSAI).

9. ◯ **S. Watanabe**, Y. Ozaki, M. Onishi (2019). Speed Up of Hyper-Parameter Tuning with Nelder–Mead Method by Parallel Computing. Pattern Recognition and Media Understanding (PRMU). **PRMU 2018 Yearly Research Encouragement Award** (AR: 3/170=1.8%).

Talks

1. ◯ ♣ **S. Watanabe**, ◯ ♣ Y. Ozaki (2025). Future Directions of AutoML from the Optuna View. NII Shonan Meeting (Advancing Automated Machine Learning).

2. ◯ **S. Watanabe**, H. Imamura, C. Shinagawa, K. Shinohara, S. Takamoto, J. Li (2024). Multi-Objective Bayesian Optimization for Materials Discovery with Neural Network Potential – An Application to Li-Ion Battery Cathode Material. Materials Research Society Fall Meeting & Exhibit.

Academic Service

Reviewer

- AutoML Conference (2023).

Mentoring & Supervision

Jun 2024 – Present   **Chisa Mori**, MSc Student, AIST.
                                    Theme: Parallel coordinate plots for multi-objective problems.

Jul 2024 – Present	**Kaito Baba**, MSc Student, Preferred Networks Inc. Theme: Development of constrained optimization for the Gaussian process-based sampler (single-objective, multi-objective).
Aug 2025 – Present	**Kaichi Irie**, MSc Student, Preferred Networks Inc. & AIST. Theme: Development of parallel processing in the Gaussian process-based sampler (article, workshop paper).

Technical Highlights

- Cluster Experience (MPI, parallel programming, large-scale experiments, MOAB, Slurm)
- Physics-Based Simulation (lattice Boltzmann, numerical integration, constraint satisfaction)
- Machine Learning Understanding (deep learning, reinforcement learning)
- Software Engineering (Python, C++, PyTorch, team development)
- Strong Mathematical Background (statistics incl. measure theory, optimization)
- Applications of Bayesian Optimization (materials science & Sim2Real gap)
- Hands-on Experience (transformers with pretraining, generative teaching networks, DQN and imitation learning using OpenAI Gym)

Miscellaneous

- **Japanese** (Native Language), **English** (C1, TOEFL iBT: 100), **German** (B2)
- Approx. Top 3.5% (highest) algorithm programmer in **AtCoder** mostly using C++.