

# Shuheï Watanabe

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## Education

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- 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

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- 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

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- 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

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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. ♣ Y. Ozaki, ♣ **S. Watanabe**, T. Yanase (2025). OptunaHub: A Platform for Black-Box Optimization. arXiv:2510.02798.
2. K. Abe, Y. Wang, **S. Watanabe** (2025). Tree-Structured Parzen Estimator Can Solve Black-Box Combinatorial Optimization More Efficiently. arXiv:2507.08053.
3. **S. Watanabe** (2025). Derivation of Output Correlation Inferences for Multi-Output (aka Multi-Task) Gaussian Process. arXiv:2501.07964.
4. **S. Watanabe** (2024). Derivation of Closed Form of Expected Improvement for Gaussian Process Trained on Log-Transformed Objective. arXiv:2411.18095.
5. **S. Watanabe** (2023). Python Tool for Visualizing Variability of Pareto Fronts over Multiple Runs. arXiv:2305.08852.
6. **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 algorithm)
7. ○ **S. Watanabe**, M. Nomura, M. Onishi (2020). The Characteristics Required in Hyperparameter Optimization of Deep Learning Algorithms. Japanese Society of Artificial Intelligence (JSAI).
8. ○ **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

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### Reviewer

- AutoML Conference (2023).

## Mentoring & Supervision

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Jun 2024 – Present	<b>Chisa Mori</b> , MSc Student, AIST. Theme: Parallel coordinate plots for multi-objective problems.
Jul 2024 – Present	<b>Kaito Baba</b> , 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

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- 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

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