Akimasa Watanuki

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Education

2026-04 – Present **Institute of Science Tokyo,** Tokyo, Japan
Master's Program in Mathematical and Computing Science, expected March 2028
Graduate Major in Mathematical and Computing Science, School of Computing
Advisor: Ryohei Kobayashi

2022-04 – 2026-03 **Institute of Science Tokyo (formerly Tokyo Institute of Technology),** Tokyo, Japan
B.S. in Mathematical and Computing Science, March 2026
Undergraduate Major in Mathematical and Computing Science, School of Computing
Advisor: Ryohei Kobayashi

Research Interests

I study high-performance computing for heterogeneous AI accelerators, focusing on GNN training on Cerebras WSEs and GPUs. I also contribute to MLIR and ClangIR infrastructure for OpenCL in the LLVM Project. My longer-term interests include verifiable AI computation and compute governance using compiler and runtime evidence.

Research areas HPC; heterogeneous accelerators; wafer-scale computing; GNN systems; performance analysis; MLIR; ClangIR; OpenCL; AI safety; compute governance.

Research Experience

2025-04 – Present **GNN Training and Performance Analysis on Cerebras CS-3,** AC2 Lab, Institute of Science Tokyo
Implemented a GraphSAGE training workflow on Cerebras CS-3 and compared it with an NVIDIA H100 on ogbn-arxiv and ogbn-products. Both systems reached similar validation accuracy, while CS-3 delivered lower average training-loop throughput under the evaluated high-level workflow. I am investigating how data placement, sparse aggregation, and the software stack contribute to this gap. Presented at SWoPP 2026 (non-peer-reviewed). [paper] [code]

Open-Source Contributions

2025-11 – Present **LLVM Project Contributor (MLIR / ClangIR)**
Authored 40+ merged pull requests and earned LLVM Project commit access. [merged PRs]
Implemented reusable compiler infrastructure that carries OpenCL metadata from ClangIR through MLIR's LLVM dialect to LLVM IR. It covers kernel-argument and kernel-execution metadata on functions, as well as language-version metadata on modules. [OpenCL contributions]
Improved invalid-input diagnostics and regression-test coverage across MLIR and ClangIR.

Publications and Presentations

2026 **A. Watanuki** and R. Kobayashi, "Characterizing Irregular GNN Training on Cerebras CS-3 Through a High-Level Workflow," IPSJ SIG Technical Report, vol. 2026-HPC-205, no. 13, pp. 1–9, July 2026. Presented at SWoPP 2026 (non-peer-reviewed). [paper] [code]

Work Experience

2026-04 – Present
Research Assistant, AC2 Lab (Kobayashi Lab), Institute of Science Tokyo
Working on the JSPS KAKENHI Grant-in-Aid for Scientific Research (B) project "Wafer-scale computing to accelerate graph-structured data processing" (26K02920).

2023-02 – Present
Programming Tutor, TSUKURIUM, Saitama, Japan
Teaching programming and computational thinking to elementary school students using Python.

2024-08
Software Engineering Intern, teamLab Inc., Tokyo, Japan
Developed and tested a computer vision module for a confidential project, utilizing OpenCV and C++.

2024-08
Web Engineering Intern, e-Seikatsu Co., Ltd., Tokyo, Japan
Developed a proof-of-concept real estate comparison application using React.

2024-03 – 2024-04
Software Engineering Intern, Fixstars Corporation, Tokyo, Japan
Built a CUDA stereo-matching pipeline, profiled it with Nsight Systems and Nsight Compute, and optimized bottleneck operations.

Skills

Natural Languages	Japanese (native); English (functional proficiency; TOEIC L&R 820).
Programming	C/C++, Python, Rust, C#, Scala.
Compiler Infrastructure	LLVM, MLIR, ClangIR.
Parallel Computing	CUDA, OpenMP, MPI, OpenCL.
Profiling	Nsight Systems, Nsight Compute.
ML Frameworks/Libraries	Cerebras Model Zoo, PyTorch, PyTorch Geometric, NumPy.

Recognition and Certifications

2024 **Applied Information Technology Engineer Examination (AP)**, certified by METI, Japan.

2023 **AtCoder Algorithm rating: 2202 (peak).**

2021 **Honorable Mention & Spring Training Camp Selected Participant**, Japanese Olympiad in Informatics (JOI) 2020/2021.

2019 **3rd place**, SuperComputingContest 2019 (Team: "supercon").