

# Charles Block

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## Education

- 2022-Present **Ph.D. Candidate, Computer Science, University of Illinois**, Urbana-Champaign  
NSF Graduate Research Fellow, advised by Dr. Josep Torrellas. Research topics include computer architecture, distributed systems, and sparsity.
- 2022-2024 **M.S. Computer Science, University of Illinois**, Urbana-Champaign
- 2018-2022 **B.S. Electrical & Computer Engineering with Honors, University of Texas**, Austin

## Industry Experience

- Summer 2025 **NVIDIA Corp., Deep Learning Training Performance Intern**
  - Characterized performance bottlenecks in large-scale distributed LLM training.
  - Identified and resolved inefficiencies in communication/GEMM overlap in TransformerEngine.
  - Investigated relationships between power and performance on the latest generation of GPUs.
- Summer 2024 **Apple Inc, CPU Architecture/Performance Intern**
  - Investigated novel memory ordering techniques and their impact on next-generation CPUs.
  - Developed enhancements to trace-based performance simulators and tooling.
  - Identified and addressed performance simulation bugs to accurately model RTL.
- Summer 2022 **Intel Corporation, Design Validation Intern**
  - Supported CPU validation in the Advanced Architecture Development Group.
  - Debugged core RTL & software infrastructure to address performance and power issues.
  - Improved run-time performance of long- and often-running validation jobs by 20x.
- Summer 2021 **Microsoft Corporation, Software Development Intern (Azure)**
  - Initiated development of a distributed service to supplement PostgreSQL databases.
  - Developed a new distributed, in-memory storage backend for PostgreSQL.
  - Developed software using the C and Rust programming languages.
- Summer of 2019 & 2020 **Amazon Robotics, Firmware Development Intern**
  - Supported firmware development for the Amazon Scout robotics project.
  - Integrated various sensors, MCUs, and SoCs using both embedded Linux and bare-metal C.
  - Developed/evaluated a real-time object detection and tracking system on an embedded SoC.
- Summer 2018 **TyRex Group, LTD, Engineering Intern**

## Academic & Leadership Experience

- 2023-Present **i-acoma Group at UIUC, Graduate Researcher**
  - Working with Professor Josep Torrellas on HPC architectures and distributed systems.
  - Supercomputer-scale distributed algorithms for sparse matrix kernels.
  - Multi-agent reinforcement learning for multi-core architectures.
- 2021-2022 **Lu Research Group at UT Austin, Research Assistant**
  - Worked with Professor Nanshu Lu to develop wearable low-power biomedical sensors.
  - Developed measurement circuitry for experiments with novel pressure sensor technology.
- 2018-2022 **Longhorn Racing - Solar Vehicle Team**
  - Oversaw manufacturing of composite materials, electronic systems, and structural components.
  - Led development of embedded hardware and software for vehicle control and power.
  - Developed lessons & mentored other students for designing circuits and software.

Spring of **Intro to Embedded Systems at UT Austin (EE319K)**, *Teaching Assistant*  
2020 & 2021 ○ Assisted in teaching and lab supervision for a freshman embedded systems course.

## Awards

- 2022 **NSF Graduate Research Fellowship**, *National Science Foundation*  
2022 **Wing Kai Cheng Fellowship**, *University of Illinois Urbana-Champaign*  
2020 & 2021 **Dr. Ariane L. Beck and Mr. Eric Sebesta Endowed Scholarship**, *UT Austin ECE*

## Publications

### Conference & Journal Publications

- [1] C. Block, G. Gerogiannis, and J. Torrellas, "Micro-mama: Multi-agent reinforcement learning for multicore prefetching," in *58th IEEE/ACM International Symposium on Microarchitecture*, ser. MICRO '25. ACM, Oct. 2025.
- [2] G. Gerogiannis, D. Merkouriadis, C. Block, A. Zulfiqar, F. Tofalos, M. Shahbaz, and J. Torrellas, "Netsparse: In-network acceleration of distributed sparse kernels," in *58th IEEE/ACM International Symposium on Microarchitecture*, ser. MICRO '25. ACM, Oct. 2025.
- [3] C. Sudusinghe, G. Gerogiannis, D. Lenadora, C. Block, J. Torrellas, and C. Mendis, "COGNATE: Acceleration of sparse tensor programs on emerging hardware using transfer learning," in *Forty-second International Conference on Machine Learning (ICML '25)*, 2025.
- [4] L. Scalco de Vasconcelos, Y. Yan, P. Maharjan, S. Kumar, M. Zhang, B. Yao, H. Li, S. Duan, E. Li, E. Williams, S. Tiku, P. Vidal, R. S. Solorzano-Vargas, W. Hong, Y. Du, Z. Liu, F. Iwane, C. Block, A. T. Repetski, P. Tan, P. Wang, M. G. Martín, J. d. R. Millán, X. He, and N. Lu, "On-scalp printing of personalized electroencephalography e-tattoos," *Cell Biomaterials*, 2024.
- [5] I. Ranawaka, M. T. Hussain, C. Block, G. Gerogiannis, J. Torrellas, and A. Azad, "Distributed-memory parallel algorithms for sparse matrix and sparse tall-and-skinny matrix multiplication," in *Proceedings of the International Conference for High Performance Computing, Networking, Storage, and Analysis (SC '24)*. IEEE Press, 2024.
- [6] V. Suresh, B. Mishra, Y. Jing, Z. Zhu, N. Jin, C. Block, P. Mantovani, D. Giri, J. Zuckerman, L. P. Carloni, and S. V. Adve, "Mozart: Taming taxes and composing accelerators with shared-memory," in *Proceedings of the 2024 International Conference on Parallel Architectures and Compilation Techniques (PACT '24)*, 2024, p. 183–200.
- [7] K.-H. Ha, Z. Li, S. Kim, H. Huh, Z. Wang, H. Shi, C. Block, S. Bhattacharya, and N. Lu, "Stretchable hybrid response pressure sensors," *Matter*, vol. 7, no. 5, 2024.
- [8] C. Block, G. Gerogiannis, C. Mendis, A. Azad, and J. Torrellas, "Two-face: Combining collective and one-sided communication for efficient distributed spmm," in *Proceedings of the 29th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS '24), Volume 2*, 2024.

## Workshop Publications

- [9] **C. Block**, P. Palacios Almendros, A. Farrell, G. Gerogiannis, and J. Torrellas, “Performance-driven composite prefetching with bandits,” in *Fourth Data Prefetching Championship at HPCA 2026*, ser. DPC4, 2 2026.
- [10] C. Sudusinghe, G. Gerogiannis, D. Lenadora, **C. Block**, J. Torrellas, and C. Mendis, “Automated data selection for efficient cost model training to optimize sparse matrix kernels on emerging hardware accelerators,” in *The Exploration in AI Today Workshop at ICML 2025*, 2025.