Benjamin Brock

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Research Interests

Distributed data structures, programming languages and tools for parallel and distributed computing.

Education

2016–Present **Ph.D.**, Computer Science, *University of California, Berkeley*.
Advised by **Katherine Yelick** and **Aydın Buluç**.
- Worked on **BCL**, a high-level C++ library of RDMA-based **distributed data structures**.
- Worked on **GraphBLAS**, a sparse matrix library for graphs.

2016 **B.S.**, Computer Science, *University of Tennessee, Knoxville*.
GPA 3.86, Graduated *summa cum laude*.

Publications

ICS'21 **Distributed-Memory Parallel Algorithms for Sparse Times Tall-Skinny-Dense Matrix Multiplication**.
O. Selvitopi, **B. Brock**, I. Nisa, A. Tripathy, K. Yelick, A. Buluç
Proceedings of the International Conference on Supercomputer 2021

RSTA'20 **The Parallelism Motifs of Genomic Data Analysis**.
K. Yelick, A. Buluç, M. Awan, Ariful Azad, **B. Brock**, R. Egan, S. Ekanayake, M. Ellis, E. Georganas, G. Guidi, S. Hofmeyr, O. Selvitopi, C. Teodoropol, and L. Oliker
Philosophical Transactions of the Royal Society, 2020

PMBS'20 **Performance Trade-Offs in GPU Communication: A Study of Host and Device-Initiated Approaches**.
T. Groves, **B. Brock**, Y. Chen, K. Ibrahim, L. Oliker, N. Wright, S. Williams, K. Yelick
Workshop on Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems 2020

IA^3'19 **RDMA vs. RPC for Implementing Distributed Data Structures**.
B. Brock, Y. Chen, J. Yan, J. Owens, A. Buluç, and K. Yelick
Workshop on Irregular Applications: Architectures and Algorithms 2019

ICPP'19 **BCL: A Cross-Platform Distributed Data Structures Library**.
B. Brock, A Buluç, and K Yelick
Proceedings of the 48th International Conference on Parallel Processing 2019

GraphBLAS

GrAPL'21 **Introduction to GraphBLAS 2.0**.
B. Brock, A. Buluç, T. Mattson, S. McMillan, J. Moreira
Workshop on Graphs, Architectures, Programming, and Learning 2021

GrAPL'20 **A Roadmap for the GraphBLAS C++ API**.
B. Brock, A. Buluç, T. Mattson, S. McMillan, J. Moreira
Workshop on Graphs, Architectures, Programming, and Learning 2020

GrAPL'20 **Considerations for a Distributed GraphBLAS API**.
B. Brock, A. Buluç, T. Mattson, S. McMillan, J. Moreira
Workshop on Graphs, Architectures, Programming, and Learning 2020

Other

ICCAD'19 **Centrifuge: Evaluating Full-System HLS-Generated Heterogeneous-Accelerator SoCs Using FPGA-Acceleration**.
Q. Huang, C. Yarp, S. Karandikar, N. Pemberton, **B. Brock**, L. Ma, G. Dai, R. Quitt, K. Asanovic, J. Wawrzynek
International Conference on Computer-Aided Design 2019

IPDPS'18 **Indigo: A Domain-Specific Language for Fast, Portable Image Reconstruction**.
M. Driscoll, **B. Brock**, F. Ong, J. Tamir, H. Liu, M. Lustig, A. Fox, and K. Yelick
Parallel and Distributed Processing Symposium, 2018 IEEE International

HPEC'16 **Performance analysis and acceleration of explicit integration for large kinetic networks using batched GPU computations**.
A. Haidar, **B. Brock**, S. Tomov, M. Guidry, J. Billings, D. Shyles, and J. Dongarra
20th IEEE High Performance Extreme Computing Conference, HPEC 2016.

JCP'15 **Explicit integration with GPU acceleration for large kinetic networks**.
B. Brock, A. Belt, J. Billings, and M. Guidry
Journal of Computational Physics, Volume 302, 2015.

Awards and Grants

Fellowships and Scholarships

2016 **NSF Graduate Research Fellowship**.
Three years full funding. 2,000 awarded annually across all disciplines.

2015 **Goldwater Scholarship**.
Premier award for US undergraduates in the sciences. 300 awarded annually across all disciplines.

2012 **Haslam Scholarship**.
Full scholarship, awarded annually by the University of Tennessee to fifteen incoming students.

Grants

2021 **NSF XSEDE Startup Grant CIS210074**, *PI*.
Access to NSF computational resources, estimated value $805.

2018 **AWS Cloud Credits for Research**, *PI*.
Amazon Web Services cloud credits for research grant, value of $25,000.

2018 **NSF XSEDE Startup Grant ASC180051**, *PI*.
Access to NSF computational resources, estimated value $2,940.13.

Experience

Selected Research Experience

2016–Present **Graduate Student**, *University of California, Berkeley*.
Worked on RDMA-based distributed data structures for large-scale parallel systems.

Summer 2018 **Intern**, *Nvidia Research*.
Worked on a high-level distributed matrix class for multi-GPU systems.

2013–2016 **Research Assistant**, *Oak Ridge National Laboratory*.
Developed FERN, a GPU-based chemical kinetics code **[JCP'15, HPEC'16]**.

Summer 2015 **Intern**, *Palantir Technologies*.
Worked on Contour, a tool for top-down, visual analysis of large datasets.

Summer 2014 **Research Assistant**, *University of Edinburgh*.
Developed patterns-based methods for high-performance code generation for GPU and many-core architectures, focusing on parallel scan. Worked under the direction of Christophe Dubach.

Service

2015 **Managing Editor**, *Pursuit*.
Managing editor for science and engineering for *Pursuit*, the University of Tennessee, Knoxville's journal of undergraduate research.

2013–2016 **President**, *HackUTK*.
Founder and president of HackUTK, the University of Tennessee, Knoxville's CTF hacking club.

Programming Experience

Experienced C, C++, MPI, CUDA, Python

Proficient Java, OpenMP, OpenCL

Languages

English *(native)* · Mandarin *(proficient, HSK6: 216)* · Cantonese *(conversational)* · French *(conversational)*