

Kyle Berney

SUMMARY

- Ph.D. in Computer Science with research spanning the fields of high-performance computing, parallel algorithms, cache-efficient algorithms, and general-purpose computing on graphics processing units (GPGPU)
- 8 years of CUDA C/C++ research and development experience

EDUCATION

Ph.D. in Computer Science <i>University of Hawai'i at Mānoa</i> Dissertation: “Parallel Cache-Efficient Algorithms on GPUs”	Aug. 2023 Honolulu, HI
M.S. in Computer Science <i>University of Hawai'i at Mānoa</i> Thesis: “Beyond Binary Search: Parallel In-Place Construction of Implicit Search Tree Layouts”	May 2018 Honolulu, HI
B.S. in Computer Science and Mathematics – double major <i>University of Hawai'i at Mānoa</i>	Dec. 2014 Honolulu, HI

EXPERIENCE

Lecturer <i>Dept. of Information and Computer Sciences, University of Hawai'i at Mānoa</i> • ICS 141: Discrete Mathematics for Computer Science I (SP25: 3 sections) • ICS 311: Algorithms (SP25: 1 section)	Jan. 2025 – Current Honolulu, HI
Graduate Research and Teaching Assistant <i>Dept. of Information and Computer Sciences, University of Hawai'i at Mānoa</i> <i>Research Assistant</i> • Henri Casanova, <i>Concurrency Research Group</i> (SU23, SP23) * Assisted in research on workflow simulation and calibration • Nodari Sitchinava, <i>Algorithms and Parallel Computing Group</i> (FA21, FA19, SU19, FA18, SU18, FA17) * Conducted research on parallel cache-efficient algorithms with applications to GPUs * Maintained Unix machines used primarily for GPU experiments via the CUDA toolkit <i>Teaching Assistant</i> • ICS 212: Program Structure, Ravi Narayan (FA22) • ICS 312: Machine-Level and Systems Programming, Henri Casanova (SP22, SP21, FA20) • ICS 443: Parallel Algorithms, Nodari Sitchinava (SP22) • ICS 432: Concurrent and High-Performance Programming, Henri Casanova (FA20) • ICS 311: Algorithms, Nodari Sitchinava (SP20, SP19, SP18, SP17) • ICS 141: Discrete Mathematics for Computer Science I, Lee Altenberg (FA16) • ICS 241: Discrete Mathematics for Computer Science II, Kazuo Sugihara (SP16)	Jan. 2016 – Aug. 2023 Honolulu, HI
Satellite Systems Programmer <i>Hawaii Space Flight Laboratory, University of Hawai'i at Mānoa</i> • Developed a data management tool written in C++ using the Qt framework that creates, displays, and modifies various data used within COSMOS: Comprehensive Open-Architecture Space Mission Operations System	July 2012 – Aug. 2013 Honolulu, HI
Hawaii Space Grant Consortium Fellowship <i>Hawaii Space Grant Consortium, University of Hawai'i at Mānoa</i> Mentor: Norbert Schorghofer, <i>Institute of Astronomy, University of Hawai'i at Mānoa</i> • Implemented and optimized a model for lunar surface temperature balance calculations on a GPU using CUDA C	Jan. 2012 – Dec. 2012 Honolulu, HI

RESEARCH

Eliminating GPU Bank Conflicts in GPU Mergesort

Authors: Kyle Berney, Nodari Sitchinava

In peer review, 2025

- Designed a bank conflict free algorithm for the pairwise Mergesort algorithm on GPUs
- Modified the CUDA C++ implementation of GPU pairwise Mergesort provided in the Thrust library to use the bank conflict free approach
- Verified empirically that the bank conflict free implementation obviates the slowdown due to bank conflicts

A Parallel Priority Queue with Fast Updates for GPU Architectures

Authors: Kyle Berney, John Iacono, Ben Karsin, Nodari Sitchinava

In peer review, 2025 (preprint available on arXiv)

- Performed amortized analysis on the work, depth, and number of I/O's for the parallel bucket heap
- Implemented the parallel bucket heap and a parallel variant of Dijkstra's algorithm for single-source shortest paths (SSSP) using CUDA C++ and the Thrust and CUB libraries
- Showed that on dense graphs with high diameter, our SSSP implementation outperforms the state-of-the-art delta-stepping GPU implementations by up to 5.4x

WfCommons: Data Collection and Runtime Experiments using Multiple Workflow Systems

Authors: Henri Casanova, Kyle Berney, Serge Chastel, Rafael Ferreira da Silva

IEEE Computers, Software, and Applications Conference, 2023

- Wrote a Nextflow workflow "tracer" using Groovy and Python that produces WfCommons workflow instances

Engineering Worst-Case Inputs for Pairwise Merge Sort on GPUs

Authors: Kyle Berney, Nodari Sitchinava

IEEE International Parallel and Distributed Processing Symposium, 2020

- Analyzed the worst-case number of bank conflicts in shared memory for GPU pairwise merge sort
- Constructed the corresponding worst-case inputs and demonstrated experimentally, using the Thrust and Modern GPU libraries, that these inputs result in up to 50% slowdown compared to the performance on random inputs

Beyond Binary Search: Parallel In-Place Construction of Implicit Search Tree Layouts

Authors: Kyle Berney, Henri Casanova, Ben Karsin, Nodari Sitchinava

IEEE Transactions on Computers, 2021

IEEE International Parallel and Distributed Processing Symposium, 2018

- Developed parallel in-place algorithms for permuting a sorted array into various implicit search tree layouts
 - * Level-order binary search tree layout (BST)
 - * Level-order B-tree layout (B-tree)
 - * van Emde Boas search tree layout (vEB)
- Analyzed the work, depth, and number of I/O's for each permutation
- Implemented the permutation and corresponding querying algorithm for each layout on both CPU and GPU platforms using C++ with OpenMP and CUDA C++, respectively
- Empirically quantified the break-even point where the performance benefits of querying each search tree layout outweighs the cost of permuting into the layout

TECHNICAL SKILLS

Languages: CUDA, C, C++, Java, Python, Bash

Profiling Tools: nvprof, NVIDIA Nsight Compute, NVIDIA Visual Profiler, Perf

Miscellaneous: OpenMP, Git, LaTeX, Unix, SLURM, Makefile

PROFESSIONAL SERVICE

External Reviewer:

- IEEE International Conference on High Performance Computing, Data, and Analytics
 - * July 2016
- ACM Symposium on Parallelism in Algorithms and Architectures
 - * March 2022
 - * March 2020
 - * March 2018
- Journal of Parallel and Distributed Computing
 - * August 2019