Cameron Durbin

cameronfdurbin@gmail.com | 970-631-4907 | linkedin.com/in/cfd

EDUCATION

University of Oregon Eugene, OR
Ph.D. Computer Science September 2022 – Present
- Research Advisory: Allen Malony
- Discipline in Machine Learning; High Performance Computing; Computer Architecture

University of Oregon Eugene, OR
Bachelor of Science, Mathematics and Computer Science September 2017 – June 2021
- Organizations: President of Cyber Security Club; Theta Chi Fraternity
- International Study: Computer Science at National University of Singapore

WORK EXPERIENCE

Research and Development Intern Albuquerque, NM
Sandia National Laboratories June 2023 – Present
- Designed a Structural Simulation Toolkit (SST) element to support matrix-vector multiplication with RISC-V instructions via CrossSim, demonstrating performance gains in analog/digital hybrid systems.
- Enhanced the RISC-V architecture by integrating new instructions into LLVM, enabling interaction with RoCC (Rocket Custom Coprocessor) to facilitate research on analog co-processors.
- Led the creation of a C++ library to encapsulate RISC-V LLVM intrinsics, streamlining instruction implementation.
- Built a reproducible Docker environment with the RISC-V LLVM compiler, Structural Simulation Toolkit (SST), and CrossSim, accompanied by comprehensive documentation.
- Developed a pipeline for seamless hardware and software simulation, ensuring multicore compatibility.

HPC Software Applications Intern Portland, OR
Intel Corporation June 2024 – September 2024
- Migrated the CUDA-based drug discovery application GNINA to SYCL, enabling efficient execution on Intel GPUs and CPUs through OneAPI.
- Developed and optimized SYCL kernels to accurately replicate CUDA functionality, ensuring correctness and achieving high performance.
- Conducted detailed performance analysis of CUDA and SYCL implementations, identifying bottlenecks and optimizing execution across diverse hardware.
- Created comprehensive documentation of the migration process and performance findings to support future SYCL adoption efforts.

HPC Software Engineer Eugene, OR
ParaTools Inc. August 2020 – June 2023
- Developed an LLVM compiler frontend to insert performance analysis hooks at critical process points, enabling advanced system analysis and optimization.
- Migrated kernel code from CUDA to ROCm, ensuring compatibility and performance on AMD GPUs.
- Containerized massively parallel programs for seamless deployment on Summit supercomputers, ensuring efficient execution across multiple nodes.
- Constructed Spack containers to streamline and optimize system package management for high-performance computing environments.
- Created interactive data visualizations using Plotly, effectively presenting complex findings in an intuitive format.
- Contributed C++ programs to the Department of Energy's Exascale Computing Project testsuite, ensuring code stability and reliability.

Projects

- **Resource-Efficient Performance Monitoring on Edge Devices**: Developed a Kubernetes-based performance monitoring application for NVIDIA Xavier NX devices, tracking CPU, memory, and power metrics. Leveraged virtual filesystems for lightweight monitoring and optimized sampling frequency to balance accuracy and computational overhead. Integrated data into application schedulers to enhance resource allocation in the Sage Continuum framework for geohazard monitoring.

- **RISC-V Microarchitecture Simulator in Structural Simulation Toolkit (SST)**: Building a RISC-V simulator supporting RV64I, RV64E, RV32I, and RV32E ISAs within SST. Enables researchers to experiment with RISC-V design and gain hands-on experience with SST for architecture exploration.

- **Parallel 3D Grid Relaxation and Shortest Path Algorithm**: Designed a parallel Bellman-Ford shortest path algorithm for 3D grids using MPI. Implemented grid relaxation techniques to improve solution accuracy and convergence, showcasing expertise in parallel computing and numerical methods.

- **High-Performance Solvers for Physics Simulations**:
  - Developed a 2D Heat Equation solver using MPI and OpenMP for grids up to 1024x2048, configured for multi-process runs over 100 timesteps.
  - Developed a Poisson's 2D Equation solver using cuBLAS/cuSPARSE with the Conjugate Gradient method, achieving efficient discretization and parallel computation.

- **Semiconductor AI Podcast:** Created a Python-based application to scrape semiconductor news, summarize articles via OpenAI's API, and generate audio podcasts using text-to-speech models. Automated daily execution via cronjobs, delivering real-time news updates.

SKILLS & INTERESTS

Programming Languages: C, C++, Python, CUDA, SYCL, Assembly
Frameworks & Tools: LLVM, RISC-V, MPI, OpenMP, Docker, Kubernetes, Structural Simulation Toolkit, PyTorch
Specializations: Compilers, GPU Programming, High Performance Computing, Machine Learning, Computational Science, System Simulations, Computer Architecture
Personal Hobbies: Skiing, Reading, Biking, Chess, Running, Tennis, Hiking