(Robert) Cameron Rutherford

HPC/ML/Q Research Software Engineer

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cameronrutherford Robert C Rutherford

Summary

Experienced HPC/ML/Q Research Software Engineer with 3+ years of expertise in deploying, optimizing, and teaching scientific software on diverse computing systems, including the world's largest supercomputers and quantum computers. Proven track record in end-to-end solution delivery, project leadership, and effective team coordination, while adept at managing social engineering challenges in software development processes.

Skills

C / C++17
CUDA, HIP, MPI, OpenMP
CMake, Spack, pybind11
google [test/benchmark]
Performance Optimization

Python
torch, Tensorflow, pyg
JAX, mpi4py, lightning
conda/mamba, poetry
qiskit, pytest, black

DevOps
GitHub/GitLab CI/CD, git flow
k8s, ansible, SLURM/LSF
Containerization, MLOps
Quality Assurance, Agile

IDEs
JupyterLab, VSCode, vim
tmux, google collab
dev-containers, jetbrains
IDE extensions, GUI tools

Documentation
Tutorial Driven Dev.
.qmd, obsidian, LaTeX
RevealJS, docx, binder
Git[Hub/Lab] pages

Other
Fully Homomorphic Encryption
Secure Multi-Party Computation
FL, DP, SSS, Cryptography
Rust, Go, Fortran

Experience

Software Engineer II HPC/ML/Q, PNNL (Virtual) **2022 - Present**

- Led Software Stack for ExaSGD project to Frontiner deployment (AMD based - current world #1)
- Facilitated deployment of ExaGO application to the cloud with ChatGPT integration
- Led software development of CUDA targetted Sparse GPU solver tailored for use case with HiOp
- MLOps internal offering leader developing containerisation and best practices community
- Assisted in Fortan (CPU) -> C++ (GPU) conversion for E3SM project through CI/CD

Software Engineer I HPC/ML/Q, PNNL (Virtual) **2021 - 2022**

- Led Privacy Preserving ML project to explore FHE, FL, DP and SMC applications in PNNL mission space
- Transitioned and successfully led ExaSGD software stack through development of AMD/HIP support
- Delivered internal tutorials on distributed machine learning with JAX and other internal MLOps offerings
- Led tutorials on using Qiskit, and trained other staff in Quantum through internal boot camp

Post-Bachelors Research Associate HPC/ML/Q, PNNL (Virtual) **2020 - 2021**

- Worked on open-source MLFlow offering to save lab $200k per project on WandB subscription
- Deployed ExaSGD software to Summit supercomputer (NVIDIA based - former world #1)
- Learned Quantum Computing basics to enable C2QA project research on IBM Quantum platform
- Worked in HPC support centre to deploy, debug and test various ML software stacks

Tech Student 4 Optimization and Control Group, PNNL (Virtual) **2020**

- Worked on RAJA linear algebra kernel development within HiOp for interface with ExaGO
- Learned CMake with Spack and implemented testing and packaging for ExaSGD software
- Profiled codebase on different GPU architectures and analyzed performance data
- Taught other developers about RAJA and CMake and delivered key kernels for project success

Sports Events Coordinator, Whitworth University (Spokane, WA) **2019 - 2020**

IT Intern, Mac Management, Keysight Technologies (Colorado Springs, CO) **2018**

Calculus III Grader / Mathematics Tutor, Whitworth University (Spokane, WA) **2017, 2019**

Basketball Coach, S.G.S. & M.L.C (Sydney, AUS) **2015**

Publications

- S. Abhyankar, S. Peles, **R. Rutherford**, A. Mancinelli, **Evaluation of AC optimal power flow on graphical processing units.** (IEEE PESGM 2021)
- S. Peles, M. Alam, A. J. Mancinelli, K. Perumalla, **R. C. Rutherford**, J. Ryan, C. G. Petra, **Porting the Nonlinear Optimization Library HiOp to Accelerator-Based Hardware Architectures** (arxiv 2021)

Conferences

Practice and Experience in Advanced Research Computing (PEARC) **2023**

Pacific Northwest National Laboratory (PNNL) Tech Fest **2021-2023**

Energy Exascale Earth System Model (E3SM) Annual Meeting **2023**

Sustainable Tools Ecosystem Project (STEP) East Coast Town Hall **2023**

Exascale Computing Project (ECP) Annual Meeting **2021-2023**

Pacific Northwest National Laboratory (PNNL) Innovation Summit **2022**

Co-Design Centre for Quantum Advantage (C2QA) Annual Meeting **2022**

Education

Scientist & Engineer Rising Leader Learning Journey **2023**

Cyber Security & National Security Seminar Series, PNNL **2021 - 2022**

Whitworth University, B.S. Mathematics and Computer Science **G.P.A 3.9/4.0**

- Outstanding Mathematics Major 2020
- ICPC Pacific Northwest Eastern Washington Site Winner 2018
- Howard R. Gage Memorial Scholarship 2017, 2018, 2019

Other Activities

Sustainable Horizons Institute HPC Mentor **2022, 2023**

Quantum Information Science / HPC STEM Mentor **2022 - Present**

Whitworth Chess Club President **2019 - 2020**

Pine Codes Hackathon Winner **2019**

SpokAnimal Shelter Volunteer **2019**

Whitworth Men’s Basketball Team **2016 - 2019**