

# (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 4+ 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.

### Experience

#### Software Engineer III HPC/ML/Q, PNNL (Virtual) 2024 - Present

- HPC MLOps offering lead, maintaining container and spack module stacks for users
- Continued work on previous and new projects, with DevOps support as needed

#### Software Engineer II HPC/ML/Q, PNNL (Virtual) 2022 - 2023

- Led Software Stack for ExaSGD project to Frontier deployment C++ / HIP (top500 #1)
- Aided development of C++ / CUDA / HIP targeted Sparse GPU solver tailored for use case with HiOp
- Assisted in Fortran (CPU) -> C++ (GPU) conversion for E3SM project through CI/CD
- Succeeded in sourcing \$30M+ in funding over 5 years through ExaGO / E3SM follow on project
- Facilitated deployment of ExaGO application to the cloud with OpenAI integration on AWS
- MLOps internal offering leader developing containerisation and MLOps best practices community
- Led lab-wide tutorial on HPC MLOps utilizing containers and Open On Demand

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

- Received PNNL's highest performance award (OPA) for a second year in a row
- Transitioned into leadership of ExaSGD software stack across LLNL, ORNL, PNNL and NREL
- Deployed ExaSGD CI/CD across [x86\_64/amd64/ppc64le] x [AMD/NVIDIA], learned HIP/AMD
- Led Privacy Preserving ML project to explore FHE, FL, DP and SMC applications in PNNL mission space
- Maintained CI/CD for several ML projects and supported novel library exploration/development
- Led tutorials and boot camps for PNNL staff on using JAX, Qiskit, and other parallel ML/computing concepts

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

- Received PNNL's highest performance award (OPA)
- Moved to internal HPC team supporting all lab hardware and projects using compute (HPC/Q/Custom)
- Successfully scaled ExaSGD C++ / MPI software to Summit (top500 #7, former #1)
- Benchmarked C / MPI communication collectives across compilers and backends, optimized and packaged product
- Worked on open-source MLFlow offering to save lab \$200k per project contract on WandB subscription

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

- Deployed C++ / RAJA MDS linear algebra kernels in HiOp as well as designing unit tests
- Learned CMake, Spack, GitHub/GitLab pipelines and QA/testing of C++ codebases
- Developed skills in performance profiling of CUDA, MPI, OpenMP and hybrid applications
- Taught other project developers about RAJA, GPUs and best practices learned

#### 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

- C.S. Oehmen, S. Peles, K. Swirydowicz, C.G. Petra, S.G. Abhyankar, W. Jones, M. Reynolds, **R.C. Rutherford**, **Advanced Computing Is at the Forefront of a New “Moonshot” Revolutionizing the North American Power Grid** (IEEE CSE 2024)
- S. Abhyankar, S. Peles, T. Becejac, J. Holzer, A. Mancinelli, **C. Rutherford**, **Exascale Grid Optimization (ExaGO) toolkit: An open-source high-performance package for solving large-scale grid optimization problems** (2022)
- 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** (2021)

## Skills

C / C++/17	DevOps	Python	Machine Learning	Other
CUDA, HIP, CPU/GPU Profiling, MPI, OpenMP, CMake, Spack	GitHub/GitLab, vim/tmux, SLURM/LSF, HPC, quarto, VSCode	torch, JAX, pyg, mpi4py, pybind11, conda/mamba, poetry	LLMs, RL, NTK, FL, DP, SMC, GNNs, Domain Aware ML	Go, Rust, Fortran, Graph DBs, SQL, Qiskit, AWS, S3 dev-containers

## Conferences

<b>PRESENTER</b>	<b>National Laboratories Information Technology (NLIT) Summit: 2024</b>
<b>Practice and Experience in Advanced Research Computing (PEARC)</b>	<b>2023</b>
<b>Pacific Northwest National Laboratory (PNNL) Tech Fest</b>	<b>2021-2023</b>
<b>Energy Exascale Earth System Model (E3SM) Annual Meeting</b>	<b>2023</b>
<b>Sustainable Tools Ecosystem Project (STEP) East Coast Town Hall</b>	<b>2023</b>
<b>Exascale Computing Project (ECP) Annual Meeting</b>	<b>2021-2023</b>
<b>Pacific Northwest National Laboratory (PNNL) Innovation Summit</b>	<b>2022</b>
<b>Co-Design Centre for Quantum Advantage (C2QA) Annual Meeting</b>	<b>2022</b>

## Education

<b>Scientist &amp; Engineer Rising Leader Learning Journey</b>	<b>2023</b>
<b>Cyber Security &amp; National Security Seminar Series, PNNL</b>	<b>2021 - 2022</b>

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**Whitworth University, B.S. Computer Science and B.S. Mathematics: G.P.A 3.93/4.0**

Outstanding Mathematics Major '20 ICPC PNW Site Winner '18 Howard R. Gage Scholarship '17, '18, '19

## Other Activities

<b>Sustainable Horizons Institute HPC Mentor</b>	<b>2022, 2023</b>
<b>Quantum Information Science / HPC STEM Mentor</b>	<b>2022 - Present</b>
<b>Whitworth Chess Club President</b>	<b>2019 - 2020</b>
<b>Pine Codes Hackathon Winner</b>	<b>2019</b>
<b>SpokAnimal Shelter Volunteer</b>	<b>2019</b>
<b>Whitworth Men's Basketball Team</b>	<b>2016 - 2019</b>