Robert Searles

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Work Experience

2019–Present **Senior Solutions Architect**, *NVIDIA Corporation*, Knoxville, TN (Remote)

I help scientists in the U.S. Department of Energy leverage NVIDIA GPUs for their research. My responsibilities are broad and include fielding and facilitating customer benchmarking requests, teaching, systems troubleshooting, application troubleshooting, performance analysis, and performance optimization. I am a certified DLI instructor for our Fundamentals of Accelerating Computing courses taught in CUDA, OpenACC, and CUDA Python. I also teach several bootcamps including the popular N-Ways to GPU Programming bootcamp, which covers the basics of CUDA, OpenACC, Standard Language Parallelism (StdPar), OpenMP Offloading, CuPy, and Numba. Lastly, I help coordinate the SA team's customer benchmarking requests to provide performance measurements and ensure customer satisfaction.

2015 **Co-Op Engineer**, *Advanced Micro Device (AMD)*, Sunnyvale, CA

Member of the external research area at the Sunnyvale facility. Implemented a template library providing high-level programming abstraction for an emerging processing-in-memory architecture.

Education

2012–2019 **Ph.D. Computer and Information Science**, *University of Delaware*, Newark, DE

Advisor: Prof. Sunita Chandrasekaran.
Research Interests:
- Dissertation work focused on creating portable programming language extensions for complex parallel patterns targeting HPC systems
- Designing and creating prototypes for programming abstractions targeting heterogeneous systems
- Auto-tuning of compiler optimizations, machine learning, and distributed graph analytics on large sets of data

2016 **M.S. Computer Science**, *University of Delaware*, Newark, DE

2008–2012 **B.S. Computer Science**, *University of Delaware*, Newark, DE

Implemented the College of Engineering's academic and research accounts system as capstone course project. System is currently used to manage access to academic and research systems throughout the college.

Academic Experience

2018–2020 **Project Leader**, *Minisweep*, SPEC HPG

Project lead for the Minisweep benchmark. Responsible for the full integration of the benchmark into the SPEC harness including the following:
- Integration of Minisweep benchmark into the SPEC HPG harness (www.spec.org/hpg)
- Workload configuration used to run Minisweep, a radiation transport mini application used to model nuclear fusion reactors, with various simulation sizes
- Documentation associated with the application, including compilation/runtime flags, dependencies, and restrictions

2011–Present **Research Assistant**, *University of Delaware*, Newark, DE

Position under Dr. Sunita Chandrasekaran. Conducted research on multiple topics, including:
- Auto-tuning high level languages targeted at GPU codes (including financial applications ported to the GPU)
- Optimizing GPU performance using OpenACC, a directive-based parallel programming model for heterogeneous systems
- Leveraging heterogeneous systems to perform program characterization by analyzing graph-based representations of applications using MapReduce
- Large-scale graph analysis on distributed systems using a combination of MapReduce and GPUs
- Creating a high-level abstraction for parallel wavefront algorithms
- Parallelized and accelerated a nuclear radiation transport miniapplication, Minisweep, on supercomputers. **Minisweep used for acceptance testing on SUMMIT (Top #1 in Top500 supercomputer)**

2010, 2015-2017 **Teaching Assistant**, *University of Delaware*, Newark, DE

Monitor lab sessions and proctor exams. Fill in for lectures when needed. Responsible for grading labs and exams and holding office hours for students who need extra help.

Publications

[1] [CONFERENCE] J. Li, A. Bobyr, S. Boehm, ..., R. Searles, ..., "SPEChpc 2021 Benchmark Suites for Modern HPC Systems," in *ACM/SPEC International Conference on Performance Engineering* (ICPE '22).

[2] [JOURNAL] E. Wright, M. Ferrato, A. Bryer, R. Searles, J. Perilla, S. Chandrasekaran, "Accelerating prediction of chemical shift of protein structures on GPUs: Using OpenACC," in *PLOS Computational Biology* (PLOS 2020).

[3] [DISSERTATION] R. Searles, "Creating a Portable Programming Abstraction for Wavefront Patterns Targeting HPC Systems," at *University of Delaware*.

[4] [JOURNAL] R. Searles, S. Chandrasekaran, W. Joubert, and O. Hernandez, "MPI + OpenACC: Accelerating Radiation Transport Mini-Application, Minisweep, on Heterogeneous Systems," in *Computer Physics Communications* (CPC 2018).

DOI: 10.1016/j.cpc.2018.10.007

[5] [CONFERENCE] R. Searles, S. Chandrasekaran, W. Joubert, and O. Hernandez, "Abstractions and Directives for Adapting Wavefront Algorithms to Future Architectures," at *The Platform for Advanced Scientific Computing* (PASC 2018).

DOI: 10.1145/3218176.3218228

[6] [CONFERENCE] M. Ghane, S. Chandrasekaran, R. Searles, M. Cheung, and O. Hernandez, "Path Forward for Softwarization to Tackle Evolving Hardware," at *Disruptive Technologies in Information Sciences 2018* (Proc. SPIE 10652).

DOI: 10.1117/12.2304813

[7] [JOURNAL] R. Searles, S. Herbein, T. Johnston, M. Taufer, and S. Chandrasekaran, "Creating a Portable, High-Level Graph Analytics Paradigm For Compute and Data-Intensive Applications," at *International Journal of High Performance Computing and Networking* (IJHPCN 2017 Vol. 10).

DOI: 10.1504/IJHPCN.2017.10007922

[8] [CONFERENCE] R. Searles, L. Xu, W. Killian, T. Vanderbruggen, T. Forren, J. Howe, Z. Pearson, C. Shannon, J. Simmons, and J. Cavazos, "Parallelization of Machine Learning Applied to Call Graphs of Binaries for Malware Detection," at *25th Euromicro International Conference on Parallel, Distributed and Network-Based Processing*, PDP 2017, St. Petersburg, Russia, 2017.

[9] [WORKSHOP] R. Searles, S. Herbein, and S. Chandrasekaran, "A Portable, High-Level Graph Analytics Framework Targeting Distributed, Heterogeneous Systems," at *WACCPD16: Third Workshop on Accelerator Programming Using Directives* (WACCPD '16). IEEE Press, Piscataway, NJ, USA, 79-88.

[10] [WORKSHOP] S. Grauer-Gray, W. Killian, R. Searles, and J. Cavazos, "Accelerating Financial Applications on the GPU," in *Proceedings of the 6th Workshop on General Purpose Processor Using Graphics Processing Units*, GPGPU-6, (New York, NY, USA), pp. 127–136, ACM, 2013.

[11] [CONFERENCE] S. Grauer-Gray, R. Searles, L. Xu, S. Ayalasomayajula, and J. Cavazos, "Auto-tuning a High-Level Language Targeted to GPU Codes," at *INPAR: Innovative Parallel Computing*, INPAR 2014, San Jose, CA, USA, 2012.

Posters & Invited Talks

2019   [POSTER] Abstractions and Directives for Adapting Wavefront Algorithms to Future Architectures, *GPU Technology Conference (GTC) 2019*, San Jose, CA

2018   [INVITED TALK] Creating Language Extensions For Complex Parallel Patterns, *National Center for Atmospheric Research (NCAR)*, Boulder, CO

Open-Source Projects

Minisweep
github.com/rsearles35/minisweep
Sn radiation transport miniapplication

Spark+X
https://github.com/rsearles35/Spark-Plus-Accelerator
Spark + GPU acceleration of graph analytics applications

PolyBench/ACC
cavazos-lab.github.io/PolyBench-ACC
Scientific kernels targeting accelerators

FinanceBench
cavazos-lab.github.io/FinanceBench
Financial benchmarks targeting accelerators

Mentor - GPU Programming Hackathons and Workshops

2019   Mentor, *GPU Hackathon - Oak Ridge Leadership Computing Facility (OLCF)*, Knoxville, TN

2017–2019   Mentor, *GPU Hackathon - Brookhaven National Laboratory*, Upton, NY

2017   Mentor, *GPU Hackathon - NASA Langley*, Hampton, VA

2016   Mentor, *3-Day OpenACC GPU Hands-on Programming Workshop at University of Delaware*, Newark, DE

2016   GPU Hackathon Participant, *5-Day GPU Programming Hackathon at University of Delaware*, Newark, DE. Implemented a machine learning algorithm used to detect and characterize malicious applications (malware) in OpenACC.

Professional Volunteerism

2018   Student Volunteer Lead, *SuperComputing 2018*, Dallas, TX

2018   Student Volunteer, *The Platform for Advanced Scientific Computing (PASC)*, Basel, CH

2017   Student Volunteer Lead, *SuperComputing 2017*, Denver, CO

2016   Student Volunteer, *SuperComputing 2016*, Salt Lake City, UT

2015   Student Volunteer, *SuperComputing 2015*, Austin, TX

2014   Student Volunteer, *SuperComputing 2014*, New Orleans, LA

2009–2012   Vice-President, *Association of Computing Machinery (ACM) @ UD*, Newark, DE

2009–2012   Webmaster, *Linux Users Group @ UD*, Newark, DE

Hobbies

Music Production   Music has always been a huge part of my life, so I decided to learn how to record and produce my own. I enjoy writing my own music, as well as recording cover songs. I also have produced tracks for several local bands in the Delaware region:
- Red Hotts: facebook.com/redhottsmusic
- Lost Continent: facebook.com/lostcontinentmetal

You can check out my recordings and videos on the following platforms:
- Soundcloud: soundcloud.com/robbiesearles
- YouTube: youtube.com/robshouse

Cars   I've always loved anything with a motor in it. I started working on my cars out of necessity during my years as a student. I could not afford to pay someone else to fix my vehicles, so I took it upon myself to learn. I still do the majority of my own maintenance on my cars, and I also do a lot of upgrades on my vehicles. I started filming some of the work I do in hopes of helping people like myself who would like to learn about their vehicles but lack formal training and/or experience. You can find these videos on my YouTube channel:
- YouTube: youtube.com/robshouse
- Instagram: instagram.com/robshouseofficial