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Robert Searles

Work Experience

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

I help scientists in the U.S. Department of Energy and other federal scientific agencies leverage NVIDIA GPUs for their research. I serve in a customer facing role and am responsible for developing an intimate understanding of customer goals, strategies, and technical needs and leverage that understanding to help define and deliver high-value solutions meeting those needs. This involves integrating NVIDIA technology into both AI and HPC Workloads leveraging my skills in performance analysis, optimization, application and systems troubleshooting, and teaching. I am a certified DLI instructor for our Fundamentals of Accelerating Computing courses taught in CUDA, OpenACC, and CUDA Python. I also am an instructor for 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 heterogeneous 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.

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