Anthony Cabrera

Heterogeneous Computing Research Scientist

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Summary

Experienced heterogeneous computing researcher and lifelong learner with a penchant for exploring questions around the hardware-software interface. Adept at quickly learning skills, languages, or tools necessary to answer research questions. Strives to communicate complex ideas effectively and accessibly. Previously held DoD-Secret clearance.

Education

Washington University in St. Louis — *St. Louis, MO*

PhD Computer Engineering	*August 2020*
MS Computer Science	*August 2018*
BS Computer Engineering, Second Major Computer Science	*May 2015*
BSAS Electrical Engineering	

Hendrix College — *Conway, AR*

BA Chemical Physics, Minor Music	*May 2013*

Research and Work Experience

Architectures and Performance Group @ Oak Ridge National Laboratory — *Oak Ridge, TN (Remote from STL)*

Software Engineer — *Aug 2020 - Present*

- Leading a multi-institution performance and portability evaluation comparing Intel and Xilinx FPGA OpenCL kernels
- Developing Hexagon DSP kernels for the Qualcomm Snapdragon chip, as part of DARPA's DSSoC project
- Exploring GPU-FPGA collaboration on HPC mini applications as part of the DoE Exascale Compute Project

Stream Based Supercomputing Laboratory @ Washington University in St. Louis — *St. Louis, MO*

Graduate Research Assistant — *July 2016 - July 2020*

- Thesis: Domain Specific Computing in Tightly Coupled Heterogeneous Systems
- Evaluated the Intel HARPv2 CPU+FPGA platform as a domain specific compute solution
- Created a benchmark suite of data integration applications (DIBS) to identify opportunities for hardware acceleration
- Ported Needleman-Wunsch OpenCL Kernels to the Intel HARPv2 CPU+FPGA platform to analyze kernel design, performance, and portability
- Architected and optimized hardware for DIBS applications using OpenCL targeting the Intel HARPv2

The MITRE Corporation — *Shiloh, IL*

Graduate Prototyping and Software Engineer — *May 2019 - August 2019*

- Created a neural network to detect cars from wireless iPhone camera stream targeting the NVIDIA Jetson Nano
- Deployed containers on GPU-enabled HPC resources to train convolutional neural networks
- Mentored undergraduate intern project on hyperparameter performance analysis
- Maintained GitLab repository to document work and enable continued development of project
- Selected as one of four interns across all of MITRE's sites to deliver company-wide presentation on project

Arm Holdings — *Austin, TX*

Graduate Research Intern — *May. 2018 - Aug. 2018*

- Quantified spatial and temporal locality by creating a novel technique based on reuse distance
- Developed dynamic binary instrumentation clients to profile memory subsystem characteristics
- Identified strategies around data layout transformations and paging to improve memory subsystem performance

Advanced Sensors Research Laboratory @ Washington University in St. Louis — *St. Louis, MO*

Undergraduate and Graduate Research Assistant — *May 2014 - July 2016*

- Developed the software/UI for filter alignment of NIR fluorescence imagers
- Assisted medical researchers with NIR fluorescence and polarization imaging studies
- Aided in the design and fabrication of a custom PCB around an ultra low-noise imaging sensor

Teaching Experience

FL17, FL18 **WUSTL CSE 560M Computer Systems Architecture I**, Graduate Teaching Assistant   *St. Louis, MO*
SU18   **WUSTL CSE 566S High Performance Computing**, Graduate Teaching Assistant
SP16   **WUSTL CSE {4,5}63M Digital Integrated Circuit Design and Architecture**, Graduate Teaching Assistant
FL14, SP15 **WUSTL CSE 200 Scientific Computing**, Undergraduate Teaching Assistant

Peer Reviewed Publications

1. **AM Cabrera**, RD Chamberlain "Design and Performance Evaluation of Optimizations for OpenCL FPGA Kernels" *IEEE High Performance Extreme Computing Conference (HPEC '20)*

2. **AM Cabrera**, RD Chamberlain "Designing Domain Specific Computing Systems" *IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM '20)*

3. **AM Cabrera**, RD Chamberlain, JC Beard "Multi-spectral Reuse Distance: Divining Spatial Information from Temporal Data" *IEEE High Performance Extreme Computing Conference (HPEC '19)*

4. **AM Cabrera**, RD Chamberlain "Exploring Portability and Performance of OpenCL FPGA Kernels on Intel HARPv2" *ACM International Workshop on OpenCL (IWOCL '19)* **Best Presentation Award**

5. CJ Faber, **AM Cabrera**, O Booker, G Maayan, RD Chamberlain "Data Integration Tasks on Heterogeneous Systems Using OpenCL" *ACM International Workshop on OpenCL (IWOCL '19)*

6. **AM Cabrera**, CJ Faber, K Cepeda, R Derber, C Epstein, J Zheng, RK Cytron, RD Chamberlain "DIBS: A Data Integration Benchmark Suite" *ACM/SPEC International Conference on Performance Engineering (ICPE '18)*

Honors and Awards

2020	**SC20 Early Career Program**, Supercomputing 2020	*Atlanta, GA*
2020	**Honors Designation for PhD Progress Review (Top 15-20% of students)**, CSE Department @ WUSTL	*St. Louis, MO*
2020	**Engineering PhD Student Commencement Marshal**, WUSTL	*St. Louis, MO*
2019	**Best Presentation Award**, International Workshop on OpenCL	*Boston, MA*
2019	**Graduate Student Ambassador**, Intel Corporation	*St. Louis, MO*
2019	**Travel Grant**, Supercomputing 2019	*Denver, CO*
2018	**Travel Grant**, Supercomputing 2018	*Dallas, TX*
2017	**Travel Grant**, Supercomputing 2017	*Denver, CO*
2015	**Graduate Danforth Scholar**, WUSTL	*St. Louis, MO*
2013	**Harold P. Brown Engineering Fellowship**, McKelvey School of Engineering @ WUSTL	*St. Louis, MO*
2013	**Hendrix College Chamber Orchestra Award**, Hendrix College	*Conway, AR*
2012	**Transamerica Employer Solution & Pension Scholarship Award**, Transamerica Corporation	*Little Rock, AR*
2011	**Hendrix College Chamber Orchestra Award**, Hendrix College	*Conway, AR*

Professional Service

2021	**Program Committee**, International Workshop on OpenCL and SYCLcon	*Remote*
2021	**SC21 Inclusivity Committee Liaison for Local Arrangements**, Supercomputing 2021	*St. Louis, MO*
2019	**Lead Student Volunteer: Press Liaison**, Supercomputing 2019	*Denver, CO*
2019	**Student Volunteer**, Supercomputing 2018	*Dallas, TX*
2017	**Student Volunteer**, Supercomputing 2017	*Denver, CO*

Skills

Languages   (Alphabetical) Bash, C, C++, CMake, DynamoRIO, Git, MATLAB, OpenCL, Python