

Emily K. Ruppel

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EDUCATION

Carnegie Mellon University: College of Engineering PhD Electrical & Computer Engineering Advisor: Brandon Lucia	Pittsburgh, PA 2016 - (Expected)2022
Carnegie Mellon University: College of Engineering M.S. Electrical & Computer Engineering	Pittsburgh, PA May 2019
University of Maryland: A. James Clark School of Engineering B.S. Electrical Engineering, Minor Computer Engineering Magna Cum Laude, with Gemstone Honors Citation	College Park, MD May 2016

PUBLICATIONS

- A Foundation for Load-Aware Energy Management in Energy-Harvesting Systems**
(In Submission) Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2022.
E. Ruppel, M. Surbatovich, H. Desai, B. Lucia.
- Debugging and Avoiding Peripheral Energy Bugs in Intermittent Systems**
(In Submission) Programming Language Design and Implementation (CGO), 2022.
E. Ruppel, B. Lucia
- Computational Nanosatellite Constellations: Opportunities and Challenges**
ACM GetMobile: Mobile Computing and Communications, Volume 25, Issue 1
B. Lucia, B. Denby, Z. Manchester, H. Desai, **E. Ruppel**, A. Colin
- Transactional Concurrency Control for Intermittent, Energy-Harvesting Computing Systems**
Programming Language Design and Implementation (PLDI), 2019.
E. Ruppel, B. Lucia
- A Reconfigurable Energy Storage Architecture for Energy-harvesting Devices**
Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2018.
Best Paper, IEEE MICRO Top Picks Honorable Mention 2019.
A. Colin, **E. Ruppel**, B. Lucia
- Intermittent Computing: Challenges and Research Opportunities**
Summit on Advances in Programming Languages (SNAPL), 2017.
B. Lucia, V. Balaji, A. Colin, K. Maeng, **E. Ruppel**
- Low Latency, High Bisection-Bandwidth Networks for Exascale Memory Systems.**
International Symposium on Memory Systems (MEMSYS), 2016
S. Li, P. Huang, D. Banks, M. Depalma, A. Elshaarany, S. Hemmert, A. Rodrigues, **E. Ruppel**,
Y. Wang, J. Ang and B. Jacob.

Tutorials

- E. Ruppel**, K. Maeng, G. Gobieski, M. Surbatovich, B. Lucia. "Getting Started with Intermittent Computing."
Interactive Tutorial. International Symposium on Microarchitecture (MICRO), 2018.

RESEARCH EXPERIENCE

- Carnegie Mellon University, Intermittent Computing Research**
Graduate Student Pittsburgh, PA
Aug. 2016-Present
- Lead an initiative to demonstrate that the circuit-level loading effect on supercapacitors must be propagated up to the programming framework to enable future energy-harvesting embedded systems.
 - Designed the power system, control board, and failure resistant control software for a batteryless PocketQube satellite and lead integration with mechanical, radio and experimental subsystems.

- Developed a compiler analysis and instrumentation pass with LLVM to automatically reduce the energy consumption of peripheral sensors and actuators on energy constrained IoT platforms.
- Developed programming and execution model to support transactional concurrency control on batteryless, energy-harvesting devices.
- Designed a custom energy harvesting development board with a reconfigurable capacitor bank and built programming language support for energy storage control.

University of Maryland, Memory Systems Research

College Park, MD

Undergraduate Researcher

Aug. 2015-May 2016

- Investigated novel, high performance computing architectures to optimize a system with unique tradeoffs using the open-source Structural Simulation Toolkit Macro simulator.
- Explored high performance computer interconnect topologies to assess the benefit of new network topology and router designs.

Gemstone Team BIKES

College Park, MD

Access Control Sub-Team Leader

Aug. 2012-May 2016

- Conducted the necessary product design, market and technical research to implement a “station-less” bikeshare optimized for cost, security and ease of use as part of a four-year research program.
- Responsible for the radio frequency identification system and the interface to a remote user database.

National Institute of Standards and Technology

Gaithersburg, MD

Undergraduate Researcher

May-Aug 2013

- Implemented and validated the mathematical model of phasor measurement unit design detailed in the IEEE Standard for Synchrophasor Measurements in LabVIEW programming environment.
- Incorporated the model into existing NIST system for submitting test signals to phasor measurement units to assess the attainability of the existing standard.

INDUSTRY EXPERIENCE

Arm Research: Devices, Circuits & Systems Group

Austin, TX

Research Intern

May-Aug. 2019

- Added programming support for intermittent execution to a Cortex-M0 based system with volatile and non-volatile memory using statically placed checkpoints.
- Modified the Arm DesignStart Cortex-M0 RTL to simulate spontaneous power failures and reboots.

Northrop Grumman Mission Systems: Power Conversion Technology

Baltimore, MD

Intern

May-Aug. 2016

- Contributed to the design of a point-of-load power supply for a radar antenna control board by using LTSPICE simulations to select power regulators and by drawing schematics using CAD tools.
- Tested and corrected errors in the initialization sequence of radar antenna control boards by applying knowledge of the LTPowerPlay software and an understanding of linear regulator clocking protocols.

IBM, Memory Development Department

Poughkeepsie, NY

Intern

June –Aug. 2015

- Assessed the compliance of a memory initialization sequence for the DDR4 LRDIMM with JEDEC specifications using digital logic analyzer traces of the system operation and corrected errors.
- Conducted failure analysis of memory cards used in the Z Systems mainframe and presented findings to assist a team seeking to identify the cause of a prevalent hardware malfunction.

Boeing Defense, Space & Security: Strategic Missile Systems Huntington Beach, CA
 Intern May-Aug. 2014

- Researched and applied strategies for converting junction device models and radiation simulation functions originating in Rockwell Electronic Design Analysis Code (REDAC) to Pspice.
- Investigated and applied method for creating an interface between components of the Minuteman missile guidance test system using LabVIEW software and the LabVIEW FPGA module.

TEACHING EXPERIENCE

Introduction to Electrical and Computer Engineering Pittsburgh, PA
 Graduate Teaching Assistant Aug.-Dec. 2020

- Lead three small groups of freshmen in weekly, remote recitations to reinforce course content.
- Facilitated remote lab demos.

Computer Architecture and Systems Pittsburgh, PA
 Graduate Teaching Assistant Aug.-Dec. 2018

- Provided supplementary material to help students understand the assigned readings.
- Assisted student groups with class project planning.

Intermediate Programming Concepts for Engineers College Park, MD
 Undergraduate Teaching Fellow Jan.-Dec. 2014

- Led recitation for students in a C Programming course to supplement and assess their understanding.
- Graded homework, project, quiz and test responses.

First-Year Innovation Research Experience – Sustainability Analytics Group College Park, MD
 Peer Research Mentor Jan-Dec. 2015

- Led students in several data intensive research projects related to natural resource usage.
- Created learning modules for statistical programming languages and software.

HONORS

PhD Qualifying Exam Passed with Distinction	2018
National Science Foundation Graduate Research Fellowship Program Honorable Mention	2017
Phillips and Huang Family Fellowship in Energy	2017-2018
William S. Dietrich II Presidential Ph.D. Fellowship	2016-2017
Stamps Bancker/Key Leadership Scholarship	2012-2016
Northrop Grumman Electronic Systems Engineering Scholarship	2012-2016

SERVICE

CASA Long Term Mentoring Committee- Co-Chair	2021
JOBS 2020 Workshop Organizing Committee- Interviews Co-Chair	2020
ASPLOS 2020 Organization Committee- Web Chair	2019-2020
ASPLOS 2020 Artifact Evaluation Committee- Reviewer	2020
ECE Graduate Organization- Secretary (2019), President (2018), VP (2017)	2017-Present
CIT College Council- Graduate Student Representative	2018-2019
Graduate Admissions Committee Open House Subcommittee- Student Member	2016-2018
Alpha Omega Epsilon, Engineering Sorority- Professional Committee Chair	2015-2016

RELEVANT COURSEWORK

Computer Architecture and Systems	Optimizing Compilers
Advanced OS and Distributed Systems	ULSI Technology Status and Roadmap for SoC
Energy Aware Computing	Reconfigurable Logic Technology
Wireless Sensor Networks	Introduction to Machine Learning