Matthew Halpern

✉ *Matthalp@utexas.edu*

Research Interests

- Mobile software systems, Web services, and computer architecture
- Optimization techniques based on crowdsourcing, analytics and big data
- Measurement-based workload characterization and performance analysis

Education

2013–Present **Ph.D., Electrical and Computer Engineering**, The University of Texas at Austin.
Computer Architecture and Embedded Processors (CAEP) Track
Advisor: Prof. Vijay Janapa Reddi
GPA: 3.89/4.00

2013–Present **M.S., Electrical and Computer Engineering**, The University of Texas at Austin.
Computer Architecture and Embedded Processors (CAEP) Track
Advisor: Prof. Vijay Janapa Reddi
GPA: 3.89/4.00

2009–2013 **B.S., Electrical and Computer Engineering**, The University of Texas at Austin.
Technical Areas: Embedded Systems and Digital Signal Processing
GPA: 3.75/4.00

Publications

Matthew Halpern, Yuhao Zhu, Vijay Janapa Reddi. "Mobile CPU's Rise to Power: Quantifying the Impact of Generational Mobile CPU Design Trends on Performance, Energy, and User Satisfaction." IEEE Symposium on High Performance Computer Architecture (HPCA) 2016.

Yuhao Zhu, Daniel Richins, **Matthew Halpern**, Vijay Janapa Reddi. "Microarchitectural Implications of Event-driven Server-side Web Applications." IEEE International Symposium on Microarchitecture (MICRO) 2015.

Yazhou Zu, Charles Leufergy, Jingwen Leng, **Matthew Halpern**, Michael Floyd, Vijay Janapa Reddi. "Adaptive Guardband Scheduling to Improve System-level Efficiency of the POWER7+." IEEE International Symposium on Microarchitecture (MICRO) 2015.

Matthew Halpern, Yuhao Zhu, Ramesh Peri, Vijay Janapa Reddi. "Mosaic: Cross-Platform User-Interaction Record and Replay for the Fragmented Android Ecosystem." IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS) 2015.

Yuhao Zhu, **Matthew Halpern**, Vijay Janapa Reddi. "Event-based Scheduling for Energy-Efficient QoS (eQoS) in Mobile Web Applications." IEEE Symposium on High Performance Computer Architecture (HPCA) 2015.

Yuhao Zhu, **Matthew Halpern**, Vijay Janapa Reddi. "The Role of the CPU in Energy-Efficient Mobile Web Browsing." IEEE MICRO Mobile Special Issue, 2015.

Awards and Honors

08/13 **Recipient**, *Cockrell School of Engineering Graduate Fellowship.*

08/13 **Recipient**, *The University of Texas at Austin Graduate School Fellowship.*

05/13 **Recipient**, *Teaching Assistant Teaching Excellence Award.*

12/11 **Runner-Up**, *EE445L Embedded System Design Competition.*

12/10 **Engineering FIG Mentor of the Year**, *UT Cockrell School of Engineering.*

Experience

Research

05/13–Present **The University of Texas at Austin**, Austin, TX.

Crowdsourced Compilation for a Responsive and Energy-efficient Mobile Web
Developing a feedback-driven optimization and compilation framework that leverages the power of "crowdsourcing" (i.e. soliciting information and computation from large groups of mobile Web browsers) to improve the responsiveness and energy efficiency of the mobile Web applications.

Crowdsourced User Interaction Studies
Bridge gap between mobile CPU design and user satisfaction using large scale crowdsourcing studies (20,000 participants). Android application use cases are recorded from real uses and replayed across a variety of processor configurations. Videos are uploaded to the Amazon Mechanical Turk service for users to vote on satisfaction.

Quantitative Performance Analysis across Smartphone Generations
Conducted measurement-based study of system-on-chip evolution across six annual smartphone generations from 2009 to 2014. Performed workload characterization of breadth of applications from Google Play.

Industry

05/15–12/15 **Research Intern**, *IBM T.J. Watson Research Center*, Yorktown Heights, NY.
Developed research prototype of a cognitive service manager for Watson Developer Cloud. The manager provisions service nodes with different machine learning model variants and intelligently routes incoming requests to the appropriate variant node.

06/14–8/14 **Software Development Intern**, *Intel Corp.*, Austin, TX.
Developed a cross-platform deterministic record and replay tool. User interacts recorded on one device can be replayed across a variety of other devices for competitive analysis.

05/13–1/13 **Research Intern**, *Coherent Logix Inc.*, Austin, TX.
Studied architecture-level energy-efficiency techniques for Hx3100B many-core processor. Developed experiment infrastructure and statistical analysis toolchain.

09/12–05/13 **DSP Application Intern**, *Coherent Logix Inc.*, Austin, TX.
Implemented DSP-based customer benchmarks and demos on manycore processors. Assisted in developing framework to exploit parallelism in image processing algorithms.

11/11–09/12 **System Software Intern**, *Coherent Logix Inc.*, Austin, TX.
Developed and enhanced embedded Linux interfaces to core-memory network of a manycore processor architecture. Resulted in also creating a fast chip loader and instruction overlaying framework.

05/11–08/11 **Enterprise Product Quality Intern**, *Dell Inc.*, Austin, TX.
Designed, coded, tested, and implemented a web-based defect tracking system on schedule. Helped meet requests by other groups for tool by creating custom interfaces, documentation, and training.

05/10–01/11 **Management Trainee Intern**, *Enterprise Rent-A-Car*, Dallas, TX.
Attained Elite Salesman status for exceptional individual and branch sales performance. Awarded outstanding customer service commendation.

Academic

01/13–05/13 **Teaching Assistant**, *The University of Texas at Austin*, Austin, TX.
Embedded and Real-time Systems Lab for Prof. Jonathan Valvano. Future course development.

01/12–12/12 **Teaching Assistant**, *The University of Texas at Austin*, Austin, TX.
Microprocessor Applications and Interfacing for Prof. Jonathan Valvano and Prof. William Bard. Conducted lab sessions to provide students hands on experience designing, prototyping, and debugging embedded systems by developing interfaces using ARM Cortex-M microcontrollers.

08/10–05/11 **Tutor**, *The University of Texas at Austin*, Austin, TX.
Reinforce students' understanding of programming, signal analysis, and circuit analysis.

Leadership

08/10–12/10 **Mentor**, *UT Freshmen Interest Group (FIG) Program.*
Responsible for 20 electrical engineering students' transition to college life. Held weekly seminars on achieving academic success and making the most of the college experience. Counseled these students in one-on-one meetings. *Awarded 2010 Engineering FIG Mentor of the year.*

Academic Service

12/15 **Artifact Evaluation Committee**, *International Symposium on Code Generation and Optimization (CGO).*

02/15 **Web Chair**, *Architectural and Microarchitectural Support for Binary Translation (AMAS-BT).*

05/14 **Volunteer**, *International Symposium on Performance Analysis of Systems and Software (ISPASS).*

Skills

Devops	Docker, Logstash, Netflix OSS, Mesos/Marathon
Programming	C, C++, C#, Java
Scripting	Bash, Python, TCL
Hardware	Verilog, VHDL
Math Tools	MATLAB
Web	CSS, Javascript, HTML, SQL
OS	Linux, Mac OS X, Windows, Embedded Linux, Android, iOS
HW Testing	Logic Analyzers, Signal Generators, Oscilloscopes
Productivity	LaTeX, Microsoft Office

Projects

Power Side-channel for Mobile Web Browsing, *Security at the HW/SW Interface.*
Demonstrated that web browsing behavior can be detected via power consumption with 78% accuracy across 100 popular webpages. A smartphone SoC was instrumented for power measurement while loading web pages. The collected power consumption time-series are fed into a machine learning pipeline for detection.

Intelligent Web-based Sprinkler System Controller, *Honors Senior Design.*
Networked, environmentally aware sprinkler system controller minimizing water consumption while maximizing user satisfaction. Interfaces to legacy sprinkler systems and uses WiFi connectivity to communicate with back-end system utilizing machine learning and data mining algorithms.

LC3-b CPU Emulators, *Computer Architecture.*
Instruction-level and cycle-level accurate simulators for the LC-3b academic processor architecture. The LC-3b has a microcoded architecture which supports exceptions, virtual memory, and pipelining.

Autonomous Navigation Robot, *Embedded and Real-time Systems Lab.*
Custom-built robot utilizing control algorithms driven by sensor acquisition interfaces running on a real-time operating system built to leverage the ARM Cortex-M3 architecture. *Finals qualifier for course racing competition.*

Wireless Camera Transmitter, *Microprocessor Interfacing and Organization.*
Interfaced smartphone quality camera to ARM Cortex-M3 on custom-designed PCB to transmit images to a demonstration receiver system through ZigBee (IEEE 802.15.4) protocol. *Won second place in course design competition and was featured in Prof. Jonathan Valvano's textbook, "Embedded Systems: Real-Time Operating Systems for the ARM Cortex-M3".*