

Jonathan Balkind

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I am a PhD Candidate focusing on the overlap between Computer Architecture, Programming Languages, and Operating Systems. I am interested in pragmatic research, having undertaken industrial and academic internships and having helped implement a 25-core chip, Piton, in silicon to test Computer Architecture ideas from our research group. I have a keen interest in pedagogical and research outreach, as shown by my work on OpenPiton, our open source research framework which is being actively used for research and education across the globe. I also spend time on community building at Princeton. I advise freshmen as a Resident Graduate Student in one of Princeton's residential colleges and mentor underclassmen through the university's ReMatch program, which I helped organise in its first year. I have participated in the Graduate Student Government, Princeton's foremost graduate student advocacy group, for several years and was recently elected as its President.

Education

September 2013 - Present

Princeton University, USA

- PhD Candidate, Department of Computer Science
- Expected Graduation Date: June 2018
- Advised by Professor David Wentzlaff

September 2015

Princeton University, USA

- Master of Arts in Computer Science

June 2013

University of Glasgow, UK

- Master in Science in Computing Science
- Received Honours of the First Class

September 2009 - August 2010

University of California, Santa Barbara, USA

- Computer Science Exchange student
- Cumulative GPA 3.94/4.00

Community Engagement

March 2017 - Present

President, Graduate Student Government

Princeton University

September 2015 - Present

Resident Graduate Student, Wilson College

Princeton University

Computer Science Graduate Committee Princeton University	September 2013 - Present
University Administrative Fellow, Office of Undergraduate Research Princeton University	September 2016 - January 2017
Communications Director, Graduate Student Government Princeton University	March 2016 - March 2017
Princeton Research Day Steering Committee Princeton University	September 2015 - May 2016
ReMatch Mentor and Event Organiser Princeton University	September 2014 - September 2015
Computing Science Society President University of Glasgow	2011 - 2013

Teaching Experience

Assistant in Instruction (TA) for COS 333 Advanced Programming Techniques <ul style="list-style-type: none"> Held weekly office hours, graded homeworks and final projects Advised seven student groups on their first large scale software projects 	February - May 2017
LabMatch/ReMatch Summer Mentor <ul style="list-style-type: none"> One of two mentors competitively selected for the first LabMatch summer cohort Advised a summer student on a data centre measurement project and acted as a graduate mentor for another freshman 	July-September 2015
Assistant in Instruction (TA) for ELE 475 Computer Architecture <ul style="list-style-type: none"> Gave tutorials, managed all aspects of class labs, and graded coursework and exams 	February - May 2015
Coursera.org Computer Architecture Teaching Assistant <ul style="list-style-type: none"> Managed course materials and exams and answered questions on discussion forum 	Fall 2014
Student Tutor/Demonstrator <ul style="list-style-type: none"> Tutored Java, C, and Operating Systems Gave lectures on C Programming 	2011 - 2013

Research Interests

My current research focuses on a hardware addition, programming language augmentation, and operating system modification to improve performance and energy efficiency for heterogeneous processors. I have a keen interest in programming languages, having applied theorem provers/functional languages to hardware design. I also enjoy systems, having taken our 25-core processor, Piton, from running simple assembly tests to full-stack Debian Linux. For my Masters, I applied machine learning to the problem of classifying network traffic.

Research Experience

2014 - Present

Princeton Graduate Research Project

Multicore Effect Tracking Architecture

- Designed and implemented a simulator for a new approach to extracting parallelism from existing C code running on heterogeneous processors
- Implemented (in verilog) a novel hardware structure for tracking function information
- *Paper in submission for inclusion in MICRO 2017*

2014 - Present

Princeton Graduate Research Project

OpenPiton Research Framework

- The world's first open source, general purpose, multithreaded, manycore processor
- Coordinated our team to transform Piton into OpenPiton
- Thousands of users from more than 70 countries

2014 - Present

Princeton Graduate Research Project

Piton Microprocessor

- 25 core processor manufactured in IBM 32nm SOI
- Responsible for OS bring-up, adding scalability to simulation infrastructure
- Managed our group in a successful test strategy that produced a fully functional chip

Summer 2013

Vacation Scholar (Research Intern)

University of Glasgow, UK

- Developed an expert search system for a Scottish Government body

September 2012 - June 2013

Glasgow Masters Research Project

MicroHydra

- Investigated methods for verifying hardware written using hardware description languages embedded in functional programming languages

Summer 2012

Vacation Scholar (Research Intern)

University of Glasgow, UK

- Implemented a machine learning system to classify network traffic in real-time

Professional Service

- 2017
- Shadow Program Committee Member**
International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2018)
- 2017
- Technical Program Committee Member**
International Workshop on Heterogeneous Distributed Cloud Computing

Work Experience

- Summer 2016
- Research Intern**
Microsoft Research, Cambridge, UK
- Worked on runtime support for safe manual memory management for C# (*paper to appear in OOPSLA 2017*)
- Summer 2012
- Summer Placement (Intern)**
ARM Ltd, Cambridge, UK
- Created a programmable controller for on-the-fly memory testing in safety-critical systems
- Summer 2011
- Assistant Engineer (Intern)**
Samsung Electronics - Telecommunications Systems Business, South Korea
- 14 week internship within the LTE Software Design Lab
 - Wrote a software design draft for LTE-3G call handover, tested operational LTE systems and researched improvements to call reporting methods
- Summer 2010
- Research Assistant (Intern)**
Distributed Systems Lab, UCSB
- 8 week research placement working on a graph visualisation framework for models of information propagation in social networks.

Honours and Awards

- September 2018
- Siebel Scholarship**
Siebel Scholars Foundation
- September 2013 - June 2017
- Gordon Y.S Wu Fellowship in Engineering**
Princeton University
- May 2016
- Fan Favourite Research Talk**
Princeton Research Day
- April 2016
- Mentor Award**
Princeton Graduate Student Appreciation Week
- Feb 2016

25 Under 25 Award

Princeton Innovation, Keller Center for Innovation in Engineering

July 2015

LabMatch/ReMatch Mentor Award

Princeton University

June 2013

Contribution to the School Award

University of Glasgow

November 2012

ARM Sponsorship

ARM Ltd

June 2012

Amor Class Prize

University of Glasgow

2009 - 2010

Dean's Honors Recipient

University of California, Santa Barbara

Publications

- Matthew Parkinson, Dimitrios Vytiniotis, Kapil Vaswani, Manuel Costa, Pantazis Deligiannis, Dylan McDermott, Aaron Blankstein, **Jonathan Balkind**, "Project Snowflake: Non-blocking Safe Manual Memory Management for .NET", OOPSLA 2017 (to appear)
- Michael McKeown, Yaosheng Fu, Tri Nguyen, Yanqi Zhou, **Jonathan Balkind**, Alexey Lavrov, Mohammad Shahradsad, Samuel Payne, and David Wentzlaff, "Piton: A Manycore Processor for Multitenant Clouds", IEEE Micro, March 2017
- Michael McKeown, Yaosheng Fu, Tri Nguyen, Yanqi Zhou, **Jonathan Balkind**, Alexey Lavrov, Mohammad Shahradsad, Samuel Payne, and David Wentzlaff, "Piton: A 25-core Academic Manycore Processor", Hot Chips: A Symposium on High Performance Chips (HC28), August 2016
- **Jonathan Balkind**, Michael McKeown, Yaosheng Fu, Tri Nguyen, Yanqi Zhou, Alexey Lavrov, Mohammad Shahradsad, Adi Fuchs, Samuel Payne, Xiaohua Liang, Matthew Matl, David Wentzlaff, "OpenPiton: An Open Source Manycore Research Framework", Architectural Support for Programming Languages and Operating Systems, Atlanta, GA, April 2016.
- David Wentzlaff, Michael McKeown, Yaosheng Fu, Tri Nguyen, Yanqi Zhou, **Jonathan Balkind**, Alexey Lavrov, Mohammad Shahradsad, and Samuel Payne, "Designing a Complex 25-core Academic Processor", *6th Workshop on Architectural Research Prototyping*, Portland, OR, June 2015.
- Michael McKeown, **Jonathan Balkind**, and David Wentzlaff, "Execution Drafting: Energy Efficiency Through Computation Deduplication," *Proc. 47th International Symposium on Microarchitecture*, Cambridge, UK, December 2014.

Invited Talks and Tutorials

- Tutorial - "Making Research Happen With OpenPiton", University of California, Santa Barbara, California. September 2017
- Tutorial - "An Overview of the OpenPiton Research Framework", University of Cambridge, England. July 2017
- Tutorial - "An Overview of the OpenPiton Research Framework", University of Edinburgh,

Scotland. July 2017

- Tutorial - "Getting to Work with OpenPiton", HPCA, Austin, Texas. February 2017
- "OpenPiton: A Full-Stack Open Source Manycore", ORCONF, Bologna, Italy. October 2016
- "OpenPiton: A Full-Stack Open Source Manycore", Politecnico di Milano, Milan, Italy. October 2016
- Tutorial - "An Introduction to OpenPiton - A Manycore Open Source Processor", ISCA, Seoul, South Korea. June 2016
- "OpenPiton: An Open Source Manycore Research Framework", University of Cambridge Computer Lab, Cambridge, UK. June 2016