James Bornholt

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Employment

University of Texas at Austin — Austin, TX, USA
Assistant Professor, Department of Computer Science — 2021–

Amazon Web Services
Visiting Academic, Amazon S3 — 2021–

Amazon Web Services — Seattle, WA, USA
Senior Applied Scientist, Amazon S3 — 2019–2021

Amazon Web Services — Seattle, WA, USA
Research Intern, Automated Reasoning Group — 2018

Microsoft Research — Canberra, Australia
Software Engineer, Research in Software Engineering (RiSE) group — 2014

Microsoft Research — Seattle, WA, USA
Research Intern, Research in Software Engineering (RiSE) group — 2012–2013

Microsoft Research — Seattle, WA, USA
Research Intern, Research in Software Engineering (RiSE) group — 2011–2012

Education

University of Washington — Seattle, WA, USA
Ph.D., Computer Science & Engineering — 2014–2019
- Advisors: Emina Torlak, Dan Grossman, Luis Ceze
- Thesis: Optimizing the Automated Programming Stack

University of Washington — Seattle, WA, USA
M.S., Computer Science & Engineering — 2016

Australian National University — Canberra, Australia
Bachelor of Philosophy (Honours) — 2010–2013
- Advisor: Steve Blackburn
- First Class Honours and the University Medal in Computer Science

Publications

Conference Papers

Using Lightweight Formal Methods to Validate a Key-Value Storage Node in Amazon S3. James Bornholt, Rajeev Joshi, Vytautas Astrauskas, Brendan Cully, Bernhard Kragl, Seth Markle, Kyle Sauri, Drew Schleit, Grant Slatton, Serdar Tasiran, Jacob Van Geffen, and Andrew Warfield. SOSP 2021. **Best Paper Award**.

Vectorization for Digital Signal Processors via Equality Saturation. Alexa VanHattum, Rachit Nigam, Vincent T. Lee, James Bornholt, and Adrian Sampson. ASPLOS 2021.

A Synthesis-Aided Compiler for DSP Architectures. Alexa VanHattum, Rachit Nigam, Vincent T. Lee, James Bornholt, and Adrian Sampson. LCTES 2020.

Automatic Generation of High-Performance Quantized Machine Learning Kernels. Meghan Cowan, Thierry Moreau, Tianqi Chen, James Bornholt, and Luis Ceze. CGO 2020.

Fixing Code That Explodes Under Symbolic Evaluation. Sorawee Porncharoenwase, James Bornholt, and Emina Torlak. VMCAI 2020.

Scaling Symbolic Evaluation for Automated Verification of Systems Code with Serval. Luke Nelson, James Bornholt, Ronghui Gu, Andrew Baumann, Emina Torlak, and Xi Wang. SOSP 2019. **Best Paper Award**. **Distinguished Artifact Award**.

Finding Code That Explodes Under Symbolic Evaluation. James Bornholt and Emina Torlak. OOPSLA 2018. **Distinguished Artifact Award**.

Nickel: A Framework for Design and Verification of Information Flow Control Systems. Helgi Sigurbjarnarson, Luke Nelson, Bruno Castro-Karney, James Bornholt, Emina Torlak, and Xi Wang. OSDI 2018.

Hyperkernel: Push-Button Verification of an OS Kernel. Luke Nelson, Helgi Sigurbjarnarson, Kaiyuan Zhang, Dylan Johnson, James Bornholt, Emina Torlak, and Xi Wang. SOSP 2017.

Synthesizing Memory Models from Framework Sketches and Litmus Tests. James Bornholt and Emina Torlak. PLDI 2017.

Push-Button Verification of File Systems via Crash Refinement. Helgi Sigurbjarnarson, James Bornholt, Emina Torlak, and Xi Wang. OSDI 2016. **Best Paper Award**.

Disciplined Inconsistency with Consistency Types. Brandon Holt, James Bornholt, Irene Zhang, Dan R. K. Ports, Mark Oskin, and Luis Ceze. SoCC 2016.

Specifying and Checking File System Crash-Consistency Models. James Bornholt, Antoine Kaufmann, Jialin Li, Arvind Krishnamurthy, Emina Torlak, and Xi Wang. ASPLOS 2016.

A DNA-Based Archival Storage System. James Bornholt, Randolph Lopez, Douglas M. Carmean, Luis Ceze, Georg Seelig, and Karin Strauss. ASPLOS 2016. **IEEE Micro Top Picks**.

Optimizing Synthesis with Metasketches. James Bornholt, Emina Torlak, Dan Grossman, and Luis Ceze. POPL 2016.

Hardware–Software Co-Design: Not Just a Cliché. Adrian Sampson, James Bornholt, and Luis Ceze. SNAPL 2015.

Uncertain<T>: A First-Order Type for Uncertain Data. James Bornholt, Todd Mytkowicz, and Kathryn S. McKinley. ASPLOS 2014. **SIGPLAN Research Highlight**. **IEEE Micro Top Picks**.

Journal Papers

Noninterference Specifications for Secure Systems. Luke Nelson, James Bornholt, Arvind Krishnamurthy, Emina Torlak, and Xi Wang. ACM SIGOPS Operating Systems Review, vol. 54, no. 1, pp. 31–39, July 2020.

A Taxonomy of General Purpose Approximate Computing Techniques. Thierry Moreau, Joshua San Miguel, Mark Wyse, James Bornholt, Armin Alaghi, Luis Ceze, Natalie Enright Jerger, and Adrian Sampson. IEEE Embedded Systems Letters, vol. 10, no. 1, pp. 2–5, March 2018.

Toward a DNA-Based Archival Storage System. James Bornholt, Randolph Lopez, Douglas M. Carmean, Luis Ceze, Georg Seelig, and Karin Strauss. IEEE Micro, vol. 37, no. 3, pp. 98–104, May–June 2017.

Uncertain<T>: Abstractions for Uncertain Hardware and Software. James Bornholt, Todd Mytkowicz, and Kathryn S. McKinley. IEEE Micro, vol. 35, no. 3, pp. 132–143, May–June 2015.

Workshop Papers

Scaling Program Synthesis by Exploiting Existing Code. James Bornholt and Emina Torlak. ML4PL 2015 (colocated with ECOOP 2015).

Approximate Program Synthesis. James Bornholt, Emina Torlak, Luis Ceze, and Dan Grossman. WAX 2015 (colocated with PLDI 2015).

REACT: A Framework for Rapid Exploration of Approximate Computing Techniques. Mark Wyse, Andre Baixo, Thierry Moreau, Bill Zorn, James Bornholt, Adrian Sampson, Luis Ceze, and Mark Oskin. WAX 2015 (colocated with PLDI 2015).

Programming the Internet of Uncertain <T>hings. James Bornholt, Na Meng, Todd Mytkowicz, and Kathryn S. McKinley. SCAW 2015 (colocated with HPCA 2015).

There's Something About Bayes: Effective Probabilistic Programming for the Rest of Us. James Bornholt, Todd Mytkowicz, and Kathryn S. McKinley. APPROX 2014 (colocated with PLDI 2014).

Posters & Talks

Uncertain<T>: A First-Order Type for Uncertain Data. James Bornholt. PLDI 2013 Student Research Competition. **First Place, PLDI Student Research Competition**. **Second Place, ACM Student Research Competition Grand Final**.

The Model Is Not Enough: Understanding Energy Consumption in Mobile Devices. James Bornholt, Todd Mytkowicz, and Kathryn S. McKinley. Hot Chips 24, 2012.

Theses

Optimizing the Automated Programming Stack. James Bornholt. PhD thesis, University of Washington, 2019.

Abstractions and Techniques for Programming with Uncertain Data. James Bornholt. Honours thesis, Bachelor of Philosophy (Honours), Australian National University, 2013.

Awards

SOSP Best Paper Award	2021
SOSP Best Paper Award	2019
OOPSLA Distinguished Artifact Award	2018
Facebook Ph.D. Fellowship	2018–2020
IEEE Micro Top Picks from the Computer Architecture Conferences, for DNA storage	2017
OSDI Jay Lepreau Best Paper Award	2016
IEEE Micro Top Picks from the Computer Architecture Conferences, for Uncertain<T>	2015
ACM SIGPLAN Research Highlight, for Uncertain<T>	2014
David Notkin Endowed Graduate Fellowship, University of Washington	2014–2015
Second Place, ACM Student Research Competition Grand Finals (undergraduate)	2014
First Place, ACM PLDI Student Research Competition (undergraduate)	2013
ANU University Medal for Computer Science	2013

Teaching

CS 395T, Systems Verification and Synthesis — University of Texas at Austin
Instructor — Spring 2022

CS 395T, Systems Verification and Synthesis — University of Texas at Austin
Instructor — Spring 2021

CSE 507, Computer Aided Reasoning for Software — University of Washington
Teaching Assistant — Winter 2017

CSE 507, Computer Aided Reasoning for Software — University of Washington
Teaching Assistant — Spring 2016

Students

Nathan Taylor (PhD)	2021–
Sammy Thomas (PhD)	2021–
Dani Wang (PhD)	2021–
Stefan Debruyn (BS Honors)	2021–2022
Owen Graves (BS Honors)	2021

Service

Program Committees

Programming Languages Design and Implementation (PLDI) — Program Committee	2022
Architectural Support for Programming Languages and Operating Systems (ASPLOS) — External Review Committee	2022
Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA) — External Review Committee	2021
Operating Systems Design and Implementation (OSDI) — Program Committee	2021
Architectural Support for Programming Languages and Operating Systems (ASPLOS) — Program Committee	2021
Programming Languages Design and Implementation (PLDI) — Program Committee	2020
Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA) — Review Committee	2020
Architectural Support for Programming Languages and Operating Systems (ASPLOS) — External Review Committee	2020
Principles and Practice of Parallel Programming (PPoPP) — Brief Announcements Program Committee	2020
Formal Techniques for Java-Like Programs (FTfJP) — Program Committee	2019
Programming Languages Design and Implementation (PLDI) — External Review Committee	2017
Computer-Aided Verification (CAV) — Artifact Evaluation Committee	2017
Principles of Programming Languages (POPL) — Artifact Evaluation Committee	2016
Programming Languages Design and Implementation (PLDI) — Artifact Evaluation Committee	2015

Reviewing

NSF panel member	2021
Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2018
IEEE Transactions on Emerging Topics in Computing	2017
Computer-Aided Verification (CAV)	2015
ACM Transactions on Embedded Computing	2015
Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2015

Department Service

PhD Admissions Committee, University of Texas at Austin	2021, 2022
Graduate Admissions Committee, University of Washington	2017–2019
Prospective Student Committee Co-Chair, University of Washington	2016

Prospective Student Committee, University of Washington 2015–2019

Student Committees

Mihir Mehta, PhD Dissertation Committee 2021

Kostas Ferlas, PhD Dissertation Committee 2020

Presentations and Seminars

Program Synthesis in the Small

Purdue University, Invited Talk Oct 2020

Synthesizing System Specifications

State of the Art in Program Synthesis, Invited Talk Sep 2019

Optimizing the Automated Programming Stack

Australian National University, Invited Talk Jul 2019

University of Toronto, Invited Seminar Apr 2019

Princeton University, Invited Seminar Apr 2019

University of British Columbia, Invited Seminar Apr 2019

École Polytechnique Fédérale de Lausanne, Invited Seminar Apr 2019

University of Massachusetts Amherst, Invited Seminar Apr 2019

Northeastern University, Invited Seminar Mar 2019

Microsoft Research, Invited Seminar Mar 2019

Georgia Institute of Technology, Invited Seminar Mar 2019

University of California, Berkeley, Invited Seminar Feb 2019

Brown University, Invited Seminar Feb 2019

Carnegie Mellon University, Invited Seminar Feb 2019

University of Maryland, College Park, Invited Seminar Feb 2019

University of Texas at Austin, Invited Seminar Feb 2019

Cornell University, Invited Seminar Jan 2019

Finding Code That Explodes Under Symbolic Evaluation

University of California, Santa Cruz, Guest Lecture Nov 2019

OOPSLA, Conference Talk Nov 2018

Galois, Invited Talk Jun 2018

Ocelot: Relational Logic in a Solver-Aided Language

Future of Alloy Workshop, Invited Talk Apr 2018

Synthesizing Memory Models from Framework Sketches and Litmus Tests

PLDI, Conference Talk Jun 2017

Programming with Estimates

Programming Languages Mentoring Workshop, Invited Talk Jun 2016

Specifying and Checking File-System Crash Consistency Models

DARPA BRASS PI Meeting, Invited Talk — Jul 2016

ASPLOS, Conference Talk — Apr 2016

A DNA-Based Archival Storage System

ASPLOS, Conference Talk — Apr 2016

Optimizing Synthesis with Metasketches

POPL, Conference Talk — Jan 2016

Dagstuhl Seminar 15491 (Approximate and Probabilistic Computing), Invited Talk — Dec 2015