James Bornholt

Contact

Computer Science and Engineering
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Education

University of Washington — Seattle, WA, USA
PhD in Computer Science and Engineering — September 2014 – present
Masters of Computer Science and Engineering — March 2016

- Advisors: Emina Torlak, Dan Grossman, Luis Ceze
- Member of the Programming Languages and Software Engineering group

Australian National University — Canberra, Australia
Bachelor of Philosophy with First Class Honours and the University Medal — January 2010 – December 2013

- Majors in Computer Science and Mathematics
- Thesis: *Abstractions and Techniques for Programming with Uncertain Data*, advised by Steve Blackburn

Publications

Conference Papers

Hyperkernel: Push-Button Verification of an OS Kernel.
L. Nelson, H. Sigurbjarnarson, K. Zhang, D. Johnson, J. Bornholt, E. Torlak, and X. Wang.
SOSP 2017.

Synthesizing Memory Models from Framework Sketches and Litmus Tests.
J. Bornholt and E. Torlak.
PLDI 2017.

Push-Button Verification of File Systems via Crash Refinement.
H. Sigurbjarnarson, J. Bornholt, E. Torlak, and X. Wang.
OSDI 2016. *Jay Lepreau Best Paper Award.*

Disciplined Inconsistency with Consistency Types.
B. Holt, J. Bornholt, I. Zhang, D. R. K. Ports, M. Oskin, and L. Ceze.
SoCC 2016.

Specifying and Checking File System Crash-Consistency Models.
J. Bornholt, A. Kaufmann, J. Li, A. Krishnamurthy, E. Torlak, and X. Wang.
ASPLOS 2016.

A DNA-Based Archival Storage System.
J. Bornholt, R. Lopez, D. M. Carmean, L. Ceze, G. Seelig, and K. Strauss.
ASPLOS 2016. *IEEE Micro's Top Picks from the Computer Architecture Conferences, 2017.*

Optimizing Synthesis with Metasketches.
J. Bornholt, E. Torlak, D. Grossman, and L. Ceze.
POPL 2016.

Hardware–Software Co-Design: Not Just a Cliché.
A. Sampson, J. Bornholt, and L. Ceze.
SNAPL 2015.

Uncertain⟨T⟩: A First-Order Type for Uncertain Data.
J. Bornholt, T. Mytkowicz, and K. S. McKinley.
ASPLOS 2014. *ACM SIGPLAN Research Highlight, November 2014. IEEE Micro's Top Picks from the Computer Architecture Conferences, 2015.*

Journal Papers

A Taxonomy of General Purpose Approximate Computing Techniques.
T. Moreau, J. San Miguel, M. Wyse, J. Bornholt, A. Alaghi, L. Ceze, N. Enright Jerger, and A. Sampson.
IEEE Embedded Systems Letters, 2017.

Toward a DNA-Based Archival Storage System.
J. Bornholt, R. Lopez, D. M. Carmean, L. Ceze, G. Seelig, and K. Strauss.
IEEE Micro, vol. 37, no. 3, pp 98–104, May–June 2017.

Uncertain⟨T⟩: Abstractions for Uncertain Hardware and Software.
J. Bornholt, T. Mytkowicz, and K. S. McKinley.
IEEE Micro, vol. 35, no. 3, pp. 132–143, May–June 2015.

Workshop Papers

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

Approximate Program Synthesis.
J. Bornholt, E. Torlak, L. Ceze, and D. Grossman.
WAX 2015 (colocated with PLDI 2015).

REACT: A Framework for Rapid Exploration of Approximate Computing Techniques.
M. Wyse, A. Baixo, T. Moreau, B. Zorn, J. Bornholt, A. Sampson, L. Ceze, and M. Oskin.
WAX 2015 (colocated with PLDI 2015).

Programming the Internet of Uncertain ⟨T⟩hings.
J. Bornholt, N. Meng, T. Mytkowicz, and K. S. McKinley.
SCAW 2015 (colocated with HPCA 2015).

There's Something About Bayes: Effective Probabilistic Programming for the Rest of Us.
J. Bornholt, T. Mytkowicz, and K. S. McKinley.
APPROX 2014 (colocated with PLDI 2014).

Posters

Uncertain⟨T⟩: A First-Order Type for Uncertain Data.
J. Bornholt.
PLDI 2013.
Winner, PLDI Student Research Competition, 2013.
Second Place, ACM Student Research Competition Grand Final, 2014.

The Model Is Not Enough: Understanding Energy Consumption in Mobile Devices.
J. Bornholt, T. Mytkowicz, and K. S. McKinley.
Hot Chips 24, 2012.

Experience

Amazon Web Services — Seattle, WA, USA
Research Intern, Automated Reasoning Group, AWS Security — January 2018 – March 2018

Microsoft Research — Canberra, Australia
Software Engineer — January 2014 – September 2014

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

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

Awards

- Facebook PhD 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 category), 2014
- ANU University Medal for Computer Science, 2013
- Winner, ACM PLDI Student Research Competition (undergraduate category), 2013

Presentations and Seminars

Programming with Estimates
Programming Languages Mentoring Workshop at PLDI 2016, Invited Talk

Optimizing Synthesis with Metasketches (for Automated Approximate Programming)
Dagstuhl Seminar 15491 (Approximate and Probabilistic Computing), Invited Talk

Teaching

Teaching Assistant, University of Washington
- CSE 507 (graduate Computer-Aided Reasoning for Software), Winter 2017
- CSE 507 (graduate Computer-Aided Reasoning for Software), Spring 2016

Tutor, University of Washington
- CSE 341 (undergraduate Programming Languages), 2015

Guest Lectures
- *Datatype-Style Programming With Lists or Structs*
  CSE 341 (undergraduate Programming Languages), University of Washington, Spring 2017
- *Angelic Execution* and *Metasketches*
  CSE 507 (graduate Computer-Aided Reasoning for Software), University of Washington, Winter 2017
- *Memory Consistency Models*
  CSE 451 (undergraduate Operating Systems), University of Washington, Autumn 2016
- *Practical Applications of SAT*
  CSE 507 (graduate Computer-Aided Reasoning for Software), University of Washington, Spring 2016
- *Memory Consistency Models*
  CSE 451 (undergraduate Operating Systems), University of Washington, Autumn 2015
- *Program Verification*
  COMP 1140 (undergraduate honors intro CS), Australian National University, Autumn 2015

Service

Review Committee Membership
- PLDI 2017 External Review Committee
- CAV 2017 Artifact Evaluation Committee
- POPL 2016 Artifact Evaluation Committee
- PLDI 2015 Artifact Evaluation Committee

External Reviews
- IEEE Transactions on Emerging Topics in Computing, 2017
- CAV 2015
- ACM Transactions on Embedded Computing (TECS), 2015
- ASPLOS 2015

Department Service
- UW CSE Graduate Admissions Committee: 2017, 2018
- UW CSE Prospective Student Committee Co-Chair: 2016
- UW CSE Prospective Student Committee: 2015–present

Students Advised
- Emily McAlister, B. Software Eng., ANU, 2014 (co-advised with Steve Blackburn and Kathryn McKinley)
  Thesis: *The Relationship Between Software and Hardware Energy Consumption on Android Mobile Devices*