Eric Koskinen

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Summary

I am the Charles Berendsen Assistant Professor of Computer Science at Stevens Institute, where I teach and conduct a research program supported by over $5.6M in funds from the National Science Foundation (NSF), DARPA and the Office of Naval Research. My career has ranged from the practical to the theoretical. I have over 15 years of experience in academia (Stevens, Yale, NYU) and 5 years of experience in industry (Amazon.com, Microsoft, IBM). I hold a PhD in Computer Science from the University of Cambridge. My research interests include formal methods/verification, programming languages, concurrency and systems.

Education

University of Cambridge, Ph.D. in Computer Science 2008 – 2013

- Thesis: Temporal verification of programs. Advisors: Byron Cook and Michael J.C. Gordon.

Brown University, Sc.M. in Computer Science 2005 – 2008

- Thesis: Transactional Boosting: Highly Concurrent Transactional Objects. Advisor: Maurice Herlihy.

College of William & Mary, B.S. in Computer Science (Highest Honors), B.S. in Physics 1997 – 2001

Employment Summary

- Stevens Institute of Technology, Assistant Professor, Hoboken, NJ 2017 – *present*
- Yale University, Lecturer & Research Scientist, New Haven, CT 2015 – 2017
- IBM TJ Watson Research Center, Research Staff Member, Yorktown Heights, NY 2014 – 2015
- New York University (NYU), Research Scientist; Visiting Professor, New York, NY 2011 – 2014
- Nagoya University, Visiting Professor, Nagoya, Japan Spring 2013
- Microsoft Research, Research Intern, Redmond, WA Summer 2008
- Microsoft Research, Research Intern, Cambridge, UK Summer 2006
- Amazon.com, Software Engineer, Seattle, WA 2003 – 2005

Funding Summary

• Office of Naval Research (ONR)	Principal Investigator	$ 215,393	Aug 2022
• National Science Foundation (NSF)	Principal Investigator	$ 399,995	Jun 2021
• National Science Foundation (NSF)	Principal Investigator	$ 499,986	May 2020
• Office of Naval Research (ONR)	Principal Investigator	$ 3,158,688	Jun 2017
• National Science Foundation (NSF)	Principal Investigator	$ 250,000	Jun 2016
• Defense Advanced Research Projects Agency (DARPA)	Principal Investigator	$ 800,000	Dec 2014
• National Science Foundation (NSF)	Principal Investigator	$ 250,000	Jun 2014
• NYU Office of the Provost (NYU)	Principal Investigator	$ 17,000	Jun 2014
• Japan Society for Promotion of Science (JSPS)	Fellow	¥ 1,000,000	Sep 2012

Awards

- Charles Berendsen Junior Professorship. Fall 2021 – present
- Provost's Early Career Award for Research Excellence. Office of the Provost. May 2020
- Computer Aided Verification (CAV) Award paper. Oct 2011
- Gates Cambridge Scholarship. Feb 2007
- Highest Honors for Undergraduate Thesis. May 2001

Publications

Conferences

- T. Antonopoulos, E. Koskinen, T. Le, R. Nagasamudram, D. Naumann, M. Ngo. An algebra of alignment for relational verification. In *Proceedings of the 50th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL 2023)*. **(POPL 2023)**. January 2023.
`https://arxiv.org/abs/2202.04278`

- H. Unno, T. Terauchi, Y. Gu, E. Koskinen. Modular Primal-Dual Fixpoint Logic Solving for Temporal Verification. In *Proceedings of the 50th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL 2023)*. **(POPL 2023)**. January 2023.
http://www.erickoskinen.com

- A Chen, P Fathololumi, E Koskinen, J Pincus. Veracity: Declarative Multicore Programming with Commutativity. In *Proceedings of the ACM on Programming Languages a.k.a. Conference on Object-Oriented Programming Systems, Languages, and Applications*. **(OOPSLA 2022)**. November 2022.
https://arxiv.org/pdf/2203.06229.pdf

- Y Liu, C Pang, D Dietsch, E Koskinen, T-C Le, G Portokalidis, J Xu. Proving LTL of Bitvector Programs and Decompiled Binaries. In *Proceedings of the 19th Asian Symposium on Programming Languages and Systems*. **(APLAS 2021)**. November 2021.
http://www.erickoskinen.com/papers/darksea.pdf

- H Unno, T Terauchi, E Koskinen. Constraint-Based Relational Verification. In *Proceedings of the 33rd International Conference on Computer Aided Verification*. **(CAV 2021)**. June 2021.
http://www.erickoskinen.com/papers/cav21.pdf

- E Koskinen, K Bansal. Decomposing Data Structure Commutativity Proofs with mn-Differencing. In *Proceedings of the International Conference on Verification, Model Checking, and Abstract Interpretation*. **(VMCAI 2021)**. January 2021.
http://www.erickoskinen.com/papers/cityprover.pdf

- C Pang, R Yu, Y Chen, E Koskinen, G Portokalidis, B Mao, J Xu. SoK: All You Ever Wanted to Know About Binary Disassembly But Were Afraid to Ask. In *Proceedings of the 42nd IEEE Symposium on Security and Privacy*. **(S&P 2021)**. May 2021.
https://www.portokalidis.net/files/sok86disas_oakland21.pdf

- C Pang, R Yu, D Xu, E Koskinen, G Portokalidis, J Xu. Towards Optimal Use of Exception Handling Information for Function Detection. In *Proceedings of the 51st Annual IEEE/IFIP International Conference on Dependable Systems and Networks*. **(DSN 2021)**. June 2021.
https://www.portokalidis.net/files/fetch_dsn21.pdf

- T-C Le, T Antonopoulos, P Fathololumi, E Koskinen, T Nguyen. DynamiTe: Dynamic Termination and Non-termination Proofs. In *Proceedings of the ACM on Programming Languages a.k.a. Conference on Object-Oriented Programming Systems, Languages, and Applications*. **(OOPSLA 2020)**. 2020.
http://www.erickoskinen.com/papers/dynamite.pdf

- T Dickerson, E Koskinen, M Herlihy, P Gazzillo. Conflict Abstractions and Shadow Speculation for Optimistic Transactional Objects. In *Proceedings of the Asian Symposium on Programming Languages and Systems*. **(APLAS 2019)**. 2019.
http://www.erickoskinen.com/papers/proust.pdf

- T Antonopoulos, E Koskinen, T Le. Specification and Inference of Trace Refinement Relations. In *Proceedings of the ACM on Programming Languages*. **(OOPSLA 2019)**. November 2019.
http://www.erickoskinen.com/papers/knotical.pdf

- Y Nanjo, H Unno, E Koskinen, T Terauchi. Dependent Temporal Effects and a Fixpoint Logic for Verification. In *Proceedings of the 33rd Annual ACM/IEEE Symposium on Logic in Computer Science*. **(LICS 2018)**. July 2018.
http://www.erickoskinen.com/papers/lics18.pdf

- K Bansal, E Koskinen, O Tripp. Automatic Generation of Precise and Useful Commutativity Conditions. In *Proceedings of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems*. **(TACAS 2018)**. 2018.
http://www.erickoskinen.com/papers/ccr.pdf

- T Dickerson, P Gazzillo, M Herlihy, E Koskinen. Adding Concurrency to Smart Contracts. In *Proceedings of the ACM Symposium on Principles of Distributed Computing*. **(PODC 2017)**. 2017.
http://www.erickoskinen.com/papers/podc17a.pdf

- T Dickerson, P Gazzillo, M Herlihy, E Koskinen. Proust: A Design Space for Highly-Concurrent Transactional Data Structures. In *Proceedings of the ACM Symposium on Principles of Distributed Computing.* **(PODC 2017 (Brief Announcement))**. 2017.

- T Antonopoulos, P Gazzillo, M Hicks, E Koskinen, T Terauchi, S Wei. Decomposition Instead of Self-Composition for Proving the Absence of Timing Channels. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation.* **(PLDI 2017)**. 2017.
`http://www.erickoskinen.com/papers/blazer.pdf`

- P Ferrara, O Tripp, P Liu, E Koskinen. Using Abstract Interpretation to Correct Synchronization Faults. In *Proceedings of the International Conference on Verification, Model Checking, and Abstract Interpretation.* **(VMCAI 2017)**. 2017.
`http://www.erickoskinen.com/papers/corrective.pdf`

- E Koskinen, J Yang. Reducing Crash Recoverability to Reachability. In *Proceedings of the ACM SIGPLAN Symposium on Principles of Programming Languages.* **(POPL 2016)**. 2016.
`http://www.erickoskinen.com/papers/cr.pdf`

- E Koskinen, M Parkinson. The Push/Pull model of transactions. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation.* **(PLDI 2015)**. 2015.
`http://www.erickoskinen.com/papers/pushpull.pdf`

- E Koskinen, T Terauchi. Local Temporal Reasoning. In *Proceedings of the ACM/IEEE Conference on Logic in Computer Science.* **(LICS 2014)**. 2014.
`http://www.erickoskinen.com/papers/ltr.pdf`

- D Dimitrov, V Raychev, M Vechev, E Koskinen. Commutativity Race Detection. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation.* **(PLDI 2014)**. 2014.
`http://www.erickoskinen.com/papers/crd.pdf`

- M Herlihy (Invited talk), E Koskinen. Composable Transactional Objects: A Position Paper. In *Proceedings of the European Symposium on Programming.* **(ESOP 2014)**. 2014.
`http://www.erickoskinen.com/papers/esop2014.pdf`

- O Tripp, E Koskinen, M Sagiv. Turning Nondeterminism into Parallelism. In *Proceedings of the ACM on Programming Languages a.k.a. Conference on Object-Oriented Programming Systems, Languages, and Applications.* **(OOPSLA 2013)**. 2013.
`http://www.erickoskinen.com/papers/tango.pdf`

- B Cook, E Koskinen. Reasoning about nondeterminsim in software. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation.* **(PLDI 2013)**. 2013.
`http://www.erickoskinen.com/papers/ctl.pdf`

- K Bansal, E Koskinen, T Wies, D Zufferey. Structural Counter Abstraction. In *Proceedings of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems.* **(TACAS 2013)**. 2013.
`http://www.erickoskinen.com/papers/structural.pdf`

- B Cook, E Koskinen, M Vardi. Temporal property verification as a program analysis task. In *Proceedings of the International Conference on Computer-Aided Verification.* **(CAV 2011 Award paper)**. 2011.
`http://www.erickoskinen.com/papers/branching.pdf`

- B Cook, E Koskinen. Making Prophecies with Decision Predicates. In *Proceedings of the ACM SIGPLAN Symposium on Principles of Programming Languages.* **(POPL 2011)**. 2011.
`http://www.erickoskinen.com/papers/dpredicates.pdf`

- E Koskinen, M Parkinson, M Herlihy. Coarse-Grained Transactions. In *Proceedings of the ACM SIGPLAN Symposium on Principles of Programming Languages.* **(POPL 2010)**. 2010.
`http://www.erickoskinen.com/papers/cgt.pdf`

- E Koskinen, M Herlihy. Concurrent Non-commutative Boosted Transactions. In *Proceedings of the ACM Symposium on Principles of Distributed Computing.* **(PODC 2009 (BA))**. 2009.
`http://www.erickoskinen.com/papers/nc-boosting.pdf`

- S Gulwani, S Jain, E Koskinen. Control-Flow Refinement and Progress Invariants for Bound Analysis. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation.* **(PLDI 2009)**. 2009.
  http://www.erickoskinen.com/papers/cfr-pi.pdf

- E Koskinen, M Herlihy. Dreadlocks: Efficient Deadlock Detection. In *Proceedings of the Symposium on Parallelism in Algorithms and Architectures.* **(SPAA 2008)**. 2008.
  http://www.erickoskinen.com/papers/dreadlocks-spaa08.pdf

- E Koskinen, M Herlihy. Checkpoints and Continuations instead of Nested Transactions. In *Proceedings of the Symposium on Parallelism in Algorithms and Architectures.* **(SPAA 2008)**. 2008.
  http://www.erickoskinen.com/papers/checkpoints-spaa08.pdf

- M Herlihy, E Koskinen. Transactional Boosting: A Methodology for Highly-Concurrent Transactional Objects. In *Proceedings of the ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming.* **(PPoPP 2008)**. 2008.
  http://www.erickoskinen.com/papers/boosting-ppopp08.pdf

- E Koskinen, J Jannotti. BorderPatrol: Isolating Events for Black-box Tracing. In *Proceedings of the ACM SIGOPS European Conference on Computer Systems.* **(EuroSys 2008)**. 2008.
  http://www.erickoskinen.com/papers/borderpatrol.pdf

Journals

- K Bansal, E Koskinen, O Tripp. Synthesizing Precise and Useful Commutativity Conditions. In *Journal of Automated Reasoning.* **(Journal of Automated Reasoning (JAR 2020))**. 2020.
  http://www.erickoskinen.com/papers/jar20.pdf

- T Dickerson, P Gazzillo, M Herlihy, E Koskinen. Adding Concurrency to Smart Contracts. In *Distributed Computing.* **(Distributed Computing (DIST 2020))**. 2020.
  https://link.springer.com/article/10.1007/s00446-019-00357-z

- T Dickerson, P Gazzillo, M Herlihy, E Koskinen. How to add concurrency to smart contracts. In *Bulletin of the EATCS.* **(Bulletin of the EATCS, No. 124)**. 2019.
  http://eatcs.org/images/bulletin/beatcs124.pdf

- B Cook, E Koskinen, M Vardi. Temporal property verification as a program analysis task. In *Formal Methods of System Design.* **(Formal Methods of System Design (FMSD 2012))**. 2012.
  http://www.erickoskinen.com/papers/fmsd12.pdf

Workshops

- T Dickerson, P Gazzillo, M Herlihy, V Saraph, E Koskinen. Proof-Carrying Smart Contracts. In *Proceedings of the Workshop on Trusted Smart Contracts.* **(WTSC 2018)**. 2018.
  http://www.erickoskinen.com/papers/pcsc.pdf

- Kshitij Bansal, E Koskinen, O Tripp. Commutativity Condition Refinement. In *Proceedings of the Workshop on Explointing Concurrency Efficiently and Correctly.* **(EC2 2015)**. 2015.
  http://www.erickoskinen.com/papers/ccr-ec2.pdf

- E Koskinen and Y Terauchi. Local Temporal Reasoning. In *Proceedings of the Workshop on High Conference Software Systems.* **(HCSS 2014)**. 2014.
  http://www.erickoskinen.com/papers/ltr.pdf

- B Cook and E Koskinen. Reasoning about nondeterminism in programs. In *Proceedings of the Workshop on High Conference Software Systems.* **(HCSS 2012)**. 2012.

- E Koskinen, M Herlihy. Concurrent Non-commutative Boosted Transactions. In *Proceedings of the Workshop on Transactional Memory.* **(TRANSACT 2009)**. 2009.

- M Herlihy, E Koskinen. Dreadlocks: Efficient Deadlock Detection. In *Proceedings of the Workshop on Transactional Memory.* **(TRANSACT 2008)**. 2008.
  http://www.erickoskinen.com/papers/dreadlocks.pdf

- M Herlihy, E Koskinen. Checkpoints and Continuations instead of Nested Transactions. In *Proceedings of the Workshop on Transactional Memory.* **(TRANSACT 2008)**. 2008.
  `http://www.erickoskinen.com/papers/checkpoints.pdf`

Thesis

- E Koskinen. Temporal verification of programs. In *Doctoral Dissertation.* **(Doctoral Dissertation)**. 2013.
  `http://www.erickoskinen.com/papers/thesis.pdf`

Drafts

- A Chen, P Fathololumi, E Koskinen, J Pincus. Servois2: An Extended Commutativity Condition Synthesizer. 2022.
  `http://www.erickoskinen.com/papers/servois2.pdf`
- T Antonopoulos, P Gazzillo, E Koskinen, Z Shao. Vertical Composition of Reversible Atomic Objects. 2016.
  `http://www.erickoskinen.com/papers/rao.pdf`
- E Koskinen, H Unno, M Vardi. Games Programs Play: Analyzing Multiplayer Programs. 2016.
  `http://cpsc.yale.edu/sites/default/files/files/tr1521.pdf`

Professional Activities

Invited Keynote Talks

- *Invited Speaker*, 24th International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI 2023). "Programming with Commutativity" Jan 2023

Funding

- Principal Investigator. ONR. $ 215,393. Aug 2022.
  AVTA Transition: Toolchain for Binary Decompilation and Alignment
- Principal Investigator. NSF. $ 399,995. Jun 2021.
  Collaborative Research: SHF: Medium: Ensuring Safety and Liveness of Modern Systems through Dynamic Temporal Analysis.
- Principal Investigator. NSF. $ 499,986. May 2020.
  SHF: Small: Symbolic Commutativity Analysis for Multicore Concurrency.
- Principal Investigator. ONR. $ 3,158,688. Jun 2017.
  Automatic Verification of Temporal Alignment of Transformed Software. (AVTA).
- Principal Investigator. NSF. $ 250,000. Jun 2016.
  SHF: Small: Collaborative Research: Concurrent Software Verification with Rely/Guarantee Abstraction.
- Principal Investigator. (Subcontract from UMD) DARPA. $ 800,000. Dec 2014.
  SOUCIS: Sound Over- & Under-Approximations of Complexity & Information Security.
- Principal Investigator. NSF. $ 250,000. Jun 2014.
  SHF: Small: Collaborative Research: Concurrent Programming with Composable Transactional Objects.
- Principal Investigator. NYU Office of the Provost. $ 17,000. Jun 2014.
  Verification Tools for Modern Programming Languages.
- Fellow. JSPS. ¥ 1,000,000. Sep 2012.
  Fellowship from the Japan Society for Promotion of Science.

Funding Advising

- NSF Panels, Software and Hardware Foundations (SHF) Program, CCF Core. 2015, 2017, 2018, 2019, 2021 (ad hoc reviewer), 2022.
- Invitation-only NSF panel on programming and concurrency. July 2013.

Dissertation Examination

- Mohammad Nikouei, Stevens. Fall 2019.
- Thomas Dickerson, Brown University. February 2019.
- Kshitij Bansal, New York University. December 2015.
- Paul Gazzillo, New York University. October 2015.
- Jingyue Wu, Columbia University. May 2014.

Organizer

- *Founder/organizer*, First International Workshop on Commutativity Reasoning & Applications, co-located with ACM/SIGPLAN PLDI 2022.
- *Conference Chair*, IEEE/ACM Conference on Logic in Computer Science (LICS). July 2016.
- *Organizer*, CMACS grant PI Meeting. October 2012.
- *Organizer*, Workshop on concurrency and verification, co-located with POPL. January 2012.

Program Committee member

- 44th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2023)
- Asian Symposium on Programming Languages & Systems (APLAS 2022).
- 46th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL 2020).
- ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2019).
- 36th ACM Symposium on Principles of Distributed Computing (PODC 2018).
- 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP 2018).
- 19th International Conference on Verification, Model Checking & Abstract Interpretation (VMCAI 2018).
- 42nd International Colloquium on Automata, Languages, and Programming (ICALP 2015).
- 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL 2013).
- 16th International Conference On Principles Of DIstributed Systems (OPODIS 2012).
- 24th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2012).

External Review Committee member

- ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2021)
- ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2019).
- 21st ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP 2016).
- 26th European Conference on Object-Oriented Programming (ECOOP 2016).
- 14th Conference on Formal Methods in Computer-Aided Design (FMCAD 2014).

Referee for

- *Book chapter*: Handbook of Model Checking.
- *Journals*: Journal of Parallel and Distributed Computing (JPDC), Logical Methods in Computer Science (LMCS), Formal Methods in System Design (FMSD), Journal of the ACM (JACM), ACM Transactions on Programming Languages and Systems (TOPLAS).
- *Funding*: NSF Software and Hardware Foundations (NSF SHF). May 2015.

Patents

- Adding Concurrency to Smart Contracts. Application. 2017.
- Static Program Reduction for Complexity Analysis. US # 20100318980 A1. June 2009.
- Optimizing Across Interfaces. US # 8214813 B2. December 2006.

Membership

- Member of the ACM.
- Member of Cambridge in America.
- Microsoft Alumnus.

Teaching Experience

Courses

- *Professor.* "Compilers" graduate/undergraduate, Stevens, Sp 2020, Sp 2021, Sp 2022, Sp 2023.
- *Professor.* "Societal Impacts of Information Technology," undergraduate, Stevens, Falls of 2017–2022.
- *Professor.* "Data Structures" undergraduate, Stevens, Spring 2019.
- *Professor.* "Introduction to Computer Science, Honors, Part II" undergraduate, Stevens, Spring 2018.
- *Professor.* "Object-Oriented Programming," undergraduate, New York University, NY, Fall 2014.
- *Professor.* "Data Structures," undergraduate, enrollment of 110, New York University, NY, Spring 2014.
- *Professor.* "Data Structures," undergraduate, enrollment of 80, New York University, NY, Fall 2013.
- *Professor.* "Software Project Planning," undergraduate, Newbury College, MA. Spring 2007.
- *Guest Lecturer.* "Databases," undergraduate, University of Cambridge. 2010.
- *Guest Lecturer.*"Verification of infinite-state programs," MPhil course, University of Cambridge. 2009.

Postdoctoral Supervision

- Ton-Chanh Le, PhD National University of Singapore. Spring 2018 – Summer 2022
- Timos Antonopoulos, PhD Cambridge. Fall 2015 – Summer 2017.
- Paul Gazzillo, PhD NYU. Fall 2015 – Spring 2018.

PhD Students (at Stevens)

- Yuandong Liu. Admitted Spring 2018. Passed Proposal Defense. Published 1 paper, with another submitted.
- Adam Chen. Admitted Fall 2019. Passed Oral and Written exams. Published 1 paper,. Passed qualifying exams. One paper submitted, one submission planned for July 2022.
- Parisa Fathololumi. Admitted Fall 2021. Passed written exam. Published two papers, one submitted.
- Mihai Nicola. Admitted Fall 2021. Joint with Tegan Brennan.
- Jared Pincus. (Master's Student) Summer 2021 – Summer 2022

Mentoring Other PhD Students

- Kshitij Bansal (NYU). Research Assistant, Summer 2015.
- Mario Alvarez (UCSD). Research Assistant, Summer 2014.
- Ruben Zaccaroni (NYU undergraduate), Fall 2014.
- Patrick Yuen (NYU undergraduate), Fall 2014.
- *Oral Qualifying exams*: Ramana Nagasamudram (Spring 2021), Konstantinos Kleftogiorgos (Winter 2021), Yifan Wang (Summer 2020), Vidya Rajagopalan (2019).

Other Service

- Student Research Competition at PLDI'20 and PLDI'22.

Seminars and Visits

- Northeastern University, Boston, MA — *exp.* Fall 2022
  "*Reasoning and Programming with Commutativity*"
- Rutgers, NJ — *exp.* Fall 2022
  "*Reasoning and Programming with Commutativity*"
- Princeton, NJ — *exp.* Fall 2022
  "*Reasoning and Programming with Commutativity*"
- MIT, Boston, MA — May 2022
  "*Reasoning and Programming with Commutativity*"
- Boston University, Boston, MA — May 2022
  "*Reasoning and Programming with Commutativity*"
- University of Maryland, MD — May 2020
  "*Automatic Commutativity Verification with Differencing Abstractions*"
- Boston University, Boston, MA — April 2020
  "*Reducing Commutativity Verification to Reachability with Differencing Abstractions*"
- ONR TPCP at Northeastern University, Boston — June 2019
  "*Automatic Verification of Temporal Alignment*"
- University of Johannesburg, South Africa — May 2019
  "*Concurrent Smart Contracts*"
- Princeton, New Jersey — May 2019
  "*Trace Refinement Relations*"
- SRI International, New York — Mar 2019
  "*Concurrent Smart Contracts with Commutativity & Atomicity*"
- ONR TPCP at the University of Washington, Seattle — June 2019
  "*Automatic Verification of Temporal Alignment*"
- Workshop on Trusted Smart Contracts (WTSC), Financial Cryptography, Curacao — Feb 2018
  "*Proof-Carrying Smart Contracts*"
- NYU, New York — Dec 2016
  "*Using Abstract Interpretation to Correct Synchronization Faults*"
- Columbia University, New York — Nov 2016
  "*Robust Concurrent Software from Commutativity & Atomicity*"
- Boston University, Boston — Nov 2016
  "*Temporal Verification of Programs*"

- NJPLS — Sep 2016
  "*Reversible Atomic Objects*"
- NFSC-JSPS Joint Research Workshop — July 2015
  "*Proving Crash Recoverability*"
- Workshop on Exploiting Concurrency Efficiently and Correctly **((EC)2 2015)** — July 2015
  "*Synthesizing Commutativity Conditions*"
- Dagstuhl Seminar 15191, Schloss Dagstuhl, Germany — May 2015
  "*The Push/Pull model of Transactions*"
- MIT, Cambridge, MA — Nov 2014
  "*Commutativity Race Detection*"
- IBM PL Day, Yorktown Heights, NY — Nov 2014
  "*Commutativity Race Detection*"
- Microsoft Research, Cambridge, UK — June 2014
  "*Local Temporal Reasoning*"
- University College, London, UK — June 2014
  "*Local Temporal Reasoning*"
- Conference on High Confidence Software and Systems **(HCSS 2014)** — May 2014
  "*Local Temporal Reasoning*"
- Yale University — Mar 2014
  "*Local Temporal Reasoning*"
- Brown University — Mar 2014
  "*The Push/Pull Model of Transactions*"
- Rice University — Mar 2014
  "*Local Temporal Reasoning*"
- Cornell University — Feb 2014
  "*Local Temporal Reasoning*"
- IBM Research, New York — Feb 2014
  "*Local Temporal Reasoning*"
- NYU, New York — Jan 2014
  "*Local Temporal Reasoning*"
- Tokyo University, Japan — May 2013
  "*Temporal verification of programs*"
- Nagoya University, Japan — Apr 2013
  "*Temporal verification of programs*"
- ETH Zurich, Switzerland — Feb 2013
  "*Commutativity Race Detection*"
- Queen Mary University, London — Feb 2013
  "*Specialization for Synchronization*"
- NEC Research — Mar 2013
  "*Reasoning about Nondeterminism in Programs*"
- Microsoft Research — Nov 2012
  "*A Theory of Serializabile Transactions*"
- CMACS NSF PI Meeting — Oct 2012
  "*Reasoning about Nondeterminism in Programs*"
- IBM PL Day — Jun 2012
  "*Reasoning about Nondeterminism in Programs*"
- Conference on High Confidence Software and Systems **(HCSS 2012)** — May 2012
  "*Reasoning about nondeterminism*"
- Vienna Sci. Tech. Fund, Austria — Dec 2011
  "*Data-structure Commutativity for Multicore Processing*"
- NJPLS — Oct 2011
  "*Reasoning about Nondeterminism in Programs*"
- IBM TJ Watson Research Lab — Apr 2011
  "*Systems Code Verification: A Moving Target*"
- RiSE Seminar, IST Austria — Apr 2011
  "*Systems Code Verification: A Moving Target*"
- Microsoft Research Cambridge — Mar 2011
  "*Systems Code Verification: A Moving Target*"

- The 2nd Workshop on the Theory of Transactional Memory **(WTTM 2010)** Sep 2010
  "*Simplified Synchronization through Optimistic Linearizability*"
- Oxford University May 2010
  "*Branching-time reasoning for general-purpose programs*"
- University of Maryland May 2010
  "*Making prophecies with decision predicates*"
- IBM TJ Watson Research Lab Feb 2010
  "*Making prophecies with decision predicates*"
- The 4th ACM SIGPLAN Workshop on Transactional Computing **(TRANSACT 2009)** Feb 2009
  "*Concurrent Non-commutative Boosted Transactions*"
- Queen Mary University of London Dec 2008
  "*Symbolic bound analysis*"
- The 3rd ACM SIGPLAN Workshop on Transactional Computing **(TRANSACT 2008)** Feb 2008
  "*Dreadlocks: Efficient Deadlock Detection*"
- The 3rd ACM SIGPLAN Workshop on Transactional Computing **(TRANSACT 2008)** Feb 2008
  "*Checkpoints and Continuations instead of Nested Transactions*"

Industrial Experience

IBM TJ Watson Research Center, Research Staff Member — Yorktown Heights, NY • 2014 – 2015

- Initiated and lead research projects and cross-institution collaborations. (See Publications)
- Filed several patents on testing and concurrency techniques for software.

Amazon.com, Software Engineer — Seattle, WA • 2003 – 2005

- Developed an e-commerce application, used by 300 customers/week and full-time editors.
- Worked with a product manager to design IMDb Resume Services (`resume.imdb.com`).
- Implemented a high-performance, custom web server capable of serving over 15,000 pages per minute, increasing performance by a factor of ten.
- Developed an engine to export data to customers such as Target, Comcast, Cablevision, and Warner.
- Developed numerous web-based tools, used by editors to manipulate live content on `imdb.com`.
- Built an interface to expose IMDb data on Amazon.com product detail pages.

Daphnia, Partner, Director of Technology — New York, NY • 2001 – 2003

- Developed e-commerce web sites and custom web applications. Managed project teams consisting of employees, client personnel, partner companies, and freelancers.
- Hosted the majority of customers. Grew company to support one full-time Sales Representative. Clients included Wall Street Systems and Outsource Consultants Inc. `www.daphnianyc.com`

Software

- *Designer and contributor to* Veracity: https://github.com/veracity-lang/veracity (OOPSLA'22)
- *Sole designer and developer of* CityProver: https://github.com/erickoskinen/cityprover (VMCAI'21)
- *Co-designer* of DarkSea, a binary verification tool: https://github.com/cyruliu/darksea (APLAS'21)
- *Co-designer* of DynamiTe, a termination verifier: https://github.com/letonchanh/dynamite (OOPSLA'20)
- *Co-designer* of ScalaProust, an extension of ScalaSTM to support Conflict Abstractions and Shadow Speculation (APLAS'19)
- *Co-designer* of Knotical, a tool for synthesizing trace refinement relations. https://github.com/knotical/knotical (OOPSLA'20)
- *Co-designer* of Servois, a commutativity condition synthesis tool. https://github.com/kbansal/servois (TACAS'18)
- *Author* of BorderPatrol, a suite of tools that enables developers to precisely trace requests through a distributed system without the need for instrumenting application components (EuroSys 2008). BorderPatrol inspired the start-up company Tracelytics, which was acquired by AppNeta.
  `http://cs.brown.edu/research/borderpatrol/`

- *Co-author* of SPEED, a program analysis tool built on the Phoenix C/C++/C# compiler platform. SPEED was applied it to a significant Microsoft product (>670,000 lines of code) and discovered complexity bounds for 90% of the loops (PLDI 2009).
  `http://research.microsoft.com/en-us/um/people/sumitg/pubs/speed.html`
- *Collaborator* on the T2 Termination prover. `http://research.microsoft.com/en-us/projects/t2/`. 2008 – 2012.
- *Designer* of IMDb Resume Services. `http://resume.imdb.com`. 2014 – 2015.

Consultation Experience

Expert

- Expert, Patent case. Summer 2022 – present
  AlmondNet, Inc. and Intent IQ, LLC.
  Representing AlmondNet, Inc. and Intent IQ, LLC, Firm: Russ August Kabat

Testifying Roles

- Testifying Expert, Patent case. Summer 2022 – present
  Uber Technologies Inc and Unified Patents LLC vs LBT IP II LLC.
  Representing LBT IP II LLC, Firm: Alston & Bird
- Testifying Expert, Breach of Contract case. Spring 2020 – Fall 2021
  VoterLabs, Inc. vs Ethos Group Consulting Services, LLC.
  Representing Ethos Group, Firm: Wick Phillips Gould & Martin LLP
- Testifying Expert, Patent case. March 2018 – Summer 2018 & Fall 2020 – Spring 2021
  Mirror Worlds vs Facebook. Southern District of New York. Case No. 1:17-cv-03473-JGK.
  Representing Mirror Worlds Technologies LLC, Firm: Russ August & Kabat
- Testifying Expert, Copyright case. Spring 2020 – *present*
  eSTEPs vs America's Leading Finance, LLC et al.
  Representing eSTEPs, LLC, Firm: Becker-Vissepó
- Testifying Expert, Patent, District Court and CBM case. Fall 2019 – Summer 2021
  Stripe Inc., Shopify Inc., and Shopify (USA) INC. vs. Boom Payments Inc..
  Representing Ethos Group, Firm: Russ, August, Kabat
- Testifying Expert, Trade Secrets case. Spring 2019 – Fall 2020
  Opternative, Inc. vs. JAND, Inc. d/b/a Warby Parker. Southern District of New York. No. 1:17-cv-06936.
  Representing Opternative, Inc., Firm: Spence PC
- Testifying Expert, Trade Secrets case. Fall 2017 – Winter 2019
  Broker Genius, Inc vs Drew Gainer and Seat Scouts LLC. Southern District of New York. No. 17-cv-08627.
  Representing Broker Genius, Inc., Firm: Pearl, Cohen, Zedek, Latzer, Baratz
- Testifying Expert, Trade Secrets case. Fall 2017
  Broker Genius, Inc vs Matthew Berry. Southern District of New York. No. 1:2017-cv-08511.
  Representing Broker Genius, Inc., Firm: Pearl, Cohen, Zedek, Latzer, Baratz
- Testifying Expert, Trade Secrets case. Winter 2017 – Fall 2017
  Broker Genius, Inc vs Nathan Zalta et al. Southern District of New York. No. 17-cv-02099.
  Representing Broker Genius, Inc., Firm: Pearl, Cohen, Zedek, Latzer, Baratz
- Testifying Expert, Class-Action case. Winter 2017 – Fall 2017
  Facebook Biometric Information Privacy Litig., Northern District of California. No. 15-cv-3747.
  Representing same, Firm: Edelson PC, Robbins Geller Rudman & Dowd LLP, and Labaton Sucharow LLP
- Source Code Expert, Audit case. Winter 2017
  eClinicalWorks, LLC.
  Representing eClinicalWorks, LLC, Firm: Quandary Peak

- Testifying Expert, Arbitration, Breach of Contract case. Fall 2016
  MachroTech LLC d/b/a GoECart vs Olive Brands LLC d/b/a MetroKitchen.com. Connecticut District Court. Arbitrartion. 3:17-cv-00376.
  Representing MetroKitchen, Firm: Daniels, Porco, Lusardi

- Expert, Copyright case. Fall 2016
  Fox Television Stations, Inc. vs FilmOn X, LLC etc. District of California. Case No. 13-cv-758.
  Representing FilmOn X, LLC, Firm: Baker Marquary LLP

- Expert, Financial Dispute case. Fall 2016 – Summer 2017
  D.K. Shah, M.D., P.C. d/b/a Grand Street Medical Associates vs Hal Nathan Buch, M.D. New York Supreme Court. Case No. 07-353.
  Representing D.K. Shah, Firm: Daniels, Porco, Lusardi

- Testifying Expert, Breach of Contract case. Winter 2016
  Confluence, Intl. vs Minnesota Department of Transportation. State of Minnesota District Court No. 62-CV-15-857.
  Representing Confluence, Intl., Firm: Walsten & Te Slaa, P.A.

Source Code Expert

- Source Code Expert, Patent case. Winter 2016
  FitBit vs Jawbone, ITC No. 337-TA-973.
  Representing FitBit, Firm: Gibson, Dunn & Crutcher LLP

- Source Code Expert, Trade Secrets case. 2014 – 2016
  Mediware Information Systems, Inc. vs HemaTerra Technologies, LLC. District Court. Middle District of Florida. No.: 3:13-cv-103-JRK.
  Representing Mediware Information Systems, Inc., Firm: Barack Ferrazzano Kirschbaum & Nagelberg LLP

- Source Code Expert, Patent case. 2013 – 2014
  Ericsson Inc vs Samsung Electronics Co, LTD., Northern District of Texas 6:12-cv-894-LED.
  Representing Samsung Electronics Co, LTD., Firm: Kirkland & Ellis, LLP

- Source Code Expert, Patent case. 2013
  Ericsson Inc vs Samsung Electronics Co, ITC No. 337-TA-866.
  Representing Samsung Electronics Co, LTD., Firm: Kirkland & Ellis, LLP

- Source Code Expert, Patent case. 2013
  AON Benfield Global, Inc. vs Guy Carpenter & Company, LLC, New York State Court. 2:11-cv-03529.
  Representing AON Benfield Global, Inc., Firm: Irell & Manella LLP