Amal Ahmed

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RESEARCH INTERESTS

Programming languages, Type theory, Language-based security, Security-preserving compilation, Dependent type systems, Gradual typing, Self-adjusting computation, Reasoning about aliasing and memory management, Typed intermediate languages, Proof-carrying code.

EDUCATION

Princeton University
- Ph.D. Computer Science, 2004
- Dissertation title: Semantics of Types for Mutable State
- Advisor: Andrew Appel
- Lothrop Fellow, 2002 – 2003

Stanford University
- M.S. Computer Science, emphasis in Databases, 1995

Brown University
- A.B. Computer Science and Economics, 1993

EMPLOYMENT

Toyota Technological Institute at Chicago, Chicago, IL
- *Research Assistant Professor*, Sept 2006 – present

Harvard University, Cambridge, MA
- *Postdoctoral Fellow*, worked with Greg Morrisett, 2004 – 2006

Cornell University, Ithaca, NY
- *Postdoctoral Research Associate*, 2003 – 2004

Princeton University, Princeton, NJ
- *Assistant in Instruction* and *Research Assistant*, 1998 – 2003

AT&T Labs, Middletown, NJ
- *Member of Technical Staff*, 1995 – 1998

Brown University, Providence, RI
- *Lab Consultant,* Department of Computer Science, 1992 – 1993
- *Research Assistant* in Artificial Intelligence, Department of Computer Science, Summer 1992
- *Teaching Assistant,* Department of Computer Science, 1991 – 1992
- *Recitation Instructor* for Financial Accounting, Department of Economics, 1990 – 1991

TEACHING EXPERIENCE

University of Chicago, Instructor
- CMCS 336: Type Systems for Programming Languages (co-taught with Umut Acar), Winter 2008

Princeton University, Assistant in Instruction
- COS 495: Medical Informatics (taught by Dr. Bill Hanson), Spring 2002
- COS 226: Algorithms and Data Structures (taught by Robert Sedgewick), Spring 1999
- COS 217: Introduction to Programming Systems (taught by J.P. Singh), Fall 1998

Brown University, Teaching Assistant
- CS 002: Introduction to CS & Applications (taught by Franco Preparata), Spring 1992
- CS 011: Programming & Problem-Solving in CS (taught by Andries van Dam), Fall 1991
- CS 004: Introduction to Programming (taught by Pascal van Hentenryck), Spring 1991

Brown University, Recitation Instructor
- EC 079: Financial Accounting, Fall 1990 and Spring 1991

PROFESSIONAL SERVICE

- Program Chair: ACM Workshop on Types in Language Design and Implementation (TLDI) 2009
- Steering Committee: ACM International Conf. on Functional Programming (ICFP) – Member at large, 2008 – present
- Co-organizer: Dagstuhl Seminar 08061: Types, Logics and Semantics for State, Wadern, Germany, February 2008.
- Program Committees:

  European Symposium on Programming (ESOP) 2010.

  ACM International Conf. on Functional Programming (ICFP) 2009.

  ACM Symposium on Principles of Programming Languages (POPL) 2008.

  ACM Workshop on Programming Languages and Analysis for Security (PLAS) 2006.

  Workshop on Semantics, Program Analysis, and Computing Environments for Memory Management (SPACE) 2006.
- Journal reviewing: ACM Transactions on Programming Languages and Systems (TOPLAS), Journal of Functional Programming (JFP), Logical Methods in Computer Science (LMCS).
- Conference and workshop reviewing: POPL, PLDI, LICS, ICFP, ESOP, ISMM, PPDP, TLDI, FOOL, APLAS, MFPS, IFL, FLOPS, LPAR.

HONORS / AWARDS

- George Van Ness Lothrop Fellowship in Engineering (University Honorific Fellowship), Princeton University, 2002 – 2003.
- Travel awards and fellowships:
  CRA-W Travel Award, 2003
  Award from Princeton University Dean's Fund for Scholarly Travel, 2003
  Association of Princeton Graduate Alumni Summer Travel Fellowship, 2002
  Margaret Goheen Travel Fellowship, 2001
  National Science Foundation Travel Grant, 2001

UNIVERSITY SERVICE

- Computer Science Graduate Committee, Princeton University, 1998 – 2003.
- Computer Science Representative to the Graduate Engineering Council, School of Engineering and Applied Sciences (SEAS), Princeton University, 2001 – 2002.
- Graduate Women in Science and Engineering, Princeton University, 1998 – 2003.
- Meiklejohn Academic Advisor, Brown University, 1992 – 1993.

INVITED TALKS

- *Gradual Typing with Polymorphism and Blame*
  Harvard University, Cambridge, Massachusetts, October 2008.
- *All for Nothing: Gradual Typing with Polymorphism and Blame*
  NU Programming Languages Seminar, Northeastern University, Boston, Massachusetts, October 2008.
- *Gradual Typing with Polymorphism and Blame*
  Princeton University, Princeton, New Jersey, October 2008.
- *Step-Indexed Logical Relations*
  Dagstuhl Seminar 08061: Types, Semantics and Logics for State, Wadern, Germany, February 2008.
- *Equivalence-Preserving Compilation*
  IFIP Working Group 2.8 (Functional Programming), Reykjavik, Iceland, July 2007.
- *Hoare Type Theory*
  Workshop on Proof-Carrying Code (PCC 2006), held in conjunction with IEEE Symposium on Logic in Computer Science (LICS), Seattle, Washington, August 2006.
- *Taming Mutable State*
  Toyota Technological Institute, Chicago, Illinois, April 2006.
- *Taming Mutable State*
  New York University, Department of Computer Science, New York, NY, April 2006.
- *Program Equivalence using Step-Indexed Logical Relations*
  Microsoft Research, Cambridge, UK, December 2005.
- *Substructural State: The Interplay of Uniqueness, Sharing, and References*
  Sun Labs, Burlington, Massachusetts, November 2005.
- *L^3: A Linear Language with Locations*
  Church Project Seminar, Boston University, Boston, Massachusetts, February 2005.
- *Reasoning about Hierarchical Storage*
  Fourth Annual Programming Languages Day, IBM T. J. Watson Research Center, Hawthorne, NY, April 2003.
- *Reasoning about Hierarchical Storage*
  Penn Logic and Computation Seminar, Univ. of Pennsylvania, Philadelphia, PA, February 2003.
- *Foundational Proof-Carrying Code*
  Yale University, New Haven, Connecticut, April 2001.
- *Mutable Fields in a Semantic Model of Types*
  Workshop on Proof-Carrying Code (PCC 2000), held in conjunction with IEEE Symposium on Logic in Computer Science (LICS) and Static Analysis Symposium, Santa Barbara, California, June 2000.

PUBLICATIONS

[1] Derek Dreyer, Amal Ahmed, and Lars Birkedal.
Logical Step-Indexed Logical Relations.
In *24th Annual IEEE Symposium on Logic in Computer Science (**LICS '09**)*,
Los Angeles, California, August 2009.

[2] Amal Ahmed, Derek Dreyer, and Andreas Rossberg.
State-Dependent Representation Independence.
In *36th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (**POPL '09**)*,
pages 340-353, Savannah, Georgia, January 2009.

[3] Amal Ahmed and Matthias Blume.
Typed Closure Conversion Preserves Observational Equivalence.
In *13th ACM SIGPLAN International Conference on Functional Programming (**ICFP '08**)*,
pages 157-168, Victoria, British Columbia, Canada, September 2008.

[4] Jacob Matthews and Amal Ahmed.
Parametric Polymorphism through Run-time Sealing: or, Theorems for Low, Low Prices!
In Sophia Drossopoulou, editor, *17th European Symposium on Programming (**ESOP '08**)*,
pages 16-31, Budapest, Hungary, March 2008.

[5] Umut Acar, Amal Ahmed, and Matthias Blume.
Imperative Self-Adjusting Computation.
In *35th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (**POPL '08**)*,
pages 309-322, San Francisco, California, January 2008.
[Since I was on the POPL'08 PC, this paper was held to a higher standard—for acceptance, it had to be judged "better than the average paper accepted to the conference."]

[6] James Cheney, Amal Ahmed, and Umut Acar.
Provenance as Dependency Analysis.
In *11th International Symposium on Database Programming Languages (**DBPL '07**)*,
pages 138-152, Vienna, Austria, September 2007.

[7] Amal Ahmed, Matthew Fluet, and Greg Morrisett.
L^3: A Linear Language with Locations.
Fundamenta Informaticae, 77(4): 397-449, June 2007.

[8] Aleksandar Nanevski, Amal Ahmed, Greg Morrisett, and Lars Birkedal.
Abstract Predicates and Mutable ADTs in Hoare Type Theory.
In Rocco De Nicola, editor, *16th European Symposium on Programming (**ESOP '07**)*,
pages 189-204, Braga, Portugal, March 2007.

[9] Amal Ahmed.
Step-Indexed Syntactic Logical Relations for Recursive and Quantified Types.
In Peter Sestoft, editor, *15th European Symposium on Programming (**ESOP '06**)*,
pages 69-83, Vienna, Austria, March 2006.

[10] Matthew Fluet, Greg Morrisett, and Amal Ahmed.
Linear Regions are All You Need.
In Peter Sestoft, editor, *15th European Symposium on Programming (**ESOP '06**)*,
pages 7-21, Vienna, Austria, March 2006.

[11] Amal Ahmed, Matthew Fluet, and Greg Morrisett.
A Step-Indexed Model of Substructural State.
In *10th ACM SIGPLAN International Conference on Functional Programming (**ICFP '05**)*,
pages 78-91, Tallinn, Estonia, September 2005.

[12] Greg Morrisett, Amal Ahmed, and Matthew Fluet.
L^3: A Linear Language with Locations.
In Pawel Urzyczyn, editor, *Typed Lambda Calculi and Applications: 7th Intl. Conference (**TLCA '05**)*,
Nara, Japan, April 21-23, 2005, Proceedings, volume 3461 of *Lecture Notes in Computer Science,*
pages 293-307, Springer 2005.

[13] Amal Ahmed, Limin Jia, and David Walker.
Reasoning about Hierarchical Storage.
In *18th Annual IEEE Symposium on Logic in Computer Science (**LICS '03**)*,
pages 33-44, Ottawa, Canada, June 2003.

[14] Amal Ahmed and David Walker.
The Logical Approach to Stack Typing.
In *ACM SIGPLAN Workshop on Types in Language Design and Implementation (**TLDI '03**)*,
pages 74-85, New Orleans, Louisiana, January 2003.

[15] Amal Ahmed, Andrew W. Appel, and Roberto Virga.
A Stratified Semantics of General References Embeddable in Higher-Order Logic.
In *17th Annual IEEE Symposium on Logic in Computer Science (**LICS '02**)*,
pages 75-86, Copenhagen, Denmark, July 2002.

[16] Amal Ahmed, Diane Litman, Anil Mishra, Peter F. Patel-Schneider, Johannes P. Ros.
Modeling Collections of Changing Interdependent Objects.
Chapter 14 of *Implementing Application Frameworks: Object-Oriented Frameworks at Work*, Mohamed E. Fayad, Douglas C. Schmidt, Ralph Johnson (Editors), John Wiley & Sons, September 1999.

UNDER REVIEW

[17] Amal Ahmed, Andrew W. Appel, Christopher Richards, Kedar Swadi, Gang Tan, and Daniel Wang.
Semantic Foundations for Typed Assembly Languages. (64 pages)
Submitted to *ACM Transactions on Programming Languages and Systems (TOPLAS)*, September 2008.

[18] James Cheney, Amal Ahmed, and Umut Acar.
Provenance as Dependency Analysis. (31 pages)
Submitted to *Mathematical Structures in Computer Science (MSCS)* Special Issue on Programming Language Interference and Dependence, March 2008.

TECHNICAL REPORTS & WORK IN PROGRESS

[1] James Cheney, Umut Acar, and Amal Ahmed.
Provenance Traces.
Draft, July 2008.

[2] Amal Ahmed, Derek Dreyer, and Andreas Rossberg.
State-Dependent Representation Independence (Technical Appendix). (71 pages)
Available at: `http://ttic.uchicago.edu/~amal/papers/sdri`, August 2008.

[3] Amal Ahmed and Matthias Blume.
Typed Closure Conversion Preserves Observational Equivalence. (50 pages)
Technical Report TR-2008-07, Dept. of Computer Science, University of Chicago, July 2008.

[4] Umut Acar, Amal Ahmed, and Matthias Blume.
Imperative Self-Adjusting Computation. (77 pages)
Technical Report TR-2007-18, Dept. of Computer Science, University of Chicago, November 2007.

[5] Aleksandar Nanevski, Amal Ahmed, Greg Morrisett, and Lars Birkedal.
Abstract Predicates and Mutable ADTs in Hoare Type Theory. (44 pages)
Harvard Computer Science Technical Report TR-16-06, Harvard University, September 2006.

[6] Amal Ahmed.
Step-Indexed Syntactic Logical Relations for Recursive and Quantified Types. (169 pages)
Harvard Computer Science Technical Report TR-01-06, Harvard University, March 2006.

[7] Amal Ahmed, Matthew Fluet, and Greg Morrisett.
A Step-Indexed Model of Substructural State. (203 pages)
Harvard Computer Science Technical Report TR-16-05, Harvard University, February 2005.

[8] Amal Ahmed, Matthew Fluet, and Greg Morrisett.
L^3: A Linear Language with Locations. (73 pages)
Harvard Computer Science Technical Report TR-24-04, Harvard University, July 2004.

[9] Amal Jamil Ahmed. *Semantics of Types for Mutable State.* PhD thesis, Princeton University, July 2004.
Available as Technical Report TR-713-04, Dept. of Computer Science, Princeton University, 2004.

[10] Amal Ahmed, Andrew W. Appel, and Roberto Virga.
An Indexed Model of Impredicative Polymorphism and Mutable References. (15 pages)
Unpublished, January 2003.

REFERENCES

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  Center for Information Technology Policy
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