

Caitlin Sadowski

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STATEMENT My research goal is to make it easier to write good code, with an emphasis on parallel programs. This involves creating dynamic analysis tools for improving correctness, efficiency, and understandability. I am also interested in ways to teach programming skills.

Interests: Programming Languages, Software Engineering, Parallelism/Concurrency, Education

EDUCATION **University of California at Santa Cruz**, Santa Cruz, CA
 M.S., Computer Science, 2009
 Ph.D. Student, Computer Science, 2006 - 2011 (expected)
 GPA: 4.0

Cavendish College, London, UK
 Post-Graduate Foundation Diploma in Art and Design, 2005-2006
 Specializing in Photography

Colorado College, Colorado Springs, CO
 B.A. Mathematics, 1999-2002
 Cum Laude, Minor in Studio Art

RESEARCH **SideTrack: Generalizing Dynamic Atomicity Analysis (PADTAD 2009)**

- Developed, implemented, and evaluated precise dynamic atomicity analysis tool
- Used vector clocks to optimize code for memory usage and speed
- Presented at 2009 Workshop on Parallel and Distributed Systems: Testing, Analysis, and Debugging

Structural Type Inference for JavaScript

- Created JavaScript AST
- Used structural type inference to infer types for functions and objects
- Wrote interface which reported type errors when usage did not match inference

Tiddle: A Trace Description Language for Dynamic Analysis (WODA 2009)

- Implemented a compiler in Haskell which translates trace fragments into *deterministic* Java programs
- Designed trace description language defined in BNF
- Reduced LOC and number of test programs for dynamic analysis tools by an order of magnitude

SingleTrack: Dynamic Determinism Analysis for Java (ESOP 2009, Master’s Project)

- Implemented tool as part of a team, including benchmarks and tests
- Evaluated performance of Singletrack, optimized code for speed, and discovered that all violations of the “deterministically parallel” specification for our benchmark suite represented real errors
- Developed formalism and operational semantics
- Primary author of correctness proof for soundness and completeness
- Presented at 2009 European Symposium on Programming, and Microsoft Research Cambridge

Multiprocessor Real-Time Scheduling (Submitted to RTSS 2009)

- Developed new “Stack-and-Slice” real-time multiprocessor scheduling algorithm
- Built scheduling simulator in OCaml to test and compare scheduling algorithms
- Clarified and extended theory of real-time multiprocessor scheduling

Stateless Model Checking of Multithreaded Java Programs

- Implemented (Java) dynamic partial order reduction and Cartesian partial order reduction algorithms to boost efficiency of search algorithm without sacrificing completeness
- Integrated the model checker into a framework with other analysis tools
- Also developed and experimentally evaluated a critical path analysis tool for identifying the potential parallelism of multithreaded Java programs

Proof Mechanization with Coq (WMM 2008)

- Mechanized the central correctness proof for Velodrome (dynamic atomicity analysis) in Coq
- Built a framework for formalizing the happens-before relation within multithreaded programs
- Refactored internal formalisms so that key properties are easier to express
- Presented results at 2008 Workshop on Mechanizing Metatheory

SimHash: Hashing for File Similarity

- Created a hash-like function (SimHash) focused on quickly identifying *similar* files in a large filesystem
- Implemented a multi-platform, scalable system using SimHash
- Explored the semantics of “file similarity”
- Coding done in C++ and Python, interfaced with a MySQL backing store

Software Transactional Memory

- Implemented (Java) and evaluated software transactional memory system based on 2006 Dice and Shavit paper, with an emphasis on high performance
- Developed correctness tests as part of a STM stress-testing harness, which revealed an error in a different STM implementation
- Compared STM systems which made different structural tradeoffs (i.e. pessimistic vs. optimistic concurrency control)

WORK

Apple, Inc., Cupertino, CA
Intern, Ipod Software Division

Summer 2007

Independently designed and developed extensible audio testing framework using mostly C++
 Built off the Synthesis ToolKit to create digital signal processing code
 Created numerous & varied automation tools using Applescript and Perl

Self-employed, London, UK and San Francisco, CA
Freelance Photographer

Sept. 2003 - Nov 2004
October 2005 - July 2006

TEACHING

University of California, Santa Cruz, Computer Science Department, Santa Cruz, CA
Teaching Assistant, Advanced Programming, Graduate Programming Languages, Graduate Algorithms
Winter 2009

Lectured on axiomatic/operational semantics, structural induction, lambda calculus, Hoare logic, dynamic programming, NP-completeness, complexity theory, well-founded induction proofs, greedy algorithms
 Assisted students in understanding advanced object-oriented concepts
 Assessed students' proof writing abilities, as well as Java, C++, and OCaml code

University of Kansas, Linguistics Department, Lawrence, KS
Lecturer

August 2005 - Sept. 2005

Co-taught first segment of computational linguistics course.
 Lectured on HTML/Perl, approaches to ambiguity in natural languages, current research

SKILLS**Languages**

Java, C/C++, OCaml, Haskell
 Python, Applescript, bash
 L^AT_EX, Coq, gnuplot

Operating Systems

Macintosh, Linux

Selected Graduate Coursework

Advanced Operating Systems, Real-Time Operating Systems, Combinatorial Algorithms, Randomized Algorithms, Software Engineering, Automatic Code Generation, Advanced Programming Languages (Type Systems), Advanced Programming Languages (Transactional Memory)

AWARDS**GAANN Fellowship**

University of California at Santa Cruz, September 2007 - Ongoing

Research Fellowship

Center for Lesbian Health Research, Institute for Health and Aging, University of California at San Francisco, June - September 2002

Margaret T. Barnes Scholarship in Mathematics

Four year, full tuition scholarship through Colorado College, 1999-2002