

JAMES KOPPEL

[contact info redacted]

EDUCATION

- Massachusetts Institute of Technology,** 2015-2021
Ph. D. in Computer Science
Advisor: Armando Solar-Lezama
Thesis: Meta-metaprogramming
- Massachusetts Institute of Technology,** 2015-2017
S. M. in Computer Science
Advisor: Armando Solar-Lezama
Thesis: Incremental Parametric Syntax for Multi-Language Transformation
- Institute for Professional Excellence in Coaching (iPEC)** 2016-2017
Certified Professional Coach (from iPEC)
Associated Certified Coach (ICF-ACC; from the International Coaching Federation)
- Carnegie Mellon University** 2009-2012
B.S. in Computer Science and B.S. in Mathematics
GPA: 3.94 / 4.00

INDUSTRY POSITIONS

- James Koppel Coaching, LLC** 2016-
Founder <http://www.jameskoppelcoaching.com>
- Coaching software engineers on how to write better code. To date, have sold several dozen individual clients and 3 corporate, charging up to \$300/hour.
 - Created the Advanced Software Design web course and weekend-intensive. Over 100 paying customers have gone through the web course and workshops since its inception in February 2018.
 - Marketed business through blog “Path-Sensitive,” which has received over 100,000 unique visitors and 800,000 views.
 - Organized the Principled Software Design Boston and NYC meetup groups, which together have over 400 members.
 - Created the Arch-Engineer mailing list, with approximately 1100 subscribers
- Kura Technologies** 2020-
Member of Scientific Advisory Board
- Recruited initially to offer training and high-level design review in software engineering, but assisted in a wide variety of ways, including mentoring founders in hiring, project management, and public speaking.
 - Performed internal mediation and conducted trainings in conflict management
- Semantic Designs, Inc** 2016
Research intern Austin, TX
- Implemented a frontend for Lua static analysis
 - Designed and implemented a dynamic analysis for deadlock detection in Java programs. Used by Apptimize to successfully detect a deadlock in their Android SDK which had escaped engineers for months and threatened custom churn.
 - Built an engine for automatically deriving symbol-table generators from a language specification.

Apptimize, Inc*Contractor*

2015-2017

Remote

- Re-architected the Apptimize Android SDK to support applications that run in multiple processes
- Ongoing maintenance and consulting on the Android Visual Apptimizer and its supporting binary-modification engine.

Apptimize, Inc*Engineer*

2014-2015

Menlo Park, CA

- Sole developer of the Android Visual Apptimizer, a WYSIWYG editor for modifying the GUI of Android applications for use in A/B testing
- Created a binary-modification engine for Android, granting the Apptimize SDK capabilities disallowed by conventional programming
- Developed new features to enhance the testing capabilities and stability of the iOS and Android SDKs
- 6 patents on topics relating to binary modification and mobile A/B testing

Tarski Technologies*Founder and CEO*

2012-2013

Sunnyvale, CA

- Designed and implemented automated program-repair system based on recent research papers, using both genetic and template-based algorithms. Used system to automatically patch bugs in large open-source projects such as the Apache Commons
- Distributed program-repair system across flexible numbers of machines using AWS and Ansible
- Developed program-repair demos using constraint-based synthesis and SMT solvers
- Recruited and directed 3 employees
- Signed up 5 companies as alpha users
- Pitched and received offers from well-known investors

Two Sigma Investments*Software Engineering Intern*

2011

New York, NY

- Developed and implemented distributed streaming algorithms for the computation of several statistics, such as the exponential moving average (EMA)
- Developed efficient job-decomposition system using integer programming with CPLEX

Facebook*Software Engineering Intern*

2010

Palo Alto, CA

- Designed and implemented a language allowing non-programmers to customize an automated abuse-report-handling system
- Trained customer-service employees in the use of said language

LetsGet.Net*Contractor*

2005 -2009

St. Louis, MO

- Wrote app atop Google maps allowing restaurants to specify zones of delivery
- Built system for sending orders to restaurants via network printers
- Developed JavaScript widget for displaying images as tooltips

ACADEMIC POSITIONS

(graduate research positions listed under Education)

Carnegie Mellon Institute for Software Research*Undergraduate Researcher*

2011-2012

Supervisor: Jonathan Aldrich

- Wrote new backend for the Plaid compiler targeting JavaScript
- Designed and implemented new language features allowing Plaid's typestate-oriented programming capabilities to be used for client-side web programming

PROJECTS

Project Ironfist

2010-

A mod for Heroes of Might and Magic II

<http://www.ironfi.st>

- Reverse engineered 100 kLOC of source code from binary
- Created technique for easier binary-modification by linking new code with disassembled code
- Developed tools to assist in reverse-engineering and binary modification, including one for load-time patching of executables
- Recruited and managed over 40 contributors. (Peak team size: 12 active members, summer 2017.)
- Estimated completion: mid 2021

Path-Sensitive

2015-

Blog

<http://pathsensitive.blogspot.com>

- Blog primarily about software design.
- Over 800,000 pageviews. Most popular post has over 100,000 views. Five posts have hit the #1 spot on the Hacker News aggregator. (Numbers as of Aug. 2021)

STUDENTS SUPERVISED

Jasper Haag (undergrad): 2017-2018. Extensions to the CUBIX framework for language-parametric transformation.

Elijah Rivera (undergrad): 2017-2019. A tool for synthesizing transformations between different representations of the same language.

Varot "Pond" Premtoon (undergrad and master's): 2017-2019. Using CUBIX to create a cross-language semantic code search tool, Yogo.

Jackson Kearnl (undergrad): 2018. Extending MANDATE, the control-flow graph generator generator, to work on the MITScript language.

Diana Molodan (undergrad and master's): 2019-present. Discovering how to transform code which is isomorphic-but-not-identical to a match pattern.

Arman Talkar (undergrad): 2019. Frontend driver for the Mandate control-flow-graph generator generator.

Angel Huang (undergrad): 2019. Automatically inferring the rationale behind a choice of variable name, to power better renaming tools.

Kliment Serafimov (undergrad): 2020. Learning language semantics from an interpreter.

Zoe Anderson (undergrad): 2019-2021. Creating a visualizer for Yogo graphs and improving Yogo's memory model for better inference in the presence of mutable state.

Shirlyn Prabakar (undergrad): 2020-present. Creating a typechecker to assist in writing Yogo queries.

PUBLICATIONS

Conference

- James Koppel, Jackson Kearnl, Armando Solar-Lezama. *Automatically Deriving Control-Flow Graph Generators from Operational Semantics*. (In submission.)

- Ferran Alet, Javier Lopez-Contreras, James Koppel, Maxwell I. Nye, Armando Solar-Lezama, Toms Lozano-Prez, Leslie Pack Kaelbling, Joshua B. Tenenbaum. *A Large-Scale Benchmark for Few-Shot Program Induction and Synthesis*. ICML 2021.
- Zenna Tavares, James Koppel, Xin Zhang, Ria Das, Armando Solar-Lezama. *A Language for Counterfactual Generative Models*. ICML 2021.
- James Koppel, Daniel Jackson. *Demystifying Dependence*. Onward 2020.
- Michael Specter, James Koppel, Daniel Weitzner. *The Ballot is Busted Before the Blockchain: A Security Analysis of Voatz, the First Internet Voting Application Used in U.S. Federal Election*. USENIX Security, 2020.
- Varot Premtoon, James Koppel, Armando Solar-Lezama. *Semantic Code Search via Equational Reasoning*. PLDI 2020.
- James Koppel, Gabriel Scherer, Armando Solar-Lezama. *Capturing the Future by Replaying the Past*. In ICFP 2018.
- James Koppel, Varot Premtoon, Armando Solar-Lezama. *One Tool, Many Languages: Language-Parametric Transformation with Incremental Parametric Syntax*. In OOPSLA 2018.

Small publications

- James Koppel, Sreenidhi Nair, Armando Solar-Lezama. *One CFG-Generator to Rule Them All*. In submission.
- James Koppel. *Version Space Algebras are Acyclic Tree Automata*. On arXiv, 2021.
- Gopal Sarma, James Koppel, Gregory Malecha, Patrick Schultz, Eric Drexler, Ramana Kumar, Cody Roux, Philip Zucker. *Formal Methods for the Informal Engineer: Workshop Recommendations*. On arXiv, 2021.
- James Koppel, Armando Solar-Lezama. *Incremental Parametric Syntax for Multi-Language Transformation*. In Companion Proceedings of the 2017 ACM SIGPLAN International Conference on Systems, Programming, Languages and Applications: Software for Humanity.
- Derrick Lin, James Koppel, Angela Chen, Armando Solar-Lezama. *QuixBugs: A Multi-Lingual Program Repair Benchmark Set Based on the Quixey Challenge*. In Companion Proceedings of the 2017 ACM SIGPLAN International Conference on Systems, Programming, Languages and Applications: Software for Humanity.

TALKS: ACADEMIC

Finding Relevant Code with Causal Inference. New England Programming Languages Symposium, November 2015. MIT, February 2016.

Making Tools Worth Building. University of Texas — Austin, July 2016.

Cracking Multi-Language Transformations. Tel Aviv University, January 2017. Technion, January 2017. MIT, March 2017. Stanford University, April 2017. University of Colorado — Boulder, July 2017. University of Illinois — Urbana-Champaign, November 2017. Carnegie Mellon University, April 2018. Nanjing University, August 2018.

Building Multi-Language Tools. Harvard, July 2019. National University of Singapore, August 2019. University of Michigan, November 2019. Indiana University – Bloomington, February 2020. Purdue University, February 2020. University of Chicago, February 2020.

TALKS: INDUSTRY/GENERAL AUDIENCE

Automating Automation. Singularity Summit, October 2012.

Intro to Linear Logic. SF Types, Theorems, and Programming Languages, May 2014.

The Checker Framework. Pivotal Labs San Francisco, July 2014.

Program Synthesis for Visual Programming. Future of Programming Meetup (San Francisco), April 2017.

Any Monadic Effect in Direct Style. SF Types, Theorems, and Programming Languages, April 2017.

The Catastrophic Risk of Software Maintenance. Effective Altruism Global: Boston, June 2017.

Cracking Multi-Language Transformations. Boston Haskell Meetup, July 2017.

You are a Program Synthesizer. Strange Loop 2018.

The Best Refactoring You've Never Heard of. Compose :: Conf, June 2019. Papers We Love — Boston, July 2019.

In addition, I organized the Principled Software Design meetups in Boston and New York, where I gave a sequence of software design workshops (10 total) to groups of local engineers. I presented at MIT, Columbia University, and local coworking spaces. See www.meetup.com/Principled-Software-Design and www.meetup.com/Principled-Software-Design-NYC/

PATENTS

- Nancy Hua, James Koppel, Jeremy Orlow. **Enhanced Code Callback.** US Patent 9,483,283, issued 11-01-2016.
- Jeremy Orlow, Dustin Howett, James Koppel. **User Interface Modification and Usage Tracking.** US Patent 10,291,729, issued 2019-05-14.
- Jeff DiTullio, Michael Fenton, James Koppel, Timothy Lundeen. **Context Check Bypass To Enable Opening Shared-Object Libraries..** US Patent 10,606,612; issued 2020-03-31.
- Timothy Lundeen, Michael Fenton, James Koppel, Jeff DiTullio. **Disabling Just-in-Time Translation for Specific Functions.** US Patent 10,628,188, issued 2020-04-21.
- Michael L. Poon, Roberto Carli, James Koppel. **Automatic Import of Third Party Analytics.** US Patent 10,282,216, issued 2020-07-07.
- James Koppel. **Run-Time Application Modification.** US Patent 10,761,835; issued 2020-09-01.

SELECTED PRESS

On the Thiel Fellowship

- “Code to Live By,” Carnegie Mellon Today.
<http://www.carnegiemellontoday.com/issues/january-2013-issue/feature-stories/code-to-live-by/>
- “Upcoming college graduate’s entrepreneurial goals boosted by \$100k grant,” St. Louis Jewish Light.
http://www.stljewishlight.com/features/arts_culture/article_630e13aa-dcd4-11e1-b9de-0019bb2963f4.html

On the Android Visual Apptimizer

- ”Apptimize Launches Android Visual Tools,” PingWest.
<http://www.pingwest.com/apptimize-launches-android-visual-tools/>
- “Can’t Code? It’s Not a Problem Anymore With Apptimize,” Tech Cocktail.
<http://tech.co/apptimize-launches-android-visual-apptimizer-2014-05>

On Election Security

- “Voting on Your Phone: New Elections App Ignites Security Debate,” New York Times.
<https://www.nytimes.com/2020/02/13/us/politics/voting-smartphone-app.html>
- “MIT researchers identify security vulnerabilities in voting app,” MIT News.
<https://news.mit.edu/2020/voting-voatz-app-hack-issues-0213>
- “Cybersecurity Experts Say Hacking Risk Is High for Mobile Voting,” Bloomberg.
<https://www.bloomberg.com/news/articles/2020-03-26/cybersecurity-experts-say-hacking-risk-is-high-for-mobile-voting>
- “Voting App Flaws Could Have Let Hackers Manipulate Results,” Wired.
<https://www.wired.com/story/voatz-voting-app-security-flaws/>
- “‘Sloppy’ Mobile Voting App Used in Four States Has ‘Elementary’ Security Flaws,” Vice.
<https://www.vice.com/en/article/akw7mp/sloppy-mobile-voting-app-used-in-four-states-has-elementary-security-flaws>
- “On Super Tuesday, Americas voting technology will be under intense scrutiny,” CNBC.
<https://www.cnbc.com/2020/03/03/on-super-tuesday-us-voting-technology-will-be-under-intense-scrutiny.html>
- “Voatz smartphone voting app has significant security flaws, MIT researchers say,” NBC.
<https://www.nbcnews.com/tech/security/voatz-smartphone-voting-app-has-significant-security-flaws-mit-researchers-n1136546>
- “Another election app comes under fire,” Boston Globe.
<https://www.bostonglobe.com/2020/02/13/business/another-election-app-comes-under-fire/>
- “This Week in Apps: YouTube TV cancels Apples rev share, more bad news for mobile voting, WhatsApp hits 2B users,” TechCrunch.
<https://techcrunch.com/2020/02/15/this-week-in-apps-youtube-tv-cancels-apples-rev-share-more-bad-news-for-mobile-voting-whatsapp-hits-2b-users/>
- “Why voting online is not the way to hold an election in a pandemic,” The Economist.
<https://www.economist.com/international/2020/04/27/why-voting-online-is-not-the-way-to-hold>
- “Security Botox or amazingly successful? Inside the battle to patch bug bounties biggest vulnerability,” Fortune.
<https://fortune.com/2020/03/31/bugcrowd-hackerone-bug-bounty-voatz/>
- “Voting by Phone: The Promise and Peril of Digital Ballots,” Wall Street Journal.
<https://www.wsj.com/articles/voting-by-phone-the-promise-and-peril-of-digital-ballots-11601636414>
- “A Mobile Voting App That’s Already in Use Is Filled With Critical Flaws,” Vice.
<https://www.vice.com/en/article/n7jk9x/mobile-voting-app-voatz-severe-security-vulnerabilities>

On Yogo

- “Working towards smarter automation for fixing code,” MIT CSAIL News.
<https://www.csail.mit.edu/news/working-towards-smarter-automation-fixing-code>

Podcast Appearances

- “James Koppel discusses counterfactual inference and automated explanation,” Elucidations.
<https://elucidations.vercel.app/posts/episode-125/>

- “On the Maintenance of Large Software: James Koppel,” Future of Coding.
<https://futureofcoding.org/episodes/030>
- “Advanced Software Design with Jimmy Koppel,” CoRecursive.
<https://corecursive.com/036-jimmy-koppel-advanced-software-design/>

AWARDS AND COMPETITIONS

- **NSF Graduate Research Fellowship**, 2015
- **David Notkin Endowed Graduated Fellowship**, 2014, 1 year of graduate funding at the University of Washington (declined)
- **Donald D. Harrington Doctoral Fellowship**, 2014, \$150,000 funding for the #1 applicant to each Ph. D. program at UT Austin (declined)
- **Thiel “20 Under 20” Fellowship**, 2012, \$100,000 for promising young scientists and entrepreneurs
- **Phi Beta Kappa**, inducted Fall 2012
- **ACM-ICPC World Finals**, 2012, Honorable Mention
- **William Putnam Lowell Mathematical Competition**, 2012, Top 200
- **CSAW CTF Finals** (offensive security competition), 2011, 10th place,
- **William Putnam Lowell Mathematical Competition**, 2009-2011, Top 500
- **National Merit Scholarship**, 2009
- **Siemens Award for Advanced Placement**, 2009

SERVICE

- **AISTATS 2019**, external reviewer.
- **Formal Methods for the Informal Engineer 2020-2021**, co-founder and program committee member.