

Ali Sinan Köksal

Professional Interests

Programming languages, program synthesis, compilers, machine learning, software engineering.

Education

- 2011-present **Ph.D., Computer Science, University of California, Berkeley, Berkeley, CA.**
Advisors: Rastislav Bodík and Nir Yosef. Thesis: “Program synthesis for systems biology.”
- 2009-2011 **M.Sc., Computer Science, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland.**
Advisor: Viktor Kuncak. Thesis: “Constraint programming in Scala.”
Ranked first in the Section of Computer Science and second in the School of Engineering.
- 2006-2009 **B.Sc., Computer Science, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland.**
Ranked first in the Section of Computer Science.

Experience

- 2016 **Technical intern, Sift Science, San Francisco, CA.**
- Added new features to the machine learning pipeline for fraud detection, and evaluated their impact.
 - Introduced streaming computation for certain offline model evaluation features in MapReduce, increasing model evaluation accuracy.
 - Designed and implemented API endpoints to efficiently summarize customer data using Elasticsearch.
 - Introduced model evaluation options to assess individual customers’ impact on overall system performance; collaborated with the finance team to analyze findings.
- 2013 **Research intern, Microsoft Research, Cambridge, UK.**
Created a tool in Scala for signaling pathway discovery from high-throughput data, using the Z3 SMT solver.
- 2013-2014 **Teaching Assistant, UC Berkeley.**
Created and graded assignments, led sections, and held office hours for the undergraduate PL course.
- 2009-2010 **Teaching Assistant, EPFL.**
Graded homeworks for Theoretical CS, Advanced Theoretical CS, and Compiler Construction courses.

Research Projects

- 2011-2018 **Program synthesis for systems biology.**
- Designed a domain-specific language in Scala to enable synthesis of concurrent finite state machines that model cell fate decision, using the Z3 SMT solver as a backend (github.com/koksal/sbl).
 - Built a framework in Scala to infer executable models of protein signaling from high-throughput time series data. Hand-crafted a solver to scale the analysis to large data sets (github.com/koksal/tps).
 - Designed an in-browser visualization tool to explore network and time series data using D3.js (github.com/koksal/tpv).
 - Developed a tool to synthesize gene regulatory network models using single-cell data, and explored identifiability of models from noisy data (github.com/koksal/karme).
- 2010-2011 **Constraint programming in Scala.**
- Designed an extension of Scala that supports constraint programming, allowing execution of declarative specifications in presence of user-defined functions and data types. Implemented the extension as a Scala compiler plugin (lara.epfl.ch/w/kaplan).
 - Co-developed ScalaZ3, a library that integrates the Z3 SMT solver with Scala for checking satisfiability and solution enumeration (github.com/epfl-lara/ScalaZ3).
- 2010 **Specifying and compiling sparse matrix formats.**
- Expressed sparse matrix formats in LL, a high-level, functional language for sparse formats.
 - Developed an LL-to-C compiler in Scala.

Awards and Honors

- 2015 NSF Software Infrastructure for Sustained Innovation (SI2-SSE) award for the proposal titled *Algorithms and Tools for Data-Driven Executable Biology*. Lead project developer and proposal co-author.
- 2013 Microsoft Research PhD Fellowship Program finalist.
- 2011 EPFL "SIA Vaudoise - Ingénieurs" prize for the second best Master average for Master studies in engineering.
- 2011 EPFL "ELCA Informatique" prize for the best Master average in the Computer Science section.
- 2009-2011 EPFL Excellence Scholarship at the Master Level for outstanding academic record.

Publications

Ali Sinan Köksal *et al.* **Synthesizing signaling pathways from temporal phosphoproteomic data.** *bioRxiv*, 2017.

Steven Woodhouse, Nir Piterman, Ali Sinan Köksal, Jasmin Fisher. **Synthesising Executable Gene Regulatory Networks from Single-Cell Gene Expression Data.** *CAV*, 2015.

Ali Sinan Köksal *et al.* **Synthesizing signaling pathways from temporal phosphoproteomic data (Abstract).** *RECOMB/ISCB*, 2014.

Ali Sinan Köksal, Yewen Pu, Saurabh Srivastava, Rastislav Bodík, Jasmin Fisher, Nir Piterman. **Synthesis of Biological Models from Mutation Experiments.** *POPL*, 2013.

Ali Sinan Köksal, Viktor Kuncak, Philippe Suter. **Constraints as Control.** *POPL*, 2012.

Philippe Suter, Ali Sinan Köksal, Viktor Kuncak. **Satisfiability Modulo Recursive Programs.** *SAS*, 2011.

Ali Sinan Köksal, Viktor Kuncak, Philippe Suter. **Scala to the Power of Z3: Integrating SMT and Programming.** *CADE Tool Demo*, 2011.

Gilad Arnold, Johannes Hölzl, Ali Sinan Köksal, Rastislav Bodík, Mooly Sagiv. **Specifying and verifying sparse matrix codes.** *ICFP*, 2010.

Skills

Programming languages

Proficient: Scala, Java. Familiar with: Python, JavaScript, C, Bash, HTML, CSS.

Spoken languages

Fluent: English, French. Native: Turkish.

Interests

Violin, contemporary classical music, street photography, modern architecture.