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Ali Sinan Köksal

Professional Interests

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

Education

2011-2018 **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.

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.

2009-2010 Selected as one of three students to participate in the EPFL-UC Berkeley Computer Science Masters Exchange Program.

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.

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.

Experience

2018-Present **Software Engineer**, *Google*, Mountain View, CA.
Working on the Knowledge Graph.

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.

Skills

Programming languages

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

Spoken languages

Fluent: English, French. Native: Turkish.

Interests

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