Kia Rahmani

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Research Interests

Program Analysis and Verification, *verified compilation and synthesis*.

Distributed Programming Models, *weak consistency/isolation tolerant applications*.

Education

2015–present **Purdue University**, *PhD in Computer Science*, West Lafayette, IN, USA.
- *Advisors*: Professor Suresh Jagannathan, Professor Benjamin Delaware
- *Courses*: Information Security, Computer-aided Program Reasoning, Distributed Database Systems, Formal Methods In Databases, Parallel Computing, Algorithm Design and Implementation,

2010–2015 **Sharif University of Technology**, *B.Sc. in Computer Science*, Tehran, Iran.
- *Thesis:* Three Ballot Voting System: Design Principles and Attacks.
- *Thesis Supervisor:* Professor Shahram Khazaei

Publications

OOPSLA'19 **CLOTHO: Directed Test Generation for Weakly Consistent Database Systems**
[Kia Rahmani, Kartik Nagar, Benjamin Delaware and Suresh Jagannthan]

PaPoC'18 **Fine-grained distributed consistency guarantees with effect orchestration**
[Kia Rahmani, Gowtham Kaki and Suresh Jagannthan]

Research Experience and Projects

2017–2019 **Directed Test Generation for Weakly Consistent Databases:**

The growing need for web-scale *always-on* applications has forced developers to move away from traditional databases, which offer relational data models and strong guarantees, to more modern "NoSQL" solutions, which tradeoff those guarantees for higher performance and availability. Unfortunately, such database applications are notoriously difficult to test and debug. Concurrent execution of database transactions may violate complex structural invariants that constrain how changes to the contents of one (shared) table affect the contents of another. To address these challenges, we designed a novel and fully automated testing framework for detecting serializability violations in (SQL) database-backed Java applications executing on weakly-consistent storage systems. Our approach combines a static analyzer and model checker to generate abstract executions, discover serializability violations in these executions, and translate them back into concrete test inputs suitable for deployment in a test environment.

2016–2017 **Fine-grained distributed consistency guarantees with effect orchestration:**

Unexpected behaviors often occur in weakly consistent data-stores. These non-deterministic behaviors can potentially violate application correctness, forcing developers to either implement very complex and ad-hoc mechanisms to avoid such anomalies, or choose to run applications using stronger levels of consistency than necessary. In order to relieve developers from having to make such tradeoffs, in this project, We leveraged declarative axiomatic specifications that reflect the necessary constraints any correct implementation must satisfy to guide a light-weight runtime consistency enforcement.

2015–2016 **Coq implementation of Quelea**: In this project, I formalized and implemented the operational semantics introduced in PLDI'15 paper, Declarative Programming over Eventually Consistent Data Stores, in Coq proof assistant. The formal model pointed out numerous previously unknown problems in the paper which I was able to offer fixes for.

Teaching Experience

Spring 2018 **Purdue University**, *Teaching Assistant (Compilers: Principles and Practice)*, IN, USA.

Fall 2014 **Sharif University of Technology**, *Teaching Assistant (Mathematical Logic)*, Tehran, Iran.

2010–2013 **Allame Helli High School**, *Computer Programming Teacher*, Tehran, Iran.

Summer Schools

June 2016 **University of Oregon**, *Programming Languages Summer School*, Eugene, OR, USA.

July 2014 **Tsinghua University**, *School on Logic, Language and Computation*, Beijing, China.

Skills

Programming Expert: Java, C++, Haskell

Proficient: Ocaml, Coq, Clojure, Scala, Python and C

Database Cassandra, Apache Ignite, CockroachDB, Riak, PostgreSQL, MySQL

Misc Git, LaTeX, Jepsen, Bash scripting

Languages Persian (Native) - English (Fluent) - Turkish (Fluent)

Professional and Extracurricular Activities

2016 – present **Director of Cultural Affairs**, *Iranian Cultural Club at Purdue University*.

2017 – present **Member of "Tatvam"**, *A Global-fusion music band at Purdue University*, Performed in several occasions as a soloist or a band member.

2010 – 2015 **Member of the University Music Association**, *Sharif University*, Tehran, Iran.

References

Suresh Jagannathan, Professor, *Department of Computer Science*, Purdue University.

- Phone: 765-494-0971
- Email: suresh@cs.purdue.edu

Benjamin Delaware, Assistant Professor, *Department of Computer Science*, Purdue University.

- Email: bendy@purdue.edu