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.
- *Advisor*: Professor Suresh Jagannathan
- *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

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.

Publications

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

Research Experience and Projects

2015–2016 **Coq implementation of Quelea**: In this project, I formalized and implemented the operational semantics introduced in my advisor's POPL'15 paper (Declarative Programming over Eventually Consistent Data Stores) in the Coq proof assistant. Even though the mere goal was to familiarize myself with proof assistants and formal language definition, the project pointed out numerous previously unknown problems in the paper which I was able to offer fixes for. The Coq implementation was later used as a supplementary material for the original paper.

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

Nondeterministic behaviors arise in weakly consistent data stores which can potentially violate application correctness, forcing designers to either implement (very complex) ad-hoc mechanisms to avoid these anomalies, or choose to run applications using stronger levels of consistency than necessary. In this project, we introduced a lightweight runtime verification system that relieves developers from having to make such tradeoffs. We leveraged declarative axiomatic specifications that reflect the necessary constraints any correct implementation must satisfy to guide a runtime consistency enforcement. Experimental results show that the performance of our automatically derived mechanisms is better than both specialized hand-written protocols and common store-offered consistency guarantees.

2017–present **Anomaly-guided Incremental Program Repair:**

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, designing correct and efficient programs backed by such databases, is far from being trivial: concurrency management techniques should be injected into the programs with care: unnecessary synchronization could result in massive performance loss. In this project, we are looking into the possibility of automating the design process of such applications. Our proposed approach is consisted of detecting possible "correctness violations" of a naive implementation and incrementally "repairing" it to get an end result that avoids such bad behaviors.

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.

Skills

Programming Expert: Java, C++, Haskell and Coq

Proficient: Ocaml, Clojure, Scala, Python and C

Database Cassandra, Riak, Apache Ignite, 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 Group**, *Sharif University*, Tehran, Iran.

References

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

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

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