Ali Shokri

Ph.D. in Computing and Information Sciences
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My research centers around advancing automated software engineering with a focus on program analysis, program synthesis, software architecture, and formal methods. I am deeply passionate about addressing the real-world challenges faced by software engineers, drawing on my years of industry experience. In my Ph.D. research, I developed an award-winning inter-procedural program synthesis approach, recognized with the first-place award at the ASE'21 conference. This achievement sets the stage for my ongoing exploration of combining formal methods with machine learning-supported program analysis. Currently engaged in postdoctoral research on formally verified pointer analysis and software compartmentalization, my aspirations extend toward contributing modestly to the evolving landscape of software engineering. My future pursuits include delving into formally verified ML-supported inter-procedural program synthesis, contributing to large-scale code repair, and exploring the concept of self-reconfigurable software. With a comprehensive background, collaborative projects with industry leaders, and grant proposal leadership, my commitment to advancing research aligns with the broader goals of the software engineering community.

Education

Ph.D. Computing and Information Sciences (Jan 2018 – Jun 2023)

Rochester Institute of Technology (RIT) - NY, USA

- Topic: Inter-procedural Program Synthesis
- Advisor: Dr. Mehdi Mirakhorli

M.Sc. Information Technology Engineering (Feb 2011 – Jan 2014)

Tarbiat Modares University (TMU) - Tehran, Iran

- Topic: Path Planning in Modular Robots
- Advisor: Dr. Ellips Masehian

B.Sc. Software Engineering (Sep 2001- Sep 2007)

University of Tehran (UT) - Tehran, Iran

- Topic: Software Development Life Cycle
- Advisor: Dr. Khansari

Awards

Research Competition

ASE'21, an A* conference in Software Engineering (2021)

- First-place Award Winner

Research Scholarship

Data61, a world leader in Data Science research (2018)

- Prestigious Research Scholarship

Admission and Fellowship

University of Melbourne, ranked 30th worldwide (2018)

- Ph.D. Admission and Fellowship

Iran Nation-wide University Exam

- Among the top 0.1% of participants (B.Sc.) (2001)

Publications

Inventions and Patents

- ”A method for deriving mathematical models from embedded code using a modified genetic algorithm to perform a symbol-to-variable mapping”, Registration date: June 24, 2022, filed as a US Patent.
- ”An SMT-based approach for extracting mathematical models from binaries”, Registration date: June 24, 2022, On its way to being filed as a US Patent.

Conference Papers (Accepted/Under review)

- **Shokri, A.**, Mujhid, IJ, Mirakhorli, M., IPSynth: Interprocedural Program Synthesis for Software Security Implementation (2024).
- Verbeek, F., **Shokri, A.**, Engel, D., Ravindran, B., Formally Verified Binary-level Pointer Analysis. (2024).
- Santos, J. C. S., Mirakhorli, M., & **Shokri, A.** (2024). Seneca: Taint-Based Call Graph Construction for Java Object Deserialization. Proc. ACM Program. Lang., 8 (OOPSLA1).
- **Shokri, A.**, Perez, A., Chowdhury, S., Zeng, C., Kaloor, G., Matei, I., ... & Rane, S. (2023). CONSTRUCT: A Program Synthesis Approach for Reconstructing Control Algorithms from Embedded System Binaries in Cyber-Physical Systems. arXiv preprint arXiv:2308.00250.
- Okutan, **A., Shokri**, A., Koscinski, V., Fazelinia, M., & Mirakhorli, M. (2023). A Novel Approach to Identify Security Controls in Source Code. arXiv preprint arXiv:2307.05605.
- **Shokri, A.**, “A Program Synthesis Approach for Adding Architectural Tactics to An Existing Code Base”, In 2021 36th IEEE/ACM International Conference on Automated Software Engineering (ASE) (pp. 1388-1390). IEEE.
- **Shokri, A.** and Mirakhorli, M., 2021. DepRes: A Tool for Resolving Fully Qualified Names and Their Dependencies. arXiv preprint arXiv:2108.01165.
- **Shokri, A.** and Mirakhorli, M., “ArCode: A Tool for Supporting Architectural Concerns Comprehension and Implementation”, In 2021 29th IEEE/ACM International Conference on Program Comprehension (ICPC) (pp. 485-489). IEEE.

- **Shokri, A.**, Santos, J.C. and Mirakhorli, M., 2021, March. ArCode: Facilitating the Use of Application Frameworks to Implement Tactics and Patterns. In 2021 IEEE 18th International Conference on Software Architecture (ICSA) (pp. 138-149). IEEE.
- Santos, J.C., **Shokri, A.** and Mirakhorli, M., 2020, October. Towards Automated Evidence Generation for Rapid and Continuous Software Certification. In 2020 IEEE International Symposium on Software Reliability Engineering Workshops (ISSREW) (pp. 287-294). IEEE.
- **Shokri, A.** and Masehian, E., 2015, October. A meta-module approach for cluster flow locomotion of modular robots. In 2015 3rd RSI International Conference on Robotics and Mechatronics (ICROM) (pp. 425-431). IEEE.
- **Shokri, A.** Hashemi, S., Akbaripour, H., Amin-naseri, M., 2013, Overcrowding Detection and Management in Emergency Department using Expert System. In 11th Iranian Conference on Intelligent Systems (ICIS2013).
- Kazemi Tabar, J., **Shokri, A.**, Jenadeleg, M., Optimized Job Shop scheduling as Constraint Satisfaction Problem using Genetic Algorithms. In 2007 12th Conference of Computer Society of Iran (CSICC 2007).

Journal Papers

- Hashemi, S., **Shokri, A.**, Amin Naseri, M. and Akbaripour, H., 2014. Designing an expert system for management of crowding and overcrowding in emergency departments. Advances in Industrial Engineering, 48(2), pp.281-292.

Work Experience

Postdoctoral Associate – Virginia Tech **(August 2023 –Present)**

- Location: Blacksburg, VA, USA
- Projects: Binary Program Analysis, Formal Methods, Software Security
- Responsibilities: Research, Presentation and Talks, Software Development, Grant Proposals

Graduate Research Assistant – RIT **(Jan 2018 – Jun 2023)**

- Location: Rochester, NY, USA
- Projects: Software Synthesis, Program Analysis, Program Comprehension, Software Certification, Security Tactics
- Responsibilities: Research, Writing Paper, Presentation, Software Development, Grant Proposal

Research Intern – Google **(August 2022 – December 2022)**

- Location: Mountain View, CA, USA
- Projects: Program Synthesis | AIDA (AI-based Developer Assistant)
- Responsibilities: Research, Design, Writing Paper, Presentation, Software Development

Research Intern – Palo Alto Research Center (PARC) **(Feb 2022 – May 2022)**

- Location: Palo Alto, CA, USA
- Projects: ReMath (Software Synthesis)

- Responsibilities: Research, Writing Papers, Presentation, Software Development

***Senior Software Engineer* - Samen Ertebat Asr (SEA) (Oct 2016 – Jan 2018)**

- Location: Tehran, Iran
- Projects: Banking System
- Responsibilities: Software Architecture, Software Design, Software Development

***Senior Software Engineer - IIN Groups* (Aug 2016 – Oct 2016)**

- Location: Tehran, Iran
- Projects: Scientific Content Provider
- Responsibilities: Software Architecture, Software Design, Leading a Team

***Senior Software Engineer - Melat Insurance* (Dec 2011 – Aug 2016)**

- Location: Tehran, Iran
- Projects: Insurance System, Banking System, Global Distribution System (GDS)
- Responsibilities: Leading a Team, Project Management, Software Architecture, Software Design, Software Development

***Co-Founder & Team Lead - Rayan Narm Fan* (Nov 2006 – Nov 2010)**

- Location: Tehran, Iran
- Projects: Qeshm Entrance-Exit Control System
- Responsibilities: CEO, Leading a Team, Software Design, Software Development

***Software Engineer - Paliz CT* (Dec 2006 – Jun 2007)**

- Location: Tehran, Iran
- Projects: Tehran Municipality System
- Responsibilities: Requirement Analysis, Software Design, Software Development

***Software Engineer - Raydana* (Sep 2005 – Feb 2012)**

- Location: Tehran, Iran
- Projects: Enterprise Resource Planning (ERP) System
- Responsibilities: Leading a Team, Project Management, Software Design, Software Development

Grant Proposals

Principal Investigator

- Submission of a $7.2M DARPA grant proposal - BAA number HR001123S0039 “Intelligent Generation of Tools for Security (INGOTS)” - as the main Principal Investigator (PI) from Hawksbill Co. with the contributions of co-PIs Prof. Joanna C.S. Santos (University of Notre Dame) and Dr. Shantanu Rane (SRI International) (2023).

Major Contribution

- Grant proposal submissions to NSF, DARPA, and DoE as a contributor (e.g., ideas, write-ups, meetings) to the technical sections (2019-2022).

Teaching

Guest Lecturer

- Course Title: Foundation of Software Engineering (SWEN-610) [Graduate level course at RIT] - Taught topic: "An Introduction to Program Synthesis" (2021)

Teaching in Industry

- Melat Insurance Co.: "Software Design Patterns" and "Java Programming" (2012-2015)
- Raydana Co.: "Java Programming (introductory/advanced)" (2009-2010)

Invited Talks

- PhD Colloquium (RIT): "Inter-procedural Program Synthesis for Automatic Architectural Tactic Implementation" (2023)
- Palo-Alto Research Center (PARC): "Code-based Model Synthesis Platform for re-Constructing Control Algorithms" (2022)
- CHAAT Talks (RIT): "Towards a Program Synthesis Approach for Adding Architectural Tactics to An Existing Code Base" (2021)

Professional Activities and Services

Reviewer

- Reviewer for the IEEE Transactions on Software Engineering (TSE)
- Reviewer for the IEEE Software Journal (IEEE Softw.)
- Reviewer for the Journal of Systems and Software (JSS)
- Reviewer for the e-Informatica Software Engineering Journal (EISEJ)
- Sub-reviewer for ACM Transactions on Software Engineering and Methodology (ToSEM)
- Sub-reviewer at the 42nd International Conference on Software Engineering (ICSE'20)

PC Member

- 33rd USENIX Security Symposium (USENIX'24) - Research Track
- 31st IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER'24) - Research Track
- 20th International Conference on Mining Software Repositories (MSR'23) – Junior PC
- 45th International Conference on Software Engineering (ICSE'23) – Student Research Competition

- 31st ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA'22) – Tool Demo
- 22nd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM'22) – Research track
- 30th International Conference on Program Comprehension (ICPC'22) – Research track
- 43rd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'22) – Research Artifact
- 38th IEEE/ACM International Conference on Software Maintenance and Evolution (ICSME'22) – Tool Demo
- 37th IEEE/ACM International Conference on Automated Software Engineering (ASE'22) – Student Research Competition
- 37th International Conference on Software Maintenance and Evolution (ICSME'21) – Tool Demo
- 35th European Conference on Object-Oriented Programming (ECOOP'21) – Research Artifact