Pardis Pashakhanloo

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Versatile ML Engineer with a proven track record in revolutionizing software engineering through combining program analysis techniques with deep learning approaches, innovating and building specialized machine learning models in various domains. Proven capacity to leverage expertise to identify and address significant vulnerabilities in code. Proficient in creating package-oriented debloating frameworks for adaptive and security-aware package management. Skilled in crafting automated tools for C/C++ program debloating and customization using reinforcement learning. Experienced in designing data models for describing experiments involving denial-of-service attacks. Adept at driving innovation and delivering impactful solutions in dynamic research environments. Instrumental in creating advanced vulnerability detection tools for auditing and fortifying Solidity contracts. Experienced in deploying AI solutions on cloud frameworks such as AWS and GCP.

Technical Proficiencies

Programming Languages	Python, C/C++, Java and SQL; familiar with Coq, Solidity, MATLAB and JavaScript/Typescript.
Tools/Technologies	Google Cloud Platform, AWS; Docker; LLVM/Clang, Slither, CodeQL, PyTorch, HuggingFace, LLM APIs; git, unix-based OS; familiar w/ MLPack, Django, NodeJS.

Career Experience

Codemod Inc, Palo Alto, CA   Mar 2024--Present
Founding AI Engineer

- Design and build automated solutions for large-scale code migrations for community and enterprise clients.
- Design and build Codemod AI, an iterative self-healing AI system for auto-generating code migration scripts (codemods) for Typescript/JavaScript from pairs of code examples and natural language description.
- Significantly enhanced the accuracy of code generation compared to SOTA LLMs through RAG, fine-tuning, program analysis techniques, etc.
- Technical Environment: AWS (EC2, ECS, S3), PyTorch, LLM, Docker, Github

CertiK, New York, NY   Feb 2023—Nov 2023
Senior Software Engineer

- Build comprehensive AI-driven vulnerability detection framework in Python (PyTorch, numpy, scikit-learn, networkx, pandas) for Solidity, ensuring robust protection from inception to deployment on Amazon Web Services (AWS). Provide effective guidance to summer intern in exploring and leveraging LLM (GPT-4, Gemini) capabilities for advanced code property extraction and AI-based formal verification.
- Enhance Solidity security by deploying cutting-edge vulnerability detection tools through integrating static analysis (Slither) with deep learning (NLP, LLM, HuggingFace, OpenAI API).
- Technical Environment: AWS (EC2, ECS, S3, Lambda), Snowflake Data Cloud, Github

Microsoft, Redmond, WA   2019, 2020
Research Internships
Mentors: David Tarditi | Suman Nath, Shuvendu Lahiri

- Extend CheckedC compiler capabilities (C++, LLVM Tooling) to bolster boundary declarations verification, which resulted in heightened precision for boundary assessments, while strengthening overall code reliability.
- Analyze concurrency bug detection false positives within the Torch Project, identifying root causes. Enhanced accuracy by addressing and mitigating the identified issues (C#).
- Technical Environment: Shell, Github, .NET Decompiler

Key Research

- **CodeTrek: Flexible Modeling of Code using an Extensible Relational Representation**
Pardis Pashakhanloo, Aaditya Naik, Yuepeng Wang, Hanjun Dai, Petros Maniatis, Mayur Naik
International Conference on Learning Representations (ICLR'22)

- **Learning to Walk over Relational Graphs of Source Code**
Pardis Pashakhanloo, Aaditya Naik, Yuepeng Wang, Hanjun Dai, Petros Maniatis, Mayur Naik
Deep Learning for Code Workshop (DL4C@ICLR'22)

- **PacJam: Securing Dependencies Continuously via Package-Oriented Debloating**
Pardis Pashakhanloo, Aravind Machiry, Hyon Choi, Anthony Canino, K. Heo, Insup Lee, Mayur Naik
ACM ASIA Conference on Computer and Communications Security (AsiaCCS'22)

- **Hashtray: Turning the tables on Scalable Client Classification**
Nik Sultana**, Pardis Pashakhanloo**, Zihao Jin, Achala Rao, Boon Thau Loo
IFIP/IEEE Symposium on Integrated Network and Service Management (IM'19)

- **Trace-based Behaviour Analysis of Network Servers**
Nik Sultana, Achala Rao, Zihao Jin**, Pardis Pashakhanloo**, H. Zhu, V. Yegneswaran, Boon Thau Loo
15th International Conference on Network and Service Management (CNSM'19)

- **Effective Program Debloating via Reinforcement Learning**
Kihong Heo, Woosuk Lee, **Pardis Pashakhanloo**, Mayur Naik
ACM Conference on Computer and Communications Security (CCS'18)

Key Projects

Codemod AI (2024–present)

- Improved accuracy of code generation from 45% (vanilla LLM) to +84% through an iterative refinement process.

- Added support for multiple code example pairs and natural language descriptions.

CodeTrek (2020–2022)

- Revolutionized code representation via deep learning, transforming codebases into dynamic relational databases.

- Implemented program embedding via guided walks, enhancing the efficiency and adaptability of software systems.

PacJam (2019–2020)

- Developed a package-oriented debloating framework for adaptive and security-aware management of an application's dependent packages.

Chisel (2018–2019)

- Engineered automated tool using reinforcement learning for debloating and customization of C programs atop LLVM.

DoStbin (2017–2018)

- Designed a data model to articulate experiments involving denial-of-service attacks.

Teaching Experience

Course Development Assistant at University of Pennsylvania (Summer 2020)
POPL'20 Tutorial: Building Program Reasoning Tools using LLVM and Z3 (Spring 2020)
Teaching Assistant

Education

Ph.D. in Computer and Information Science

University of Pennsylvania; advised by Mayur Naik, 2017-2022

Dissertation: [Integrating Declarative Static Analysis with Neural Models of Code](#)

Select Coursework: Software Analysis and Testing, Software Foundations, Machine Learning, Advanced Databases, Theory of Computation

B.Sc. in Software Engineering

Sharif University of Technology, 2012-2017

Select Coursework: Programming Language Design, Compiler Design, System Analysis and Design, Object-oriented Programming and Design, Software Engineering.

Awards

Computing Research Association Woman Graduate Cohort Scholarship– Jan. 2018, 2020
National Elites Foundation Scholarship for Outstanding Academic Success – Feb. 2014