Raphael Sofaer

Computer Science PhD Student

Contact Information

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Research Objectives

To reduce the cost of high reliability software. My interests include developing new techniques to incrementally integrate formally verified software into existing codebases and developing analysis tools for dynamic languages.

Current Projects

Patch Verification — I am building a framework for verifying that a patch to an unverified C program fixes a targeted bug and changes no other behavior. This project leverages existing formal models of LLVM semantics.

Model2Proof — I am working to automate the construction of well-founded axiomatic bindings between proof-style verified programming (targeting Verus), and libraries verified with automated techniques (targeting Kani).

Education

2021–Present **MS/PhD in Computer Science**, *Columbia University*, New York

I am advised by Ronghui Gu, Jason Nieh, and Junfeng Yang as part of the Software Systems Laboratory. My research interests are in formal verification of software systems and the development of software engineering tools for widely used managed languages.

2008–2013 **BA in Math/Computer Science**, *New York University*, New York

I was a joint major in Math/CS and received the Computer Science Prize for Academic Excellence and Service to the Department in 2013.

Publications

July 2022 **Upgradvisor**, *Operating Systems Design and Implementation (OSDI '22)*

Upgradvisor identifies exactly what changes in a dependency are relevant to a depending application. This often reduces the size of the code review for a dependency upgrade by 90%, and in many cases entirely eliminates the need for human review. https://www.usenix.org/conference/osdi22/presentation/david

July 2024 **RogueOne**, *International Conference on Software Engineering (ICSE '24)*

RogueOne analyzes updates to JavaScript (npm) packages and detects possible malware. RogueOne detects new data-flows which cross the boundaries of packages or other 'trust domains'. It significantly improves on the previous state of the art in both false positive and false negative rates. https://conf.researchr.org/details/icse-2024/...

Other Experience

2019–2020 **Software Engineer**, *Undersea Warfighting Development Center*

I designed and implemented a cloud environment to give contractors limited access to a specialized dataset. My work enabled the development and comparison of machine learning models for submarine applications.

2014–2019 **US Navy Submarine Officer**, *USS Springfield*

As a submarine junior officer, I supervised day-to-day operations and maintenance of the nuclear power plant, managed chemical and radiological controls, coordinated radio room operations, and stood Officer of the Deck watches. I was USS Springfield Junior Officer of the year in 2018, qualified Submarine Engineer, and received a Navy and Marine Corps Commendation Medal.