# CHINMAY DESHPANDE

## CONTACT INFORMATION


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## RESEARCH INTERESTS

My primary research interests lie broadly in the area of security and compilers. I am specifically enjoy working on topics relating to reverse engineering, software exploitation, and guiding their automation using formal program analysis techniques. More recently, I have been interested in binary lifting, (in-place) rewriting, optimizations and exploring static and dynamic approaches for the same.

## EDUCATION

**University of California Irvine** *Fall '19 - Present*
Ph.D. in Computer Science GPA: 4.0/4.0
*Advisor: Prof. Michael Franz, Area: Binary Analysis, Compilers and Security*

**National Institute of Technology Karnataka, Surathkal** *2013 - 2017*
B.Tech in Information Technology GPA: 8.87/10
*Thesis Project: Optimizing Search Strategies in Binary Symbolic Execution*

## EXPERIENCE

**Secure Systems and Software Lab** Research Assistant
*UC Irvine* *Fall '19 - Present*

- Currently working on BinRec, a research project involving binary rewriting using dynamic trace information.
- The idea is to lift recorded program traces to LLVM-IR, stitch them together and compile them down to their binary representation while leveraging security transformations provided by clang out-of-the-box.

**Binary Ninja** Intern
*Vector35* *Summer '20*

- Implemented User-informed dataflow (UIDF), a feature which allows users to inform values to identified variables at the Medium-level IL (MLIL) layer. UIDF seeds the analysis with provided variable values and enables constant propagation, dead-code elimination based on the resulting dataflow.
- Was involved in the ideation, design and development of the feature - including core algorithms, API and the user-interface. Also worked on general bug-fixes and product improvement.

**Rune/Radeco** Contributor
*radare2* *2016 - 2018*

- Implemented an Explorer module in Rune, a binary symbolic execution engine, to allow pre-defined choices at program points of the SSA-based radeco-IR. Designed a new memory-module backend to support single-byte symbolic memory accesses. Also developed arch-rs, a library for providing low-level architecture information through a rich set of APIs.
- Mentored radeco, a decompiler project, which involved implementing control-flow restructuring and IR to AST translation for C-like pseudocode output as a part of GSoC.

**McAfee** Software Development Engineer
*Advanced Threat Defense (Windows Sandbox)* *2017 - 2019*

- Primarily conducted research on binary sandboxing (user-mode hooking, process memory analysis, evasion techniques, etc.) and reverse engineering of Windows malware.
- Designed and implemented *DOPE - Detection over Partial Evaluation*, a JavaScript deobfuscation engine to improve detection of script-based malware found embedded across environments such as WScript and PDFs.
- Research on understanding the PDF file format structure and enumerating its attack surface (exploits, autoactions, etc.) for development of a prefilter module to improve product performance.

## RELEVANT COURSES

- **Advanced Computer and Network Security (CS 295)** - Worked on research demonstrating weaknesses of Data-Space Randomization (DSR) against register stack-spills. Implemented a PoC exploit using CVE-2015-1548 against mini_httpd.
- **Advanced Compiler Construction (CS 241)** - Implemented an optimizing compiler from the ground-up including phases such as language parsing, SSA-based IR generation, optimization passes (CSE, DCE) and register allocation.
- **High Performance Computer Architectures and their Compilers (CS 243)** - Worked on understanding the current state of the art in automated binary parallelization techniques.

## SKILLS

- **Languages** Python, C/C++, Rust, JavaScript
- **Software** IDA, Binary Ninja, radare2, gdb, OllyDbg, Z3, Yara, WinDbg

## ACTIVITIES

- **Teaching Experience:** Teaching Assistant for CS253P - Advanced Programming and Problem Solving in Fall 2019 and ICS32 - Programming with Software Libraries in Winter 2020.
- **Capture The Flag:** Member of team **No Internet Access**. Team Profile: https://ctftime.org/team/8096. Active participation in CTF events with the team achieving a peak rank of 2 in India.

## ACHIEVEMENTS

- **2019**: Recipient of the Dean's award for showcasing outstanding research potential at UC Irvine.
- **2018**: Awarded a Letter of Recognition from the VP of Security Operations Products at McAfee for making exceptional contributions to the ATD product.
- **2018**: Mentor for the Google Summer of Code (GSoC) program under the radare2 organization.
- **2017**: Selected for the Radare Summer of Code (RSoC) 2017 program.
- **2016**: Awarded student scholarship to attend Conj, the annual Clojure Conference at Austin, Texas owing to my contributions to open-source Clojure projects.
- **2016**: Awarded the MITACS Globalink scholarship to intern as an undergraduate research assistant at The University of Victoria, BC, Canada.