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Internships and Research Projects

• **Improving Fuzzing of Javascript Engines** *(May '17 – Present)*
Guide: Prof. Giovanni Vigna and Prof. Christopher Kruegel *University of California, Santa Barbara*
- Used instrumentation-guided genetic algorithms in fuzzers to trigger unexpected behaviour in JS Engines
- Made modifications to American Fuzzy Lop (AFL) which resulted in **faster block coverage**
- Found a bug in Apple **Safari's javascript interpreter** - JavaScriptCore
- Generated environments for automated running of experiments using **kubernetes** and **docker**

• **Isolated Network Infrastructure for Security Experiments** *(Dec '16 – May '17)*
Guide: Prof. R.K. Shyamasundar *IIT Bombay*
- Set up a network of VMs mimicking an infrastructure with a DNS, Mail, Proxy, Web and Time server
- Used **vagrant combined with VirtualBox** to ease the process automatic generation of VMs
- Implemented mini-projects using the infrastructure, to demonstrate **dictionary attacks, stack smashing and Man-in-the-Middle (MITM) attacks**

Open Source Contributions

• **OWASP ZeroDay Cyber Research Shellcoder** | *Open Web Application Security Project*
- Implemented a new OSX x86 shellcode module using **assembly programming** for penetration testing on OSX. This module was successfully demoed at DEFCON 2016
- Made various enhancements to improve the user experience

• **SymEngine** | *Fastest Symbolic manipulation library written in C++*
- Implemented a new Infinity class to handle calculations which could lead to infinitely large values
- Added new functions for manipulations of symbolic polynomials and trigonometric functions

Key Development Projects

• **Indexing Schemes for Data Recording Systems** | *Guide: Prof. S. Sudarshan (Aug '17 – Present)*
- Hacking **postgres internals** for implementing new indexing techniques to support large continuous stream of incoming data and store it in a manner suitable for future access
- Implementing a incremental organization of **B+ trees** in memory and on disk to support both insertion and queries with reasonable efficiency, and without the delays of periodic batch processing
- Using a **stepped-merge algorithm** for merging trees on disk to structure data for faster queries

• **Smashing the Stack** | *Guide: Prof. R.K. Shyamasundar* *(Apr '17 – May'17)*
- Demonstrated techniques like **ret2libc attack** and **NOP spray** for exploiting buffer overflows, bypassing Data Execution Prevention (DEP) and Address Space Layout Randomization (ASLR) mitigations
- Demonstrated **format string exploits** to get arbitrary memory reads and writes

• **Run - Treasure Hunt** | *Yahoo! Japan HackU Winner - IIT Bombay* *(Mar '17 – Apr '17)*
- Built a multiplayer treasure hunt Android game supported by a Django server. Players look for and click a picture of an object around them as shown in the clue received on their phones to get the next clue
- Used histogram equalization and scale invariant feature transform(SIFT) for crude image matching

- **Real-time Chat Application** | *Guide: Prof. Varsha Apte* *(Apr '17 – May '17)*
  - Built a multithreaded chat server using **Linux socket programming** in C, with LDAP login support
  - Implemented secure salted password hashing with **Argon2i algorithm** for storing passwords in database
  - Built an Android and command line client application with features like friend requests, blocking, last seen and group chat

- **Institute Hacker News** | *Student Technical Activity Body (STAB) - IIT Bombay(Apr '16 – Apr '17)*
  - Website to help students share and discuss about interesting technical information they find online
  - Implemented the backend using the **Django** framework for managing database, authenticating users using Single Sign On(SSO) login and managing upvotes and comments on various shared links

- **LendIt - Book lending website** | *InOut Hackathon Finalist - NIT Surat* *(Aug '16 – Aug'16)*
  - Implemented a backend using Django for the Lendit website, which allows user interaction, sending notifications, searching and lending books, maintaining a user profile among other features
  - Got selected among the **top 5**(out of 50) development projects and went through to the final round

- **Checkers with AI** | *Guide: Prof. Varsha Apte* *(Sep '15 – Oct '15)*
  - Used **Minimax** to make a one player checkers with Computer as opponent
  - Used the 'simplecpp' library, developed by at IIT Bombay, for the graphical components

Interests

Software Security, Network Security, Software Development

Academic Achievements

- **Department Rank 3** in the Computer Science batch
- Secured **All India Rank 24** in **JEE Advanced** out of 150,000 students
- Received IIT Bombay's **Institute Academic Prize** 2015-16
- Secured **100.00 percentile** in JEE Main amongst **1.5 million** students across India
- Awarded the **Kishore Vaigyanik Protsahan Yojana** (KVPY) Fellowship by Govt. of India
- Awarded the **National Talent Search Examination** (NTSE) scholarship by NCERT

Technical Achievements

- **Runner Up** in **Yahoo! Japan HackU** 2017 at IIT Bombay
- **2nd Runner Up** in **Microsoft code.fun.do** 2016 at IIT Bombay
- **2nd Runner Up** in **Kandy Sugar Hackathon** 2016 organised by kandy.io and Web & Coding Club
- **1st** position in **XLR8 2015** for making a remote controlled obstacle crossing robot

Position of Responsibility

- **Founder & Manager** | *CSE Cybersecurity Club - IIT Bombay* *(Nov '16 – Present)*
- **Web Convener** | *Student Technical Activities Body(STAB) - IIT Bombay* *(May '16 – May '17)*
- **Volunteer** | *Web and Coding Club - IIT Bombay* *(May '16 – May '17)*

Programming Skills

C/C++, Python, Bash, x86 assembly, MIPS assembly, SQL, JAVA, Javascript, Django framework, HTML, CSS, jQuery, SQLite, Docker, Vagrant, OpenGL, LaTeX, Arduino, Git, Make, CMake, MATLAB