Karan Ganju

Curriculum Vitae

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Education

2012–2016 **B.Tech Computer Science and Engineering**, *IIT Bombay*, CGPA: 8.9/10.

Interests

Cybersecurity, Networks and Systems

Research Experience

Jan–May 2016 **Code Flow Checker**, *under Prof. R.K. Shyamasundar.*

- Created a **code flow checker** which analyzes the source code of a program to understand the potential flows of execution within it so as to prevent illegitimate code flows that occur during **buffer overflow attacks**
- A **function labeller** was created according to the code flows into that function and a system of **runtime checks** was conceptualized which would use heuristics to judge whether the current flow of execution within the program was legitimate

Aug–Dec 2015 **AES Cracker**, *under Prof. Bernard Menezes.*

- Created a **trojan program** in the form of a debian package which deciphers the **openssl-based AES-encrypted communication** of the victim
- The trojan runs in the background and **sniffs network packets**. As soon as encrypted messages from a targeted server are received, the trojan captures the sniffed data and launches a program to obtain the cache lines accessed during decryption
- This data is then sent back to the attacker which using a **side-channel cache access-based attack** obtains the private key of the victim.

Aug–Dec 2015 **Information Flow Control for Hadoop**, *under Prof. R.K. Shyamasundar.*

- Analyzed Hadoop data flows to help conceptualize a monitor which could **identify data flows** that could potentially **harm confidentiality**
- Logs were generated and processed to identify all flows of data that happened in the underlying distributed file system

Internships

May–July 2015 **Samsung Electronics, South Korea**, *Security Part, Visual Display Team.*

- Analyzed **Device Guard**: a software whitelisting security tool in Windows 10 Enterprise
- System activity was monitored using Windows Sysinternals Dynamic analysis tool called **Procmon** and relevant Windows executable files were analyzed using **PE file analyzers**
- Dependencies were established and possible limitations of Device Guard were identified after a preliminary analysis

May–July 2014 **Flutterbee - Tinyowl, Mumbai, India**.

- Worked on the **backend web framework** for **Tinyowl**, an Android application which facilitates centralized food ordering from a wide variety of food joints
- Worked extensively on **Ruby on Rails** to recreate their statistics panel (which provides data for customer support and management) using **memcache, postgreSQL** and **mongoDb**
- Modified their website using **Twitter Bootstrap** and wrote a **ruby script** to provide customer service through SMS

Achievements

2013 Secured **19th rank** in the online round of ACM International Collegiate Programming Contest (**ICPC**) and represented IIT Bombay in the regional level

2012 Secured an All India **Rank 34** in **IIT-JEE** among 500,000 students

2012 Secured an All India **Rank 58** in **ISAT** among 80,000 students

2009 Secured **9th rank** in National Science Olympiad (**NSO**) conducted by SOF

2008 Recipient of National Talent Search Examination (**NTSE**) scholarship

2008 Secured **28th rank** in International Maths Olympiad (**IMO**) conducted by SOF

Projects

Academic Projects

Jan–May 2016 **Accident Autodialler**, *Under Prof. Kavi Arya*, Embedded Systems.

- Created an **automobile crash detection system** which alerts emergency contacts, via GPRS and SMS, about the occurrence of an accident along with conveying its location coordinates
- Created an **Android app** which connects to the system to provide real-time safety updates
- **Accelerometer and GPS module** were used to detect accidents and location respectively while a **GPRS modules** was employed for communication

Aug–Dec 2015 **PaaS using Docker**, *Under Prof. Purushottam Kulkarni*, Virtualization.

- Created our own **Platform as a Service** for developers to host web and database servers without worrying about underlying resource constraints and infrastructure
- **Docker** was used to manage **Linux Containers** which were used to host these servers with **checkpointing and load balancing** features for high availability

Jan–May 2015 **Filesystem for GeekOS**, *Under Prof. Dhananjay M. Dhamdhere*, Operating Systems.

- Implemented **all basic system calls** which would be required for a bytestream filesystem in a minimalist OS called GeekOS
- Created **kernel data structures** for filesystem such as inodes, file map tables and superblock as well as a **page cache**

Jan–May 2015 **Custom C Compiler**, *Under Prof. Amitabha Sanyal*, Compilers.

- Created a compiler for a minimal version of c++ using lexc++ and bisonc++ maintaining **efficient register allocation**
- Involved tokenizing input code stream, parsing tokens, performing syntactic and semantic checking and appropriately calling assembly instructions on a dummy machine

Aug–Dec 2014 **Virtual Stock Market**, *Under Prof. Nandlal L Sarda*, Databases.

- Created a **Java-based web portal** where users can register and engage in a virtual stock market with a fixed amount of initial funds and invest in stocks, bonds, mutual funds and FDs
- A script was used to extract stock prices and correspondingly update them in the **postgreSQL database** which displayed results on the frontend via **JDBC APIs**

Aug–Dec 2014 **Analysis of Page Replacement Techniques in ToyDB**, *Under Prof. Nandlal L Sarda*, Databases.

- Enhanced the **Buffer Manager in ToyDB** by implementing **multiple page replacement techniques** such as LFU and LRU
- Compared different techniques on the basis of number of buffer hits and misses for various different operations (select, join etc.)

Hackathons

Microsoft Hackathon 2015 **Windows Task Automator**.
Created an application allowing the user to **schedule and loop tasks** on the OS such as downloads, file handling, media playback etc. through creation of an **interactive work-flow**

Microsoft Hackathon 2014 **Windows Phone Mall Navigator**.
Created a Windows mobile application which facilitates navigation within malls; user inputs what he wants to buy and using **GPS**, directions are provided to the corresponding shops

Yahoo Hack U 2013 **Google Chrome Popover Search**.
Created a Chrome extension which **identifies highlighted text** and **shows relevant links**, pictures and options for advanced search on Facebook, Twitter and Flickr

Other Projects

Transformers Created a simulator and an animated video of a transformer (humanoid robot which can morph into a car) using **OpenGL** with basic texture shading, lighting and moving cameras

PaperSim Modified a paper folding simulator to produce better-looking creases and folds efficiently

Snake Recreated the original game in c++ with different **power-ups** such as wormholes and different **mazes** as well as various **levels of difficulty**

Pocket Tanks Recreated the **single-player and multi-player** game with GUI in PLT Scheme

Pascaline Created a simulation of a pascaline (mechanical calculator) using **Box2D Physics Engine**

Personalize Your Laptop Successfully managed to create and market our own service (**personalized laptop skins**)

Extra Curricular Activities

2013 Participated as an **actor in Performing Arts Festival** of IIT and won **PAF Colour**

2012 Secured **2nd position** in **Freshiezza Street Play**

2012 Was part of **National Sports Organization football team** at IIT Bombay

2012 Completed a **6 month Drums course** offered by the Cultural Council of IIT

2011 Secured **7th rank** in **Technothlon** Hauts Round at IIT Guwahati among 150,000 students

References

Prof. Bernard Menezes
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Prof. R.K. Shyamasundar
IIT Bombay
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