Nirjhar Roy

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Academic Qualifications

Year	Degree/Certificate	Institute	CPI/%
2018 - Present	MS(CSE)	Indian Institute of Technology, Kanpur(IIT Kanpur)	8.00/10
2012 - 2016	B.Tech(CSE)	Institute of Engineering and Management, Kolkata(IEM)	8.66/10
2012	I.S.C.E(XII)	Calcutta Boys' School	87.6%
2010	I.C.S.E(X)	Calcutta Boys' School	88.7%

Work Experience

- **Tata Consultancy Services:** I worked as an Assistant Systems Engineer Trainee in a production support team. The project client was TATA CLIQ and my role was to resolve various client and end-user issues.
- **Duration :** 9 months(25/07/2016 - 09/05/2017)

Research Experience - MS Thesis

- **Securing Demand Paging in Enclave Platforms and Keystone** (*Jan '19 - Ongoing*)
  Advisor: **Dr. Pramod Subramanyan**, *IIT Kanpur*
  - **Aim:** My research has focused on preventing information leakage via page faults in enclave platforms using Oblivious RAMs (ORAMs).
  - **Research Overview:** My research work has introduced new attacks and defences on demand paging in enclave platforms. On the offensive side, my work shows that the current state-of-the-art for demand paging in enclaves (InvisiPage, ISCA'19) leaks page reuse distances and these can be used to exfiltrate secrets from enclave applications. On the defensive side, I have developed new algorithms based on the Ring ORAM cryptographic primitive to enable performant and secure demand paging in the runtime for the Keystone enclave platform. Our works shows it is possible to be more secure *and* more performant than the current state-of-the-art, InvisiPage. Our implementation has been tested and evaluated on a commercially-available RISC-V board (HiFive Unleashed) and can be used to run unmodified Linux-based Keystone enclave applications on this hardware.

Key Projects

- **Trace Simulator** (*May '19 - Dec '19*)
  Mentor : **Dr. Pramod Subramanyan**, *IIT Kanpur*
  - This is trace-based simulator for an applications page accesses, that implements support for a Path ORAM and Ring ORAM. We used it to optimize ORAM parameters, page replacement policies and performance vs. memory trade-offs for our enclave runtime.
- **"Encrypted Dropbox" : A cryptographically authenticated and secure file store** (*Jan '19 - Apr '19*)
  Mentor : **Dr. Pramod Subramanyan**, *Course :* **Computer System Security**, *IIT Kanpur*
  - Designed a file storing and sharing system testbed where the contents are encrypted, and file operation primitives are all secure even if the server is malicious. It won't be able to read or tamper file contents and also to map file contents to its owners.
- **"Capture the Flag" : Binary and Web based attacks attacks** (*Jan '19 - Apr '19*)
  Mentor : **Dr. Pramod Subramanyan**, *Course :* **Computer System Security**, *IIT Kanpur*
  - Implemented attacks in Binary CTF using Buffer overflow, Integer overflow and web based attacks like Cross-site scripting, CSRF.
- **Implementation of CRAFTML, an Efficient Clustering based Random Forest for Extreme Multi-label Learning**
  Mentor : **Dr. Piyush Rai**, *Course :* **Introduction to Machine Learning**, *IIT Kanpur* (*Aug '18 - Nov '18*)
  - Implemented CRAFTML algorithm with python and tested on datasets like Mediamill, Bibtex, Delicious and Amazon 670K.
- **Compact Distributed Objects** (*Aug '18 - Nov '18*)
  Mentor : **Dr. Ratan K. Ghosh**, *Course :* **Topics in Distributed System**, *IIT Kanpur*
  - A student management system implementation with distributed and compact objects(using Protobuf) which involved accepting requests from multiple clients and detecting and resolving multi-client request conflicts efficiently. Java was used as the programming language.
- **Home Automation and Alert System** (*Jan '16 - April '16*)
  Mentor : **Prof. Eekian Wong**, *Course :* **Design Lab**, *Institute of Engineering and Management, Kolkata*
  - Designing an home alert and automated control system for old and physically challenged people, implemented using Arduino Uno.
- **Flight Management System** (*Jul '14 - Dec '14*)
  Mentor : **Prof. Eekian Wong**, *Course :* **Object Oriented Programming in Java**, *Institute of Engineering and Management, Kolkata*
  - With the primary aim to learn the basic principles of Object oriented programming, we designed a simple flight management system that will give a set of direct flights as well connecting flights with the results being sorted in increasing order of flight duration.

Technical Skills

- **Programming Languages :** C, C++, Java, Python
- **Software and Libraries :** GDB, Numpy, Gem5

Scholastic Achievements

- Secured **All India Rank 377** in **GATE 2018** amongst 1.1 Lakh candidates with **99.65** percentile.
- Secured **Rank 2505** in **WBJEE 2012** amongst 1 Lakh candidates with **97.49** percentile.
- **Competitive Coding :** Finalist in FantaC conducted in B.P. Poddar Institute of Technology,Kolkata in 2015.
- **Code Debugging: Finalist in Bugsmash** in I.E.M, Kolkata in 2015.
- **Medals:** Won medals and certificates in school for **getting above 90%** in I.C.S.E(best of 5 subjects) and I.S.C.E (best of 4 subjects).

Relevant Courses

- Introduction to Machine Learning, Computer Systems Security, Basic Computer Architecture, Basic Operating Systems, Basic Computer Networks