Khushang Singla
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SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 30** in **Joint Entrance Examination Advanced** amongst 0.25 million candidates *(2021)*
- Ranked **24** in **Indian Olympiad Qualifier** in Chemistry Part-II conducted by HBCSE, India *(2021)*
- Qualified **Indian National Mathematical Olympiad(INMO)** conducted by HBCSE, TIFR, India **twice** *(2021,2020)*
- Achieved the **KVPY Fellowship twice** by achieving All India Rank **72** in SX stream and **130** in SA stream *(2020,2019)*
- Awarded with the National Talent Search Examination **NTSE** Scholarship by NCERT, Government of India *(2019)*

WORK EXPERIENCE

Software Engineering Internship | *Rubrik* — *May-July 2024*
- Developed a new service to provide **object storage** through **REST API** on Rubrik's proprietary file system
- Developed a performance testing framework to test the performance of the new service with different access/storage patterns
- Worked with **kubernetes** and **docker** to deploy the new API and the performance testing framework on a multi-node cluster
- Received a **return offer** in recognition of the work done and dedication

KEY PROJECTS

Spectre Attack Without Shared Memory | *Advanced Computer Architecture* — *October-November 2023*
- Explored various intricacies of **Spectre** and developed a **covert channel** based on **Flush Reload** and Spectre
- Utilized **Prime and Probe** technique to develop a side channel attack out of the covert channel using spectre
- Implemented the attacks on modern **AMD Zen3** and **Intel Haswell** processors, demonstrating their security vulnerabilities

Exploring TLB Attacks | *Guide: Prof. Biswabandan Panda* — *January-April 2024*
- Explored limitations of **amdprefetch** attack on recent processors introduced by kernel and TLB structure changes
- Explored **TLB reversing** technique that desynchronizes TLB from memory and exploits this to get better accuracy in results

Compiler for SCLP | *Implementation of Programming Languages* — *January - April 2024*
- Developed a compiler for a Simple C like programming language that supports **loops**, **conditions** and **functions**
- Implemented lexer and parser using **Flex** and **Bison**, build **AST**, **RTL** and generated MIPS assembly for the program

Analysing Cache Hierarchy | *Computer Architecture* — *March-April 2023*
- **Compared various Cache Hierarchies** like inclusive, exclusive, non-inclusive for performance in Graph Workloads
- Implemented various replacement policies in **ChampSim simulator** to analyse memory bottleneck issues in graphs
- Improved IPC values in graph workloads on using a hybrid of **exclusive and non-inclusive** cache hierarchies

Workload Manager | *Virtualization and Cloud Computing* — *March-April 2024*
- Developed a workload manager using **Kubernetes** services to handle a large amount of single-threaded processes
- Implemented a front-end service in **flask** where users can submit their workloads and used pgSQL database at back-end
- Managed workload completion using the database for **scheduling** and **qouta** management with isolation of users

Process Fingerprinting | *Guide: Prof. Biswabandan Panda* — *August-November 2023*
- Explored the **Website Fingerprinting** attack that uses interrupt side channel to leak information about website accessed
- Utilized the **interrupt side channel** to leak information about the process being run in a virtual machine and analysed cause

File Transfer Protocol | *Guide: Prof. Bhaskaran Raman* | *Course Project: Computer Networks* — *March 2023*
- Implemented file transfer protocol server with support for **multiple clients** as well as client with **get and put support**
- Used **socket constructs** for implementing TCP connnection and **selectors** for supporting multiple clients in C++

FastChat | *Software Systems Lab* — *October-November 2022*
- **Built an application** for people to interact with each other personally or in groups along with **E2E encrypted** messages
- Implemented **loadbalancers** to obtain **high throughput** with the limited resources dedicated to the servers
- Used the **socket module** in python, **PyNaCl** for encryption, salting for authentication and **SQL server database**

POSITION OF RESPONSIBILITY

Institute Technical Convener | *Cyber Security Community, IIT Bombay* — *June 2022-April 2023*
- Participated in various **Capture The Flag (CTFs)** competitions as a part of the team **IITBreachers**
- **Created challenges** and **hosted the website** for tyroCTF, a CTF for beginners which saw **100+** registrations
- Taught various topics in **Reverse Engineering ELF files** for CTM training of following tenure's Core Team Members

EXTRACURRICULAR

- Emerged rank 1 with **full score** in **TrustCTF**, a CTF for all students across the institute, conducted by TrustLab *(2023)*
- **Mentored** students to make a **Secure and Distributed Cloud Storage System** in Seasons of Code by WnCC *(2023)*
- Made a **Remote Controlled car** with a browser website used on a mobile phone as a remote under **XLR-8** *(2022)*