

Aditya Rohan

JUNIOR UNDERGRADUATE · MATERIALS SCIENCE AND ENGINEERING

Indian Institute of Technology, Kanpur

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Scholastic Achievements

2019	Intel SRC Student , Member of the funded research program for students	India
2016	All India Rank 3520 , Joint Entrance Exam Advanced, among more than 200,000 selected students	India
2014	State Top 1% , National Standard Examination in Physics, conducted by IAPT	India
2014	State Top 1% , National Standard Examination in Chemistry, conducted by ACT	India

Work Experience

RTE - Research Track Exchange

IIT Kanpur

RESEARCH PROJECT, UNDER PROF. KANAD BASU AND PROF. RAMESH KARRI, NYU

May 2018-November 2018

- Developed new methods for malware detection using debug hardware like ARM CoreSight and Intel Platform Analysis Technology
- Designed a simulator in Python to simulate x86, x86_64 and SPARCv9 assembly instructions.
- Trained a machine learning based malware detector on these values to identify malware with upto 99.65% accuracy. Algorithms used: Random Forest, Decision Trees and kNN.
- Trained another classifier based on instruction ordering in the aforementioned architectures to achieve upto 100% accuracy in detecting malware.

IGVC - Intelligent Ground Vehicle Competition

IIT Kanpur

TEAM MEMBER, UNDER PROF. MANGAL KOTHARI

Sept. 2017-May 2018

- Designed Lane Detection Algorithm for Autonomous Ground Vehicle based on structure and color of elements present in video feed in real time to navigate unknown terrains according to the problem statement.
- Implemented and highly modified GPU accelerated gSLICr segmentation algorithm for identifying white lanes on a golf course.
- Applied neural nets(in C++) and algorithms such as Random Forest for grass elimination and extracted the lanes using Hough Transform and converted it into top view using Inverse Perspective Transform and birds eye node, finally passing to the mapping node.
- Placed 5th in the Design Competition and 12th Overall in IGVC 2018, Michigan, USA.

New York Office, IIT Kanpur

Kanpur, India

INFRASTRUCTURE MANAGEMENT, UNDER PROF. MANINDRA AGARWAL

May 2017 - August 2018

- Served as a team lead of 3 interns in infrastructure group, continued as a volunteer and peer mentor.
- Deployed various containerized applications over a Kubernetes cluster with nodes spread across multiple datacenters.
- Worked on a scalable web application with an extensive technology stack and implemented an OAuth2 based sign-in system for the web application, via Github.
- Deployed notifications in Phabricator using the Aphlict server and terminated the SSL on Nginx, sent websocket traffic to the same port as normal HTTP traffic and used nginx to proxy it selectively based on the request path.
- Created a Finger-Print based attendance system in python to be used during the internship. Used and learned about minutae matching algorithms such as Bozorth and Mindtct.

Research Projects

Reverse Engineering the Stream Prefetcher

IIT Kanpur

RESEARCH PROJECT, UNDER PROF. BISWABANDAN PANDA

December 2018- Present

- Reverse engineered the stream prefetcher at L2 level cache.
- Discovered various properties regarding the dominance of direction/distance of prefetch on prefetch degree.
- Showed that the Stream Prefetchers are shared among virtual cores.
- Receive funding from the Intel SRC program for this research.
- **In Proceedings**, of HASP 2019 in conjunction with ISCA 2019.

NVModule

IIT Kanpur

RESEARCH PROJECT, UNDER PROF. DEBADATTA MISHRA

January 2019- Present

- Extended support for Non-Volatile Memory(NVRAM) in the linux kernel
- Wrote micro-benchmarks to compare the various consistency mechanisms for NVRAMs, like UC, UC-, sfence+clflush, mfence+clflush+mfence.
- Trying to study the performance and utility of various consistency mechanisms with real-world applications.

Profiling Parallel I/O

IIT Kanpur

RESEARCH PROJECT, UNDER PROF. PREETI MALAKAR

January 2019- Present

- Tested Darshan and Darshan Extended Tracing on IITK CSE Cluster and HPC2010 Supercomputer.
- Ran benchmarks like IOR and S3D-IO for identifying congestion points on the clusters.
- Trying to propose semi-topology aware optimizations to improve throughput.

Projects

Linux Kernel - Topics in Operating Systems

IIT Kanpur

COURSE PROJECT, UNDER PROF. DEBADATTA MISHRA

January 2019 - Present

- Implemented kernel module for counting the number of TLB misses, page-reads, page-writes for a given virtual memory area. Extended the same for a system with Page Table Isolation enabled.
- Modified the linux kernel to introduce cgroup variables to count the number of tcp/udp packets sent/recieved from a container.
- Modified the linux kernel to introduce cgroup variables for throttling the rate of tcp/udp packets sent/recieved.

Secure FS - Computer Systems Security

IIT Kanpur

COURSE PROJECT, UNDER PROF. PRAMOD SUBRAMANYAN

January 2019 - Present

- Implemented a representative secure file-system in Go, to work on a malicious web-server with the key-value pairs stored on a secure server.
- Modified the famous Zoobar application to fix buffer overflows and DoS vulnerabilities and added support for privilege separation.

MPICH Applications - Parallel Computing

IIT Kanpur

COURSE PROJECT, UNDER PROF. PREETI MALAKAR

January 2019 - Present

- Implemented various parallel blocking/non-blocking algorithms with MPICH like MPI_REDUCE, MPI_GATHER, MPI_BCAST etc.
- Modified the PNetCDF library for optimization of non-blocking method and added variable number of species[in Fortran].
- Implemented Ping-Pong benchmark in MPICH, tested performance on IITK-CSE Cluster and HPC2010 Supercomputer.

TLB-based Microarchitectural Side-Channel Attack - Secure Memory Systems

IIT Kanpur

COURSE PROJECT, UNDER PROF. BISWABANDAN PANDA

July 2018-November 2018

- Mounted a side-channel attack through the shared translation lookaside buffer to extract 256-bit EdDSA secret keys and RSA keys without privileged access.
- Reverse engineered the microarchitecture of TLB to find set and way associativity of various levels of TLB and their sharedness properties
- Developed pointer-chasing strategies to monitor latency of eviction sets from various levels of TLB.
- Mounted Flush-Reload, Prime-Probe, and other side-channel attacks on current processors

GemOS - Operating Systems

IIT Kanpur

COURSE PROJECT, UNDER PROF. DEBADATTA MISHRA

July 2018-November 2018

- Implemented Multi-level paging, signals like SIGINT, SIGSEGV and SIGFPE and exception handlers like page-faults and divide-by-zero.
- Added system calls like expand, shrink, write, sleep, clone etc and implemented process scheduling with round-robin scheduling policy in GemOS.
- Designed a scalable filesystem for GemOS.

Relevant Courses

Secure Memory Systems
Computer Systems Security
Computer Organization

Operating Systems
Topics in Operating Systems
Data Structures and Algorithms

Computer Architecture
Parallel Computing
Introduction to Programming

i: In progress

Teaching

ESC101 - Introduction to Programming

IIT Kanpur

COUNSELLING SERVICE

July 2017- April 2018

- Took lectures for the course 'Introduction to Programming' for upto 350 students at once.
- Prepared practice programming questions and arranged practice tests for the same.
- Provided one-to-one mentoring for two students to help them get through the course work.

Skills

Programming	C/C++, Python, x86 Assembly , Golang, MATLAB/GNU Octave
Operating Systems	Ubuntu, Arch Linux, Linux Mint, CentOS, MacOS
Utilities	Linux shell utilities, Git, Docker, Kubernetes, \LaTeX , MPICH, Darshan, GDB, OpenCV, Keras

Positions of Responsibility

- **Manager, Software Corner, Techkriti'18:** Created and tested problems for IOPC (International Online Programming Contest), which witnessed participants from more than 20 countries, competing for prizes worth 1.5 Lakh rupees
- **Team Leader-J2, Infrastructure Group NYO IITK:** Lead a team of sophomore and freshman SWE interns for two months.

- **Academic Mentor, Counselling Service:** Took lectures for the more than 350 students for the course Introduction to Programming(ESC101)
- **Student Guide, Counselling Service:** Helped in conducting orientation for 850 students, with 6 peer mentee

Interests

- Computer Architecture
- Secure Memory Hierarchies
- Operating Systems