

# Aditya Rohan

JUNIOR UNDERGRADUATE · MATERIALS SCIENCE AND ENGINEERING

Indian Institute of Technology, Kanpur

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## Educational Qualifications

Year	Degree	Institution(Board)	CGPA/%
July'16 – Present	B.Tech, MSE	Indian Institute of Technology, Kanpur	7.5/10.0
2015	MSB – XII	DACN, Nagpur (Maharashtra State Board)	80.0%
2013	CBSE – X	Kendriya Vidyalaya, Nagpur (CBSE)	10.0/10.0

## Scholastic Achievements

2019	<b>Intel SRC Student</b> , Member of the funded research program for students, only UG member from IITK	India
2016	<b>Top 0.1 percent</b> , among 1,50,000 candidates in JEE Advanced	India
2016	<b>Top 0.1 percent</b> , among 1.5 million candidates in JEE Mains	India
2014	<b>State Top 1%</b> , National Standard Examination in Physics, conducted by IAPT	India
2014	<b>State Top 1%</b> , National Standard Examination in Chemistry, conducted by ACT	India

## Publications

### Reverse Engineering the Stream Prefetcher For Profit

Pheonix, Arizona, USA

ACCEPTED, AT HARDWARE AND ARCHITECTURAL SUPPORT FOR SECURITY AND PRIVACY, 2019

April 2019

Aditya Rohan, Prakhar Agarwal, Biswabandan Panda, "Reverse Engineering the Stream Prefetcher For Profit", (HASP-ISCA'19)

### Repurposing Debug Hardware for Malware Detection

Kolkata, India

IN PROCEEDINGS, OF IEEE ASIAN TEST SYMPOSIUM, 2019

June 2019

Aditya Rohan, Kanad Basu, Ramesh Karri, "Repurposing Debug Hardware for Malware Detection", (IEEE ATS'19)

## 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.
- In proceedings of 28th IEEE Asian Test Symposium.

### 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

RESEARCH PROJECT, UNDER PROF. BISWABANDAN PANDA

IIT Kanpur

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 and discovered a new timing side-channel.
- Receive funding from the Intel SRC program for this research.
- Paper **Accepted**, at HASP 2019 in conjunction with ISCA 2019.

## NVModule

RESEARCH PROJECT, UNDER PROF. DEBADATTA MISHRA

IIT Kanpur

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

RESEARCH PROJECT, UNDER PROF. PREETI MALAKAR

IIT Kanpur

January 2019- Present

- Tested Darshan and Darshan Extended Tracing on IITK CSE Cluster and HPC2010 Supercomputer.
- Performed experiments to show the effect of DXT and Darshan on native application's throughput and execution time.
- Performed experiments to show the node-distance independence of application throughput on HPC2010.

# Projects

## Linux Kernel - Topics in Operating Systems

COURSE PROJECT, UNDER PROF. DEBADATTA MISHRA

IIT Kanpur

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

COURSE PROJECT, UNDER PROF. PRAMOD SUBRAMANYAN

IIT Kanpur

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

COURSE PROJECT, UNDER PROF. PREETI MALAKAR

IIT Kanpur

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

COURSE PROJECT, UNDER PROF. BISWABANDAN PANDA

IIT Kanpur

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

COURSE PROJECT, UNDER PROF. DEBADATTA MISHRA

IIT Kanpur

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  
Partial Differential Equations  
Linear Algebra

i: In progress

Topics in Operating Systems  
Operating Systems  
Introduction to Electronics  
Introduction to Programming

Computer Architecture  
Parallel Computing  
Data Structures and Algorithms  
Multivariable Calculus

# Teaching

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## ESC101 - Introduction to Programming

COUNSELLING SERVICE

IIT Kanpur

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

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

## Positions of Responsibility

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- **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

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- Computer Architecture
- Secure Memory Hierarchies
- Operating Systems