

# Anish Saxena

SENIOR UNDERGRADUATE

Indian Institute of Technology Kanpur

☎ (+91) 7405-80-5164 | ✉ anish.saxena@outlook.com | 🏠 anish-saxena.github.io | 📺 Anish-Saxena | 📺 Anish-Saxena

## Education

### Indian Institute of Technology Kanpur

BACHELOR OF TECHNOLOGY, MECHANICAL ENGINEERING/ **CPI: 9.1/10.0**

- Minor in Computer Systems

Kanpur, India

2017 - 2021 (exp.)

### St. Kabir School

CENTRAL BOARD OF SECONDARY EDUCATION CLASS XII/ **94.4%** | **SCHOOL TOPPER**

2017

CENTRAL BOARD OF SECONDARY EDUCATION CLASS X/ **CGPA: 10.0/10.0**

2015

Ahmedabad, India

## Honors & Awards

2019 **Semiconductor Research Corporation (SRC) Member**, Indian Research Program

India

2017 **Aditya Birla Group Scholarship**, Awarded to 15 students selected from IITs and BITS

Mumbai

2017 **All India Rank 1828**, Joint Entrance Examination Advanced, 175,000 students

India

2017 **KVPY Fellowship**, Awarded by IISc Bangalore and Government of India

Bangalore

## Work Experience

### Intel Labs, India

Mr. Anant Nori

RESEARCH INTERN, PROCESSOR ARCHITECTURE RESEARCH LAB

May 2020 - Sep. 2020

- Improved the performance of non-inclusive cache hierarchy by implementing and extending research ideas.
- Extended a state-of-the-art research simulator, collected memory traces, and performed cache simulations.
- **Reduced simulation time by 10×** while maintaining greater than 99% correlation to a full-scale simulation.
- Devised Bloom Filter-based implementation to track parameters like reuse distance efficiently in hardware.
- Developed custom cache policies and examined performance against oracular policies like Belady.

### CAR3S Group, IIT Kanpur

Prof. Biswabandan Panda

GROUP MEMBER

Apr. 2019 - Jun. 2020

- Improved accuracy of attacks that exploit instruction execution latency variation caused by processor caches.
- Identified that Dynamic Voltage and Frequency Scaling (DVFS) and OS scheduling affect execution latency.
- Introduced noise-aware calibration, periodic feedback, and victim profiling to optimize baseline attacks.
- Devised **DABANGG, a novel set of refinements that enable precise, accurate, and noise-resilient attacks**.
- Conducted experiments, mounted attacks on AES and RSA cryptosystems in OpenSSL and GnuPG libraries.
- **First author of the paper under submission** to the IEEE Symposium on Security and Privacy, 2021.
- Funded by NXP Semiconductors through SRC; work is accessible at [car3s.github.io/dabangg/](https://car3s.github.io/dabangg/).

### New York Office, IIT Kanpur

Prof. Manindra Agrawal

COMPUTER SYSTEMS INTERN

May 2018 - Jul. 2018

- Led a team of 4 to develop the infrastructure stack of a scalable microservice-based web portal.
- Integrated Spinnaker to enable continuous and immutable delivery of Docker images on Kubernetes cluster.
- Configured pipelines, auto-triggered by Concourse Continuous Integration (CI) workflow, for Spinnaker.
- Integrated Clair static vulnerability analysis tool to flag buggy Docker images and fail the build in CI stage.
- Added Canary analysis stage to the pipeline and integrated Locust load testing framework in this stage.
- Implemented client-side auth-enabled snapshot facility in UPMC Enterprises' Elasticsearch-operator.

## Relevant Coursework

- Advanced Computer Architecture<sup>A</sup>
- Programming for Performance<sup>A</sup>
- Data Structures & Algorithms
- Applied Numerical Methods<sup>A</sup>

A\*: grade for exceptional performance

- Computer Architecture<sup>A\*</sup>
- Operating Systems<sup>A</sup>
- Introduction to Programming<sup>A</sup>
- Linear Algebra

A: grade

- Topics in Operating Systems
- Computer Organization<sup>A</sup>
- Non Classical Logic
- Multivariable Calculus

## Projects

### Efficient and synergic heterogeneous systems

Prof. Biswabandan Panda

CAR3S GROUP, IIT KANPUR

Jul. 2020 - present

- Funded by Qualcomm Research to improve the front-end and memory subsystem of Systems-on-Chip.
- Developed a framework to collect Memory & Data Traces (MDT) through emulation or natively for Android.
- Modified QEMU, the emulator used by Android Studio, to collect MDT from Android 9.0 API with x86\_64 ABI.
- **Extended Valgrind, a memory profiling framework, collected MDT natively** from ARMv8-based devices.
- Extended ChampSim, a trace-driven simulator, utilized MDT and analyzed patterns to improve value prediction, branch prediction, instruction prefetching, and cache compression at LLC.

### SMA Actuator-based Space Antenna

Prof. Sahil Kalra

SPACE TECHNOLOGY CELL, IIT KANPUR

Jan. 2019 - Feb. 2019

- Developed mechanism for ISRO to enable motion with 3 degrees of freedom in antenna deployed in satellites.
- Utilized a novel State Memory Alloy (SMA) actuator to allow the third axis of rotation through motors.
- **Designed protocols for ISRO's NavIC chip** for transmission and reception of signals to control the system.

### Campus Sustainability Challenge

Team Leader

7<sup>TH</sup> INTER-IIT TECH MEET, IIT BOMBAY

Oct. 2018 - Dec. 2018

- Led a team of 6 to propose and implement solutions for waste generated on the institute campus.
- Mounted sensors in composting bins, captured Biogas, reduced PNG consumption in hostel messes by 14%.
- Configured E-Waste Management Software, modelled E-waste generation, analyzed disposal frequency, environmental and economic factors, and identified optimal combination of recycling techniques.

### E-Waste Management Software

Prof. Indranil Saha

COURSE PROJECT

Aug. 2017 - Nov. 2017

- Given E-waste disposal behavior and constraints on economic and environmental resources, identified the optimal path to safely and efficiently treat the E-waste.
- **Modelled the path-finding algorithm from scratch** to perform linear optimization of 8 parameters, like amortized cost, subject to 20 constraints, like efficiency, per process.

## Talks

|      |  |            |
|------|--|------------|
| 2020 | <b>DABANGG Attack</b> , via CAOS reading group to graduate students and faculty        | IIT Kanpur |
| 2020 | <b>Microarchitectural Security</b> , talk and demo as part of SRC Annual Design Review | Bangalore  |
| 2019 | <b>Flush-based Attacks</b> , guest lecture as part of course on Secure Memory Systems  | IIT Kanpur |
| 2019 | <b>ZombieLoad and CLK<sub>screw</sub> Attacks</b> , via CAOS reading group             | IIT Kanpur |

## Skills

|                    |   |
|--------------------|---|
| <b>Programming</b> | C++, C, Python, Golang, Java, Bash, Verilog                                   |
| <b>Frameworks</b>  | Pthreads, OpenMP, CUDA, Intel TBB, ANTLR, Valgrind                            |
| <b>Utilities</b>   | Git, Vim, $\LaTeX$ , GDB, PIN, QEMU, ChampSim, Xilinx ISE, Docker, Kubernetes |

## Extracurricular Activities

|      |   |            |
|------|---|------------|
| 2020 | <b>Systems Reading Group</b> , Leader   | IIT Kanpur |
|      | Conducted series of talks to discuss basic and advanced topics in systems research.     |            |
| 2019 | <b>Programming Club</b> , Coordinator   | IIT Kanpur |
|      | Guided a team of 24, conducted workshops, organized hackathons, and delivered lectures. |            |
| 2019 | <b>HDL &amp; Digital Design</b> , Programming Club Project                              | IIT Kanpur |
|      | Mentored 5 students to develop a 16-bit pipelined processor and synthesized it on FPGA. |            |
| 2018 | <b>Clean Coder</b> , Association for Computing Activities Project                       | IIT Kanpur |
|      | Developed a filesystem using Go-FUSE to sandbox a guest user on a host filesystem.      |            |

## Miscellaneous

- Senior Mentor to 15 undergraduate freshers, helped them navigate life and career choices in college. 2020
- Represented CAR3S group in departmental seminars and maintained the group website. 2019, 2020