

Anish Saxena

SENIOR UNDERGRADUATE

Indian Institute of Technology Kanpur · Mechanical Engineering

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Education

Indian Institute of Technology Kanpur

Kanpur, India

BACHELOR OF TECHNOLOGY, MECHANICAL ENGINEERING/ **CPI: 9.0/10.0**

2017 - 2021 (exp.)

- Minor in Computer Systems

St. Kabir School

Ahmedabad, India

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

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

Processor Architecture Research Lab

Intel Labs, India

ARCHITECTURE RESEARCH INTERN

May 2020 - Sep. 2020

- Implemented and analyzed research ideas and improved the performance of non-inclusive cache hierarchy.
- 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 simulation.
- Devised efficient techniques to identify and track parameters like reuse distance that affect cache policy.
- Developed custom cache policies and examined performance against oracular policies like Belady for 1000s of workloads; **achieved 0.5% average improvement in L2 hitrate.**

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 work 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/.

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 Architectureⁱ
- Programming for Performanceⁱ
- Data Structures & Algorithms
- Applied Numerical Methodsⁱ

A*: grade for exceptional performance

- Computer Architecture^{A*}
- Operating Systems^A
- Introduction to Programming^A
- Linear Algebra

A: grade

- Topics in Operating Systems
- Computer Organization^A
- Non Classical Logic
- Multivariable Calculus

i: in progress

Projects

Compression Algorithms for Caches

CAR3S GROUP, IIT KANPUR

Prof. Biswabandan Panda

Jul. 2020 - present

- Funded by Qualcomm Research to improve bandwidth of cache hierarchy in heterogeneous System-on-Chip.
- **Collected Memory Access Traces (MAT) from Android applications** and analyzed access patterns.
- Utilized Pin, a dynamic binary instrumentation toolkit, to collect MAT from Android 4.4 API with x86 ABI.
- Modified QEMU, the emulator used by Android Studio, to collect MAT from Android 9.0 API with x86_64 ABI.
- Extended Valgrind, a memory profiling framework, to collect MAT natively from ARMv8-based devices.
- **Extended ChampSim, a trace-driven simulator, to utilize MAT** and collect bandwidth-specific metrics.

SMA Actuator-based Space Antenna

SPACE TECHNOLOGY CELL, IIT KANPUR

Prof. Sahil Kalra

Jan. 2019 - Feb. 2019

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

Campus Sustainability Challenge

7TH INTER-IIT TECH MEET, IIT BOMBAY

Team Leader

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

COURSE PROJECT

Prof. Indranil Saha

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.
- Developed in Visual C++ and .NET framework; accessible at [github://Anish-Saxena/E-Waste-Management/](https://github.com/Anish-Saxena/E-Waste-Management/).

Skills

Programming C++, C, Python, Golang, Java, Bash

Frameworks Pthreads, OpenMP, CUDA, Locust, ANTLR, Hugo

Utilities Git, Vim, \LaTeX , PIN, QEMU, Valgrind, ChampSim, GDB, Docker, Kubernetes, Concourse, Spinnaker

Extracurricular Activities

2020 **Systems Reading Group**, Leader

IIT Kanpur

Conducted series of talks to discuss basic and advanced topics in systems research.

2019 **Programming Club**, Coordinator

IIT Kanpur

Guided a team of 24, conducted workshops, organized hackathons, and delivered lectures.

2019 **HDL & Digital Design**, Programming Club Project

IIT Kanpur

Mentored 5 students to develop a 16-bit pipelined processor and synthesized it on FPGA.

2018 **Clean Coder**, Association for Computing Activities Project

IIT Kanpur

Developed a filesystem using Go-FUSE to sandbox a guest user on a host filesystem.

Miscellaneous

- Represented CAR3S group in departmental seminars and maintained the group website. 2020
- Delivered a guest lecture on DABANG in a graduate-level course on Secure Memory Systems. 2019
- Delivered talks on ZombieLoad and $\text{CLK}_{\text{screw}}$ attacks through CAOS reading group. 2019
- Two-time regional finalist of TCS IT Wiz Quiz. 2014, 2016