Anish **Saxena**

Senior Undergraduate

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Education

Indian Institute of Technology Kanpur — *Kanpur, India*

Bachelor of Technology, Mechanical Engineering: **CGPA: 9.0/10.0** — *2017 - 2021 (exp.)*

- Minor in Computer Systems

St. Kabir School — *Ahemdabad, India*

Class XII Board exam: **94.4%** | **School Topper** among all streams — *2017*

Class X Board exam: **CGPA: 10.0/10.0** | Received **Certificate of Merit** — *2015*

Honors & Awards

Academic

2019 **SRC Member**, Sole undergraduate student, funded by NXP Semiconductors — *India*

2017 **Aditya Birla 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**, Indian Institute of Science and Government of India — *Bangalore*

Extra-Curricular

2016 **All India Rank 236**, Silver Certificate, Technothlon IIT Guwahati, 10,000 students — *India*

2016 **Regional Finalist**, TCS IT WIZ Quiz, 600+ teams — *Gujarat*

2013 **Outstanding Social Action Project**, Change Maker Program, ITSA International — *Gujarat*

Work Experience

Intel Labs: Processor Architecture Research Lab — *Bangalore*

Architecture Research Intern — *May 2020 - present*

- Focused on non-inclusive cache hierarchy optimizations to achieve higher performance than state-of-the-art.
- Collected and analyzed memory access patterns using application traces and trace-driven simulation.
- Modified the age-insertion amd age-update algorithms in replacement policy for level 2 cache.
- Compared the new policy against oracular Belady policy to quantify upper bound of possible gain.

CAR3S Group: Cache Attack Optimizations — *IIT Kanpur*

Group Member, under Prof. Biswabandan Panda (Biswa) — *May 2019 - Jul. 2019*

- Exploited Dynamic Voltage & Frequency Scaling technique to attack many-core systems.
- Analyzed the effects of core pinning, frequency and OS scheduling policy on instruction execution latency.
- Measured accuracy of proof-of-concept attack with with memory, computer and I/O intensive workloads.
- Evaluated Meltdown-type transient execution attacks based on their integrity and confidentiality breach.
- Studied fault-based CLK_{screw} attack and micro architectural data-sampling based ZombieLoad attack.

New York Office: Infrastructure Group — *IIT Kanpur*

Computer Systems Engineer, under Prof. Manindra Agrawal — *May 2018 - Jul. 2018*

- Spearheaded a team of 4 individuals to develop microservice based scalable and persistent virtualized stack.
- Worked with multi-node bare-metal Kubernetes cluster, integrated Canary analysis in infrastructure stack.
- Automated zero-downtime immutable docker image generation using Concourse Continuous Integration.
- Configured and deployed Spinnaker Continuous Deployment tool from scratch with auto-trigger pipelines.
- Integrated Clair static vulnerability analysis tool and Locust distributed load-testing model in the pipeline.

Projects

Research

Compression algorithms for cache hierarchy — *IIT Kanpur*

Project Member, under Biswa — *Jul. 2020 - present*

- Project sponsored by Qualcomm Research and work done as part of CAR3S Group.
- Enabled trace collection for guest instructions in QEMU to collect memory access pattern of Android apps.
- Modified ChampSim simulator to run collected traces with memory accesses to analyze application footprint.

DABANGG Attack — *IIT Kanpur*

Undergraduate Research Project, under Biswa · Paper · Source Code — *Jul. 2019 - Jun. 2020*

- Work funded by NXP Semiconductors via Special Research Program of Semiconductor Research Corporation.
- Exploited power-saving mechanism (DVFS) that dynamically changes frequency in modern processor cores.
- Improved accuracy and noise resilience of cache timing based Flush+Reload and Flush+Flush attacks.
- Attacked RSA (GnuPG library) and AES (OpenSSL library) cryptosystems in extremely noisy environments.
- Reduced error rate in covert channel in presence of noise and mounted Spectre transient execution attack.

SMA Actuator based Space Antenna — *IIT Kanpur*

Space Technology Cell IIT Kanpur, under 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 motor and integrated State Memory Alloy (SMA) actuator to allow movement of axis of rotation.
- Planned to use ISRO's NavIC chip to allow transmission and reception of signals to control the antenna.

Development

Campus Grocery App — *IIT Kanpur*

Project Manager, Agnys Waste Management Pvt. Ltd. — *Jul. 2019 - Nov. 2019*

- Coordinated a team of 4 individuals with the startup to develop an Android & iOS application.
- Technological stack included Flutter & Firebase, aimed to sell organic fruits & vegetables.

Campus Sustainability Challenge — *IIT Kanpur*

Team Leader, 7TH Inter-IIT Tech Meet, IIT Bombay — *Oct. 2018 - Dec. 2018*

- Led a team of 6 individuals to identify environmental issues in campus and implement innovative solutions.
- Integrated smart sensors to monitor humidity & temperature and optimize current composting practices.

E-Waste Management Software — *IIT Kanpur*

Advanced Track Project, under Prof. Indranil Saha · Source Code — *Aug. 2017 - Nov. 2017*

- Developed in Visual C++, predicted best solutions to treat E-Waste given environmental constraints.
- Designed algorithms to display best route for given set of data, performedrelative cost analysis.

Relevant Coursework

- Advanced Computer Architecture[i]
- Operating Systems[A]
- Introduction to Electrical Systems[A]
- Non Classical Logic
- Computer Architecture[A*]
- Computer Organization[A]
- Introduction to Electronics
- Partial Differential Equations[A]
- Topics in Operating Systems
- Data Structures & Algorithms
- Fundamentals of Computing[A]
- Multivariable Calculus

A: grade for exceptional performance* *A: grade* *i: in progress*

Skills

Utilities	QEMU, Xilinx ISE, LaTeX, Vim, Git, Docker, Kubernetes, Concourse, Spinnaker
Programming	C, C++, Go, Python, Bash, Verilog
Operating Systems	Ubuntu, Arch Linux
Languages	English, Hindi, German

Positions of Responsibility

Coordinator Programming Club, IIT Kanpur *Mar. 2019 - Mar. 2020*

- Guided a team of 24 secretaries to conduct workshops and hackathons under the purview of programming.
- Responsible for delivering lectures to students, procuring industrial projects and organizing events
- Organized a comprehensive camp in winter vacations with50+ lectureson variety of topics.

Secretary Programming Club, IIT Kanpur *Apr. 2018 - Mar. 2019*

- Delivered stand-alone lectures and set-up programming based questions for various events.

Extracurricular Activities

2019 **Systems Reading Group**, Leader *IIT Kanpur*
Conducted series of talks to discuss basic and advanced topics in systems research.

2019 **HDL & Digital Design**, Programming Club Project *IIT Kanpur*
Mentored a group of 5 individuals on digital design through FPGA based implementation.

2018 **Clean Coder**, Association for Computing Activities' Project *IIT Kanpur*
Developed a filesystem using Go-fuse. Implemented interactive Bash scripts.

2018 **Microsoft code.fun.do**, Participant *IIT Kanpur*
Developed a web-app utilizing Azure services to ease online document viewing experience.

2017 **Placement Volunteer**, Students' Placement Office *IIT Kanpur*
Coordinated company placements during winter season, in campus.

Miscellaneous

- Represented CAR3S group in CSE Department's M Tech Seminar. *Feb. 2020*
- Audited a graduate level course on *Secure Memory Systems*. *Jul. 2019*
- Delivered a talk on ZombieLoad attack through CAOS reading group. *Jul. 2019*
- Delivered a talk on CLK_{screw} attack through CAOS reading group. *Mar. 2019*
- Audited an undergraduate level course on *Computer Microarchitecture*. *Jan. 2019*
- Developed the first ever Motherboard Tier List on Tom's Hardware website. *Nov. 2014*