Anish **Saxena**

PhD Student · Georgia Institute of Technology

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Education

Georgia Institute of Technology — *Atlanta, USA*
Doctor of Philosophy, Computer Science — *2021 - present*

Indian Institute of Technology Kanpur — *Kanpur, India*
Bachelor of Technology, Mechanical Engineering/ **CPI: 9.1/10.0** — *2017 - 2021*
- 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

Memory Systems Lab, Georgia Tech — *Prof. Moinuddin Qureshi*
Graduate Research Assistant — *Aug. 2021 - present*
- Exploring software and architectural techniques to tackle hardware and microarchitectural vulnerabilities.

NVIDIA Corporation, India — *Mr. Bharatkumar Sharma*
HPC GPU Advocate Intern, Hackathons and Boot-Camps Team — *May 2021 - Aug. 2021*
- Created open-source tutorials and boot-camps for scalable multi-GPU programming for HPC applications.
- Developed codes with CUDA-aware MPI, NCCL, and NVSHMEM libraries and labs in Jupyter Notebooks.
- Published all materials online; work is accessible at github.com/gpuhackathons-org/gpubootcamp/.

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 $10\times$ 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.

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.
- Funded by NXP Semiconductors through SRC; work is accessible at car3s.github.io/dabangg/.

Relevant Coursework

- Advanced Computer Architecture[A]
- Programming for Performance[A]
- High Performance Computing & ML[A*]
- Data Structures & Algorithms
- Computer Architecture[A*]
- Operating Systems[A]
- Modern Cryptology[A]
- Introduction to Programming[A]
- Topics in Operating Systems
- Computer Organization[A]
- Non Classical Logic
- Applied Numerical Methods[A]

A: grade for exceptional performance*
A: grade

Projects

Highly Scalable Fast Fourier Transform on GPUs
Prof. Mahendra Verma

Course Project, PHY690W: High Performance Computing — *Feb. 2021 - Aug. 2021*

- Extended Tarang, a parallel computational fluid dynamics simulator, to enable GPU-based FFTs.
- Developed MPI and CuFFT-XT-based variable precision 1D and 3D scalable forward and inverse FFTs.
- Achieved upto $1650\times$ single-node speed-up over FFTW on DGX-A100 and linear strong and weak scaling.
- Compared DGX-A100's performance in PARAM Siddhi AI with EPCC Cirrus cluster with 6 V100 GPUs per node.

Efficient and Synergic Heterogeneous Systems
Prof. Biswabandan Panda

CAR3S Group, IIT Kanpur — *Jul. 2020 - Jun. 2021*

- 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.

Organic Grocery App
Project Manager

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

- Coordinated a team of 4, developed an Android application to sell organic fruits and vegetables.
- Identified application stack, used Flutter for development and Firebase for infrastructure.

Campus Sustainability Challenge
Team Leader

7TH 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 an in-house E-Waste Management Software, 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, verified results for data-sets of up-to 4 million residents.

Talks

2021 **CUDA Programming**, guest lecture, course on High Performance Computing — *IIT Kanpur*
2020 **DABANGG Attack**, via CAOS reading group to graduate students and faculty — *IIT Kanpur*
2020 **Microarchitectural Security**, talk and demo as part of SRC Annual Design Review — *Bangalore*
2019 **Flush-based Attacks**, guest lecture, course on Secure Memory Systems — *IIT Kanpur*

Skills

Programming C++, C, Python, Golang, Java, Bash, Verilog
Frameworks Pthreads, MPI, OpenMP, CUDA, NCCL, Intel TBB, ANTLR, Valgrind
Utilities Git, Vim, LaTeX, GDB, PIN, Nsight Systems, QEMU, ChampSim, Xilinx ISE, Docker, Kubernetes

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.

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*