Anish **Saxena**

PhD Student · Georgia Institute of Technology

(+1) 470-232-5725 | anish.saxena@outlook.com | anish-saxena.github.io | Anish-Saxena | Anish-Saxena

Education

Georgia Institute of Technology — *Atlanta, USA*
Doctor of Philosophy, Computer Science · **GPA: 4.0/4.0** — *2021 - present*
- Advisor: Prof. Moinuddin K. Qureshi

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

Honors & Awards

2019 **Semiconductor Research Corporation (SRC) Member**, Indian Research Program — *India*
2017 **Aditya Birla Group Scholarship**, Awarded to 15 students from IIT 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*

Relevant Experience

Micron Technology, USA — *Patrick Estep*
Research Intern, Advanced Memory Group — *May. 2022 - Aug. 2022*
- Architected CXL memory systems by analyzing Google's Warehouse-Scale Computing (WSC) workloads.
- Filed a patent for a multi-core emulation mechanism to replay WSC workloads on native hardware.

Memory Systems Lab, Georgia Tech — *Prof. Moinuddin K. Qureshi*
Graduate Research Assistant — *Aug. 2021 - present*
- Designed PT-Guard, a transparent, low-overhead mechanism to protect page tables against Rowhammer.
- Designed AQUA (MICRO'22), a scalable Rowhammer mitigation that quarantines aggressor rows at runtime.

NVIDIA Corporation, India — *Bharatkumar Sharma*
HPC GPU Advocate Intern, Hackathons and Boot-Camps Team — *May 2021 - Aug. 2021*
- Created open-source tutorials and bootcamps on multi-node GPU programming for HPC applications.
- The bootcamp and code are accessible at github.com/gpuhackathons-org/gpubootcamp/.

Intel Labs, India — *Anant Nori*
Research Intern, Processor Architecture Research Lab — *May 2020 - Sep. 2020*
- Improved performance of non-inclusive caches by extending reuse-distance based cache policies.
- Accelerated a cycle-accurate simulator, collected memory traces, and performed functional simulations.

CAR3S Group, IIT Kanpur — *Prof. Biswabandan Panda*
Group Member and SRC Student Member — *Apr. 2019 - Jun. 2020*
- Devised DABANGG (WOOT'22), refinements that enable accurate and noise-resilient cache attacks.
- Developed tracing techniques for ARM architectures and analyzed cache compression for mobile SoCs.

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.
- Configured Spinnaker-based CI/ CD pipeline and integrated canary analysis and stress testing capabilities.

Papers

AQUA: Scalable Rowhammer Mitigation by Quarantining Aggressor Rows at Runtime
***Anish Saxena**, Gururaj Saileshwar, Prashant Nair, Moinuddin Qureshi*
55^{th} Annual IEEE/ACM International Symposium on Microarchitecture **(MICRO)**, Chicago, USA, October 2022.

DABANGG: A Case for Noise Resilient Flush-Based Cache Attacks
Anish Saxena *and Biswabandan Panda*
16^{th} IEEE Workshop on Offensive Technologies **(WOOT)**, San Francisco, USA, May 2022.

PT-Guard: Guarding Page Tables Against DRAM Fault Injection Attacks
Anish Saxena*, Gururaj Saileshwar, Jonas Juffinger, Andreas Kogler, Daniel Gruss, Moinuddin Qureshi*
Under submission

Scalable Multi-node Fast Fourier Transform on GPUs
Manthan Verma, Soumyadeep Chatterjee, Gaurav Garg, Bharatkumar Sharma, Nishant Arya, Shashi Kumar, ***Anish Saxena****, Mahendra K. Verma*
Under submission

Projects

Novel Server Memory Systems — *Prof. Moinuddin Qureshi*
Memory Systems Lab — *Sep. 2022 - present*
- Analyzing a novel CXL-based memory system that foregoes low latency memory for higher bandwidth.

Adaptive Rowhammer Defenses — *Prof. Alexandros Daglis*
Memory Systems Lab — *Oct. 2021 - Feb. 2022*
- Devised a software-based Rowhammer defense that limits running time of processes through OS scheduler.
- Explored the design-space that trades off performance for varying levels of Rowhammer security.

Scalable Fast Fourier Transform on GPUs — *Prof. Mahendra Verma*
Prof. Verma's Group in Collaboration with CDAC and NVIDIA — *Feb. 2021 - Aug. 2021*
- Extended Tarang, a parallel computational fluid dynamics simulator, to enable multi-node multi-GPU FFTs.
- Developed scalable 3D FFT implementation and evaluated it on PARAM Siddhi AI supercomputer.

Efficient Memory Tracing for Mobile Architectures — *Prof. Biswabandan Panda*
CAR3S Group in Collaboration with Qualcomm Research — *Jul. 2020 - Jun. 2021*
- Developed a framework to collect native traces for Android applications on ARM architectures.
- Extended QEMU for emulation and Valgrind for native tracing and evaluated cache compression algorithms.

Campus Sustainability Challenge — *Team Leader*
7^{TH} 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%.

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

2022 **AQUA Rowhammer Mitigation**, paper talk at the 55^{th} MICRO conference — *Chicago*
2022 **Rowhammer Attacks and Defenses**, guest lecture at IIT Bombay — *Mumbai*
2022 **Google Datacenter Application Traces**, invited research talk at Intel Labs — *Bangalore*
2022 **DABANGG Attack**, paper talk at the 16^{th} WOOT workshop — *San Francisco*
2021 **CUDA Programming**, guest lecture, course on High Performance Computing — *IIT Kanpur*
2020 **Noise-resilient Flush Attacks**, CAOS reading group to 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*
2019 **ZombieLoad and CLKScrew Attacks**, CAOS reading group to students and faculty — *IIT Kanpur*

Skills

Programming C++, C, Python, Bash
Frameworks Pthreads, MPI, OpenMP, CUDA, NCCL, Intel TBB, ANTLR, Valgrind
Utilities Git, LaTeX, GDB, PIN, QEMU, ChampSim, gem5, Xilinx ISE, Nsight Systems, Docker, Kubernetes

Relevant Coursework

- Topics in OS (Distributed Systems)[A]
- High Performance CompArch[A]
- Advanced OS (Programming NVMe)
- High Performance Computing[A*]
- Data Structures & Algorithms
- Quantum Computing[A]
- Parallel CompArch[A]
- High Performance Programming[A]
- Operating Systems[A]
- Non Classical Logic
- Secure & Reliable CompArch[A]
- Computer Architecture[A*]
- Modern Cryptology[A]
- Computer Organization[A]

A: grade for exceptional performance*
A: grade

Technical Service

2020 **Systems Reading Group**, Leader — *IIT Kanpur*
Discussed topics in computer systems. Resources: https://anish-saxena.github.io/tags/srg/

2019 **Programming Club**, Coordinator — *IIT Kanpur*
Led a team of 24, conducted workshops, organized hackathons, and delivered lectures.

Miscellaneous

- Senior Mentor to 15 students at IIT Kanpur, helped them navigate life and career choices in college. *2020*
- Represented CAR3S group in departmental seminars and maintained the group's digital presence. *2019, 2020*