Sarthak Rout

Senior Undergraduate at Department of CSE, IITK
sarthakr@iitk.ac.in

Education

Year	Degree/Exam	Institute	CPI/%
2023	B.Tech (Computer Science and Engineering)	Indian Institute of Technology, Kanpur	**9.50**/10
2019	CBSE (Class XII)	Sir Padampat Singhania Public School, Kota	95.2%
2017	CBSE (Class X)	DAV Public School, Chandrasekharpur, BBSR	10.0/10

Scholastic Achievements

- Academic Excellence Award for year 2019, 2020, 2021
- AIR **202** in JEE (Advanced) *2019*
- Participated in OCSC for **IChO**, 2019 and **IOAA**, 2018 and 2017, **IJSO** 2016
- Special Award for Best Performance in Theoretical Round, OCSC, IOAA *2018*
- AIR **42**, KVPY (SA) Fellow *2018*
- Qualified RMO, NTSE *2017*

Programming Achievements

- Rated **1858** (Max) @ Codeforces, 2102 (Max) @ Codechef
- **301**st, Google Kickstart Round D 2022
- **197**th, Google Kickstart Round E 2022
- 1001st, Google Hashcode 2021

Relevant Coursework

- Operating Systems, Computer Architecture ^{o}, Parallel Programming *, Computer Networks
- Probability and Statistics, Numerical Analysis*, Probabilistic ML^{o}, Deep Reinforcement Learning*
- Data Structures and Algorithms, Algorithms - II, Compiler Design, Modern Cryptology, Quantum Computing

* ≡ A* grade for exceptional performance, ^{o} ≡ Ongoing course

Technical Skills

- **Languages**: C, C++, Python, TypeScript, Verilog
- **Frameworks**: Django, Angular, OpenAI, Rasa
- **Libraries**: PyTorch, Numpy
- **Tools**: Git, Docker, LaTeX

Extracurriculars

- Ranked **16**th out of 3400 teams in HCL HackIITK Hackathon for building **malware** and **botnet detection** tools by training **deep learning models** - </>
- Bagged **2**nd position out of 250+ teams in Mathemania 2020, inter-college olympiad-style math problem solving contest

Positions of Responsibility

- Secretary at Programming Club and Entrepreneurship Cell *2021*

Internships

- **Text2Design: Research Intern, Big Data Labs, Adobe Systems** (May '22 - Jul '22)
  - Built end-to-end **design synthesis pipeline** that generates graphic design variants from **multi-modal inputs**, including prior designs and **submitted invention disclosure**
  - Used **GPT2** and **KeyBERT** to generate slogans and relevant queries from text input to retrieve images from Adobe Stock and selected top layouts ordered by cosine similarity score
  - Explored **GAN** and VAE-based frameworks to auto-generate content-aware design layouts
  - Incorporated **brand guidelines** by extracting features such as logos, fonts and color palettes by extending algorithms in the NeurTEx paper and used Flask frontend for demo in a team
- **Software Development Intern, LimeChat** (May '21 - Jul '21)
  - Developed & deployed highly configurable Level 3 conversational e-commerce AI chatbots
  - **Modularised** existing monolithic codebase and wrote scripts for one-touch bot deployment
  - Used Docker with Azure Kubernetes Service to deploy and organise multiple **microservices**
  - Introduced an OTP-based auth system to secure sensitive order tracking flows for 2 leading D2C brands in India and received **PPTO** offer to rejoin as an intern

Key Projects

* ≡ Course Project

- **GIPSC: Golang to MIPS Compiler - Compiler Design** - </> * (Jan '22 - Apr '22)
  - Implemented a compiler for a fully functional subset of the **Go** language to **MIPS** ISA
  - Designed a lexer, **parser** and **semantic analyser** that supports Go features, including short variable declaration, **multi-level pointers**, **struct**, array, **floats** and **labelled statements**
  - Supported advanced features like **constant folding**, **multi-dimensional arrays**, system call wrappers, **module imports**, multiple returns and multiple assignments
- **Parallel Programming** - </> * (Jan '22 - Apr '22)
  - Implemented and compared locks like **Lamport's Bakery**, **spin-lock**, **test-and-test-and-set**, **ticket** and **array lock** with **no false sharing** using instructions like **cmpxchg**
  - Implemented and compared various barriers like **sense-reversing** and **tree barriers** both using **busy wait**, **POSIX Conditional Variables**, and **OpenMP directives**
  - Optimised algorithms for distributed systems for **travelling salesman problem**, matrix inversion, matrix product and Gauss-Seidel iterative solver using **OpenMP** and **CUDA**
- **Penalty Shot Task (as Keeper) - Deep RL** - </> - 📄 - 📄 * (Aug '21 - Nov '21)
  - Implemented multi-agent gym environment featuring rendering capabilities & human play
  - Experimented with **policy gradient** methods like PPO, TD3 & DDPG against one another
  - Improved agent performance by introducing a **pseudo-reward for supplementary goals**
- **Building GemOS - Operating Systems** - </> * (Aug '21 - Nov '21)
  - Created file archiving utility and enabled IPC using system calls like pipe(), fork() and exec()
  - Implemented system calls for pipe and persistent pipe structures sharing data concurrently
  - Developed a **debugger** for functions using INT3 featuring a **stack backtrace** of functions
  - Extended clone() system call to a set of **threading APIs** with **private memory areas**
- **Private Computation using Cryptographic Primitives - SnT** 📄 - </> (May '20 - Jul '20)
  - Implemented a **distributed point function** library based on principles of **Function Secret Sharing** in Rust using multi-threading and memory optimisation
  - Used gRPC, gTest and Google Benchmark for testing, networking and benchmarking
- **InfoSec IITK - ACA Project** (Feb '20 - Apr '20)
  - Examined web exploitation, reverse engineering and privilege escalation techniques
  - Devised a proof-of-concept exploit and reported a **critical vulnerability in OARS, IITK** exposing internal databases storing sensitive information such as grades