Sarthak Singhal

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Senior Year Undergraduate
Department of Computer Science and Engineering
Indian Institute of Technology Kanpur

Degree/Board	Institution	Year	CGPA/%
B.Tech, CSE	Indian Institute of Technology Kanpur	2021 (expected)	9.71/10.0
AISSCE – XII	Sanskar School, Jaipur	2017	94.2%
CBSE – X	Tagore Public School, Jaipur	2015	10.0/10.0

Scholastic and Programming Achievements

- Academic Excellence Award, IIT Kanpur, 2017-18, 18-19
- All India Rank **169**, JEE Advanced, 2017
- All India Rank **78**, JEE Mains, 2017
- All India Rank **173**, KVPY, 2016
- Rank **88** and **173** in **ACM ICPC** Amritapuri regionals 2019 and 2018 respectively
- Rank **31** among the Indian teams in Google Hash Code 2019
- Completed all 5 levels of Google foobar challenge

Projects

Building GemOS

Course Project, Operating Systems July 2019 - Nov 2019

- Implemented file system syscalls including open, write, pipe, etc.
- Implemented multi-level paging management for syscalls like mmap, munmap and mprotect.
- Implemented smart process creation for system calls like cfork and vfork by properly managing the processes.
- Designed a read-write lock and implemented multi-threaded hashtable with Open Addressing using mutual exclusion devices like locks and semaphores for preventing concurrent access.

Parallel Programming

Assignments, Programming for Performance Oct 2020 - Nov 2020

- Implemented program optimizations such as loop transformations, vectorization using Intel SSE/AVX Intrinsics for achieving tremendous speedups (10x-30x) in serial programs.
- Used Intel TBB & OpenMP and wrote optimized CUDA kernels for extacting performance benefits from programs such as Prefix sums, 3D stencil computations and Quicksort.

Oz Interpreter

Course Project, Principles of Programming Languages Nov 2020

- Developed an interpreter from scratch for a simple kernel language, Oz.
- Implemented all the basic features of a declarative sequential language such as application of non-suspendable and suspendable statements, unification of variables and values, maintenance of a single assignment store and a semantic stack, and pattern matching.

DCaptcha

Course Project, Machine Learning Nov 2019

- Built a CAPTCHA decoder using OpenCV for Image Preprocessing and Segmentation.
- Used PyTorch for building a CNN for character recognition after segmentation.
- Got accuracy of 100% on test dataset after training the model on a dataset of 2000 images of similar styled captcha.

Relevant Courses

Introduction to Programming, Discrete Mathematics, Data Structures & Algorithms, Software Labs, Advanced Algorithms, Computer Organization, Machine Learning, Operating Systems, Compiler Design, Computer Networks, Database systems, Programming for Performance, Programming Languages, Data Mining, Parallel Computing(i), Modern Cryptography(i)

i: In progress

Work Experience

D. E. Shaw India Private Limited *Hyderabad, India*

Software Engineering Intern May 2020 - June 2020

- Built an attachment prediction system for the internal ticketing management system, DESFlow.
- Experimented with various keyword based and ML based algorithms and built a Machine Learning model using the combination of Naïve Bayes and Graham's algorithm achieving 90% precision, 59% recall and 90% accuracy.
- Improved the Graham's algorithm and employed normalized keyword approach on top of the Machine Learning model to improve the recall to 67% and precision to 91%.
- Extended the solution to handle similar use cases like setting the due date and closing the request and also added the support for active learning for model to evolve over time.

Google Summer of Code *India*

Software Developer, Boost C++ Organization May 2019 - Aug 2019

- Integrated Boost.Units with the existing base coordinate system and restructured all the classes to make them compatible with Boost.Units to provide a robust astronomical coordinate system.
- Created the parser for binary table extension and ASCII table extension for FITS File system.
- Wrote unit tests using Boost Unit Test framework.

Summer of Code, IIT Kanpur *IIT Kanpur*

Full Stack Developer Intern May 2018 - July 2018

- Developed a dynamic and scalable web application using LAMP stack from scratch as an initiative to improve the medical system by keeping track of records of patients and their medical history.
- Implemented various functionalities like doctor could add a patient, update its records, refer it to another doctor, etc. and patient could search for doctors and the labs in his area.
- Developed a question-answer platform for the medical system which had the functionality to filter the questions based on illness, search questions based on keywords, notifications for patients if their questions get answered, etc.
- Technologies and languages used: PHP, MYSQL, AJAX, HTML, Javascript, Microsoft Azure(for deployment).

Skills

Programming: C/C++, Python, Java, Haskell, Bash Scripting, Verilog
Web: PHP, HTML5, CSS, Javascript, SQL, NodeJS
Utilities: MPI, OpenMP, CUDA, IntelTBB, Linux Shell Utilities, Git, LaTeX, Vim

Miscellaneous

- Designed a hybrid value predictor using techniques like smart training, blacklist filtering, PC-AM, etc.
- Constructed a parser using flex and bison to obtain ASTs of the input Java programs.
- Built an android app using MERN stack to manage the upcoming coding contests and hackathons.
- Developed a decoder in Haskell to decipher monoalphabetic substitution cipher.
- Secretary in Association of Computing Activities, IIT Kanpur from April 2018 - April 2019. Helped in conducting coding contests, hackathons and other events in the campus.