Siddharth Kalra

Final Year Undergraduate
Computer Science and Engineering
Indian Institute of Technology Kanpur

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Examination	Institute	Year	CPI/%
Graduation	IIT Kanpur	2021-2025	**9.81**/10.0
Intermediate/+2	Navyug Convent Sr. Sec. School, Delhi	2021	94.4%
Matriculation	Salwan Public School, Gurgaon	2019	98%

Scholastic Achievements

- Received **A*** (outstanding) grade in **9 Math/CSE** courses and in **12** courses overall, with a CPI of **9.93** in Math/CSE courses
- **All India Rank 122**, JEE Advanced 2021
- **All India Rank 15**, JEE Main 2021
- Cleared **RMO** 2018 and obtained **merit certificate** in **INMO** 2019, qualifying for direct participation in **INMO** 2020
- **All India Rank 5**, KVPY SX 2021
- **All India Rank 34**, KVPY SA 2020
- Cleared **NSEP** 2019 and **NSEP, NSEC**, **NSEA** and **INAO** (with **AIR 30** in INAO) in 2020
- Received **Academic Excellence Award** from SSPC, IITK **thrice** for exceptional academic performance at IIT Kanpur
- Awarded the prestigious **NTSE Scholarship**, 2020 by Govt. of India for being among the top 2000 students across India
- Selected for **Reliance Foundation Scholarship**, 2022 given to 60 computer science students across country
- Recipient of **Class of 1990 Scholarship**, 2022 for 3rd best AIR at IIT Kanpur in JEE Advanced 2021
- Received **Quadeye Excellence Scholarship** 2023, being ranked among top 10 at IIT Kanpur

Work Experience

Quantbox Research — *Bengaluru*
Quantitative Research Intern — *May'24 – Jul'24*

- **Objective:** To develop a framework for **Black Box Optimization** of costly-to-evaluate functions with **stopping criteria** while preventing **overfitting**
- Used **Bayesian Optimization** and developed heuristics for stopping criteria with UCB and qUCB acquisition function
- Developed method for faster batch-Bayesian Optimization using **parallel computation** and implemented it using **BoTorch**
- Obtained results for all methods in pnl and correlation space, **outperforming grid search and random search**
- Used properties of **Gaussian Process** hyperparameters to avoid function spikes and increase out of sample performance
- Obtained relationship of lengthscale parameter with dimensions for **scalable Bayesian Optimization** with stopping criteria
- **Modified** Real-coded **Genetic Algorithm** to obtain simple Mutation based optimization algorithm, giving decent results

Competitive Programming

- Highest rating of **2213 (6 star)** on **Codechef** (profile: sid_iitk) and **1804 (expert)** on **Codeforces** (profile: failure_)
- Secured **Global Rank 13** in Starters 143 (div 1) and **Global Rank 15** in Starters 147 (div 1) on Codechef
- Secured **Global Rank 172** in Round 883 (div 3) and **Global Rank 298** in Round 969 (div 2) on Codeforces

Skills

- **Languages:** C, C++, Python, JavaScript
- **Libraries:** Numpy, Pandas, Scikit-learn, Tensorflow, Pytorch, Keras, Matplotlib, BoTorch
- **Web :** HTML, CSS, ReactJS, Express
- **Utilities :** Bash, Verilog, Git,LaTeX, SQL, flex, Bison, MIPS

Projects

Python to x86 Compiler — *Jan'24 – Apr'24*
Course Project, Compiler Design [*Github*]

- Developed fully functional **Python to x86** compiler for statically typed subset of python using **flex** and **bison**
- Implemented **lexical**, **syntax** and **semantic analyzer** including type checking, type conversion and scope analysis along with efficient **error handling** and got **full marks**
- Included support for **advanced features** such as strings, **classes**, multi-level **inheritance** and multi-dimensional **lists**

Zero Shot Machine Unlearning — *Jan'24 – Apr'24*
Course Research Project, Probabilistic Machine Learning [*Github*]

- Explored seed paper **Zero Shot Machine Unlearning** and suggested **improvements** on it in a team of 5
- Improved GKT method by adding **entropy filter** and obtained **98.3**% accuracy in **40% lesser** epochs for **optimal threshold**
- Used **Deep Inversion** to generate high quality images and trained student model using them, obtaining **85**% accuracy

Fast Randomized Median Algorithm — *Jan'24 – Apr'24*
Course Project, Randomized Algorithms [*Github*]

- Designed **randomized** median-finding algorithm in $\mathbf{1.5n+o(n)}$ comparisons, outperforming bound of $2n$ for a deterministic one
- Analyzed the **Las Vegas** algorithm, proving **inverse exp. bound** on probability of failure on number of comparisons
- Implemented the algorithm and executed for different values of parameters to find the optimal one, giving $\sim \mathbf{1.6}n$ comparisons

Building GemOS — *Aug'23 – Nov'23*
Course Project, Operating Systems

- Added support for **strace** and user space **function call tracing** functionality by implementing syscalls in teaching OS
- Implemented memory management methods **mmap**, **munmap** and **mprotect** and wrapper syscalls **memalloc** and **memfree**
- Developed page-fault handler for **lazy allocation** and copy - on - write fault handler for efficient memory management on **fork**

What's Next — *Jan'23 – Apr'23*
Course Project, Software Developement and Operations [*Github*]

- Collaborated in a team to develop an **upcoming campus events** display and management web app using **MERN stack**
- Added support for features like bookmarks, notifications, clash detection and integrated payement portal for venue booking
- Drafted **Design, Implementation** and **Test documents** and executed **Unit, Integration and System Testing**

CSE-BUBBLE — *Mar'23 – Apr'23*
Course Project, Computer Architecture [*Github*]

- Designed and implemented a fully functional **processor** in **Verilog HDL** capable of executing a subset of **MIPS ISA**
- Developed custom op-code formats for **R−, I− and J− type instructions** executing them using single cycle execution
- Simulated the processor by executing machine code for **Bubble Sort** stored in instruction memory to sort an integer array

Miscellaneous

- Mentored 15 mentees in **MERN Stack** Project and 9 mentees in **Graph Theory and Applications** project at ACA, IITK
- **Senior Executive**, Public Relations team at Techkriti'23

Relevant Courses

*A** :Outstanding *i*: Ongoing

Data Structures & Algorithms (A*)	Advanced Algorithms (A*)	Randomized Algorithms (A*)	Machine Learning
Probabilistic Machine Learning (A*)	Linear Algebra and ODE (A*)	Discrete Mathematics (A*)	Probability for CS
Fundamentals of Computing (A*)	Computer Organization (A*)	Operating Systems	Compiler Design
Software Development and Operations	Logic for Computer Science (A*)	Intro to Electronics	Real Analysis
Principles of Database Systems^i	Computer Systems Security^i	Data Mining^i	Complex Analysis^i