Scholastic Achievements

- Secured **All India Rank 4**, State Rank 2 in the Grade 10 **ICSE** Examination out of **170,000** students *(2016)*
- Achieved **All India Rank 5** in the **CBSE** Board Examinations (Grade 12) out of **1.2 million** candidates (**Overall** *East Zone Topper* and *All India Rank 3* in the Science Stream) *(2018)*
- Only student to receive the **Advanced Performance**(AP) grade in **Computer Programming** & **Utilization** and amongst the **top 3** in the **Biology** course*(Molecular, Physical and Biomedical modules) out of **500+** students (2018-19)*
- Awarded **AP grade** in **Advanced Calculus** (*top* **12** *out of* **1000+** students) for *exemplary* performance *(2018)*
- Attained a Semester Performance Index (**SPI**) of **perfect 10** in the First, Fourth and Fifth Semesters *(2018, 2020)*
- Among the **top 12** students to be granted **Change of Branch**/Major to Computer Science *(2019)*
- Offered **Computer Science** at the National University of Singapore (**NUS**) with **100 %** scholarship *(2018)*

Scholarships and Recognition

- Bagged the **Institute Academic Award**, given to the **Top 25** out of a batch of 1000+ students for *exceptional* academic performance in the first year of Undergraduate Study at IIT Bombay *(2018-19)*
- Bestowed with the **KVPY** (Kishore Vaigyanik Protsahan Yojna) Fellowship, given to the talented young minds in the field of Science and Technology, by Department of Science and Technology, Govt. of India *(2018)*
- Felicitated by **The Governor of West Bengal**, with the *Mamraj Agarwal Rashtriya Puraskar* for exemplary performance in the ICSE and by *Mr. S.K.Birla*, industrialist & trustee of Birla High School with a **Gold** medal *(2016, 2018)*
- Received a **Letter of Appreciation** from Ms. Mamata Banerjee, Chief Minister of West Bengal for *exemplary* performance in the CBSE Examinations along with the *Swami Vivekananda Scholarship* for *Undergraduate Study* *(2018)*
- Granted the *Ramawatar Gupt Pratibha Puraskar* and a cash award by **Sanmarg Foundation** for securing **99**% in Hindi in the ICSE, the **Times of India EduShine** for stupendous performance in the Grade 12 Board *(2016, 2018)*
- Recipient of the **Udbhav Poddar Memorial** Prize and the Dr. **RS Pandey Proficiency** *Silver Medal* for securing the **highest marks** in the country in Mathematics and Hindi respectively, in the ICSE Examinations *(2016)*

Internship and Research Experience

Software Development Intern *(Dec '20 - Jan '21)*
Guide: Mr. Sachin Korgaonkar (Project Manager) Motilal Oswal Financial Servies Ltd.

- Designed an HR **Compliance portal** with different functions for different user types, using C#, Asp.Net and Ms-Sql
- Features: add/edit user and document category details, upload documents in each category and view them in a repository

Computational Linguistics (COLING) Conference, 2020 NLP Conference | *(July - Dec '20)*

- **Textgraphs-14**: Shared Task on **Multi-Hop Inference** for **Explanation Regeneration**:
  - Co-authored a **publication**, developed methods to reconstruct the explanation graph for elementary science questions
  - Developed a model with an improvised Information Retrieval using tf-idf vectorizer to rank all explanations in the dataset
  - Designed a unique *re-ranker* using **BERT**, *RoBERTa* & *SciBERT*, got 0.5061 Map score and were ranked **4th**

Research Intern — Cryptography *(April - May '20)*
Guide(s): Prof. Steve Kremer and Jannik Dreier INRIA, Nancy, France

- Formal **Verification** of *security protocols*:
  - Studied operational semantics, equivalence properties (in the *applied pi calculus* and the **Tamarin** prover) and the **SAPIC** plugin (tool translating high level protocols to multiset rewrite rules, *analyzable* by Tamarin)
  - Introduced the notion of biprocesses (*semantics and translation*) and **diff equivalence** in SAPIC, and worked on the **soundness proof** of the translation after the addition

Quantitative Research Analyst *(Dec '19 - Jan '20)*
Guide(s): Prof. Prasanna Tantri, Prof. Nitin Kumar and Ravi Ranjan Indian School of Business, Hyderabad

- **Deep Learning:** *Applying **NLP** techniques to **Time Series Analysis** for Stock Futures :*
  - Designed an intuitive approach for storing the stock history in vector form using a Ticker **Embedding Model**. Incorporated technical indicators such as Momentum, Trailing Volatility, Asset Class and average return per asset class
  - Designed and implemented an **LSTM** classifier (using **PyTorch**) to forecast the trend of **Expected Returns**
  - Expanded the LSTM to incorporate **attention**, and **retrain** over latest data *while testing*
  - Optimized the hyperparameters using libraries: Ray for **Grid Search** and Hyperopt for **Bayesian** optimization
- **Trading Algorithms:** *Implementation* and *back-testing* using **Python**
  - Implemented the **Pairs**, **Betting against** β and **Momentum** trading algorithms on the Nifty-200 stocks
  - Experimented with daily, weekly and monthly *rebalancing* of equally weighted and value weighted portfolios
- Awarded a **Letter of Recommendation** for *exceptional* performance shown throughout the internship

Data Analytics Intern *(June - July '19)*
Guide: Mr. Amit Ambekar (Vice President, Marketing) Spencer's Retail Ltd.- RPSG group
- *Analysis of underperforming stores given all KPIs and SKU (Stock Keeping Units) level data*: **Statistical Analysis** of transactional & brick level data to attribute reasons for de-growth in the *MGF Gurgaon* and *Vizag* hyper stores
- Given all category **KPIs**, *deep dived* into SKU level performance to come up with solutions to **counter degrowth**

Machine Learning Intern *(May - June '19)*
Guide: Prof. Vipul Arora Indian Institute of Technology, Kanpur
- *Analysis of ML Algorithms for Spam Email Classification in Python*: Anaylzed SVMs and Neural Networks before implementing **Naive Bayes** and **KNN** on numerous data sets using *Keras*, Pandas, Numpy and *Scikit-learn*

Software Engineering Intern *(Nov - Dec '18)*
Guide: Mr. Mohsin Ali (Project Manager) Citytech Software Pvt. Ltd.
- Configured and enhanced a **chatbot** for Employee Leave Applications using **Microsoft LUIS** after a *comparative study* with *Google Dialog Flow*. Helped in introducing *Voice to Text feature* (using Bing API) from Microsoft Azure
- Researched on **Human Resource Automation** and developments in *Google Assistant, IBM Watson, Alexa and Cortana*

Projects & Key Assignments

Buffer Overflow Attacks and Defenses | *Computer Architecture* Course Project | *(Sept - Dec '20)*
- Demonstrated the Stack and Heap based buffer overflow exploits and the special cases: Return to LibC, Off by One and Use after Free using **C** & **x86**. Performed a detailed case study on the Code Red Worm which was based on buffer overflow

Google Forms and Survey Management | *Software Systems* Course Project | *(Sept - Nov '19)*
- Designed own Form and Survey Management system like Google Forms with **user authentication**
- Allowed *modular* question design (paragraph, file upload, dropdown, checkbox, radio button), form validation (constraints on answers like alphanumeric, range, email-ID, .pdf only), adding **collaborators** and shareable forms (surveys & quizzes)
- Data analyzable by plotting of numerics (**Matplotlib**), learning dependencies in responses and summarized presentation of subjective answers. Used **Django** for backend, **Sqlite3** for database structure, **Bootstrap** for responsiveness

Sentiment Analysis by BERT Self Project | *(July '20)*
- Achieved **91 %** accuracy in predicting positive/negative sentiments on the **IMDB** reviews dataset
- Used BERT from the Hugging Face *transformers* library and **Pytorch** for preprocessing and funetuning the model

Other Course Projects
- **File System**: Emulated a disk over a text file with the superblock, inode and data blocks. Implemented a file system on the emulated disk with basic operations like open/close/read and write
- **Copy-on-Write Fork in xv6**: Implemented the CoW fork which allocates new memory pages only on modification
- **Custom Memory Manager**: Implemented a memory manager to allocate and deallocate memory dynamically. Extended the allocator to be elastic and map pages only on demand
- **Scheduler in xv6**: Modified the current scheduler in xv6 to consider user-defined process priorities. Used priorities as weights to implement a weighted round robin scheduler, while taking care of starvation
- **Custom Linux Shell**: Built a shell in **C** with support for background, serial & parallel processes, and kill signal & exit
- **Pure Numpy Implementation of CNN**: Implemented the Fully Connected, Convulution, Avg and Max Pooling layers in pure numpy. Trained the model on the MNIST and CIFAR10 datasets to achieve accuracies of 94% & 53% respectively
- **Spanning Tree Protocol**: Simulated the network bridge topology as a *distributed system* of nodes, communicating via messages, in **C++**. Configured nodes to run the protocol and agree upon a *loop-less topology* to prevent a *broadcast storm*
- **SAT Solver**: Designed a SAT Solver using **z3 in Python**, to check satisfiability in CNF (Conjunctive Normal Form). Solved the *NQueens, Sudoku* and *Graph Colouring* problems with the solver, using **DPLL** (a backtracking algorithm)
- **Efficient Memory Allocator**: Designed a simulator in **C++** for efficient dynamic memory allocation of processes using the **first-fit** *strategy*. Handled allocation, deallocation & termination requests for upto 10^6 process requests simultaneously
- **Non Parametric Estimation**: Compared methods of histogramming & Kernel Density Estimation, anaylzed *rate of convergence*. Implemented **Cross Validation** in **MATLAB** (*bandwidth selection* giving maximum joint likelihood)

PCA for Fruit Image Generation and MNIST | *Data Analysis* Course Project | *(Oct - Nov '19)*
- Plotted closest representations of RGB fruit images, using *Principal Component Analysis*, fitting a *MultiVariate Gaussian*. Generated new images by random sampling (representative of the dataset), using the closest representations, in **MATLAB**
- Performed *Principal Component Analysis* on the MNIST dataset to visualize principal modes of variation (*MultiVariate Gaussian* fitting), in **MATLAB**, decided on number of *degrees of freedom* of digits and inferred handwriting tendencies.

Positions of Responsibility

Teaching Assistant | *CS 101 - Computer Programming & Utilization* | *Prof. Purushottam Kulkarni* *(July - Nov '19)*
- **Only sophomore** to be selected for TA-Ship on the basis of **academic prowess** in the subject. Involved in teaching and assisting students within and outside lab hours, with problems and conceptual doubts on a **one-to-one basis**

Interact Coordinator — Community Service | *Rotary Club of Calcutta Visionaries* *(2017-18)*
- Coordinated **blood camps, health camps**, eye camps, newspaper collection drives, **organised sports** for *village children* in the Sunderbans. Conducted free **computer classes** for *underpriveleged* children of Sambhu Sadan Vidayala, Kolkata

Events Coordinator, Techfest | *Asia's largest Science and Technology Festival* IIT Bombay | *(2019-20)*
- Spearheaded a team of **15+** in conceptualizing and organizing **Technoholix**, featuring *International* performances. Organized **PAN India** workshops on investment education with *NISM, NSE & SEBI*, under the *Financial Literacy Initiative*

Technical Skills

Languages	C++, Python, Java, C#, Bash, Matlab, Vhdl
ML Libraries	Pytorch, Keras, TensorFlow, Scikit-Learn, Ray, Hyperopt, Rouge, Grobid
Web Tools	HTML5, CSS3, Javascript, Bootstrap, Django, Sqlite3, Ms-Sql, Asp.Net
Software Tools	Git, LaTeX, Sed, Awk, Makefiles, Scipy, ns3, Wireshark, Proverif