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Education

- 2018 - **Bachelor of Technology in Computer Science and Engineering**
Present *Indian Institute of Technology Bombay, Mumbai, India*
Cumulative GPA : 9.66 / 10.00
- 2016 - 2018 **All India Senior School Certificate Examination**
Central Board of Secondary Education (CBSE) Board Examinations, Grade 12
Birla High School, Kolkata, Percentage : 99%
- 2003 - 2016 **Indian Certificate of Secondary Education**
ICSE Board Examinations, Grade 10
La Martiniere for Boys, Kolkata, Percentage : 98.67%

Scholastic Achievements

- 2016 Secured **All India Rank 4**, State Rank 2 in the Grade 10 **ICSE** Examination out of **170,000** students
- 2018 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)
- 2019 Only student to be awarded the **Advanced Performance grade (AP)** for *extraordinary performance* in the **Computer Programming and Utilization** course out of 528 students
- 2018 Awarded **AP grade** in **Advanced Calculus** (given to the top 12 students out of 1032) and in the **Biology** course consisting of *Molecular, Physical and Biomedical modules* (top 3 students out of 502)
- 2018, 2020 Attained a Semester Performance Index (**SPI**) of **perfect 10** in the First, Fourth, Fifth and Sixth (CS) Semesters
- 2019 Among the **top 12** students to be granted **Change of Branch**/Major to Computer Science
- 2018 Offered **Computer Science** at the National University of Singapore (**NUS**) with **100 %** scholarship

Internship and Research Experience

- May - July **Software Engineering Intern** MICROSOFT IDC, HYDERABAD
2021 *One Fleet Autopilot Team, Azure Compute Group* CLOUD + ARTIFICIAL INTELLIGENCE
- As part of an exercise to consume datacenter inventory in a unified format, updated a critical tool used by Autopilot teams, tenants and services to enumerate fault domains for servers in different datacenters to support both inventory formats in use today while migration from one to the other. In addition, added access from both developer and production machines. Used **C#, C++/CLI** and **C++** and Cockpit (for querying)
- Dec - Jan **Software Development Intern** MOTILAL OSWAL FINANCIAL SERVICES LTD.
2020-21 *Guide: Mr. Sachin Korgaonkar (Project Manager)*
- Designed an **HR Compliance portal** with functions for different user types, using **C#, ASP.NET & MS-SQL**
 - Features: add/edit user and document category details, upload documents in each category and view in repository
- July - Dec **Computational Linguistics (COLING) Conference, 2020** NLP CONFERENCE, BARCELONA
2020 **Textgraphs-14: Shared Task on Multi-Hop Inference for Explanation Regeneration:**
- Co-authored a **publication**, developed methods to reconstruct gold explanations for elementary science questions
 - Developed a model with an improvised Information Retrieval using tf-idf 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**
- Apr - May **Research Intern | Cryptography** INRIA, NANCY, FRANCE
2020 **Formal Verification** of security protocols: *Guide(s): Prof. Steve Kremer and Jannik Dreier*
- Studied operational semantics and 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

Dec - Jan 2019	Quantitative Research Analyst <i>Guide(s): Prof. Prasanna Tantri, Prof. Nitin Kumar and Ravi Ranjan</i>	INDIAN SCHOOL OF BUSINESS, HYDERABAD
	DEEP LEARNING : Applying NLP techniques to Time Series Analysis for Stock Futures : <ul style="list-style-type: none"> Designed an intuitive approach for storing the stock history as a vector 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 <i>while testing</i> Optimized the hyperparameters using libraries: Ray for Grid Search and Hyperopt for Bayesian optimization Awarded a Letter of Recommendation for exceptional performance shown throughout the internship 	
	TRADING ALGORITHMS: <i>Implementation</i> and back-testing using Python <ul style="list-style-type: none"> Implemented the Pairs, Betting against β and Momentum trading algorithms on the Nifty-200 stocks Experimented with daily, weekly and monthly <i>rebalancing</i> of equally weighted and value weighted portfolios 	
June - July 2019	Data Analytics Intern <i>Guide: Mr. Amit Ambekar (Vice President)</i>	SPENCER'S RETAIL LTD.- RPSG GROUP
	<ul style="list-style-type: none"> Statistical Analysis of transactional & brick level data of the underperforming stores, to understand and attribute reasons for de-growth, using Pandas, Sqlite and the various graph visualizations in Matplotlib Given all the KPIs with respect to category, deep dived into individual SKU level performance to come up with solutions to counter degrowth, in the <i>MGF Gurgaon Hyper</i> store and the <i>Vizag Hyper</i> store 	
May - June 2019	Machine Learning Intern Analysis of ML Algorithms for <u>Spam Email Classification</u> in Python: <ul style="list-style-type: none"> Analyzed KNN, Naive Bayes, SVMs and Neural Networks and finally implemented Naive Bayes and KNN for the classification of various data sets into spam and ham using <i>Keras</i>, <i>Pandas</i>, <i>Numpy</i> and <i>Scikit-learn</i> 	INDIAN INSTITUTE OF TECHNOLOGY, KANPUR <i>Guide: Prof. Vipul Arora</i>
Nov - Dec 2018	Software Engineering Intern <i>Guide: Mr. Mohsin Ali (Project Manager)</i>	CITYTECH SOFTWARE PVT. LTD.
	<ul style="list-style-type: none"> Configured and enhanced a chatbot for Leave Applications using Microsoft LUIS after a <i>comparative study</i> with <i>Google Dialog Flow</i>. Helped in introducing <i>Voice to Text</i> feature (using Bing API) from Microsoft Azure Research on Human Resource Automation & developments in <i>Google Assistant</i>, <i>IBM Watson</i>, <i>Alexa</i> & <i>Cortana</i> 	

Key Technical Projects

Database and Information Systems	Restaurant Management System <ul style="list-style-type: none"> Created a GUI website application for a Restaurant Management System with cookie based login authentication The application creates an ordering pipeline (order, cook, serve) that simulates a real-world restaurant system A customer can view recommended dishes, filter dishes based on cuisine and place orders, chef/waiter can complete the orders. The owner can update inventory, employee information, allot orders and can view analytics and graphs on top dishes, employees, statistics on profits, expenditure & wastage (filterable on date ranges) Used MVC architecture in NodeJS (Express), PostgreSQL, Bootstrap, ChartJS, html2pdf.js 	PROF. UMESH BELLUR (Mar - May '21)
Compilers	Sclp Compiler <ul style="list-style-type: none"> Created a C-like compiler from scratch using lex and yacc Implemented the scanning, parsing, Abstract Syntax Tree (AST), Three Address Code (TAC) and Register Transfer Language (RTL) stages for input programs with visibility of output of each intermediate stage. Supports assignments, functions, complex expressions, control flow structures with all data types and operations Ensured illegal tokens, syntax errors, semantic errors are reported 	PROF. UDAY KHEDKAR (Jan - Apr '21)
Computer Architecture	Buffer Overflow Attacks and Defenses <ul style="list-style-type: none"> Demonstrated the Stack and Heap based buffer overflow exploits and the special cases: Return to LibC, Off by One, Use after Free using C & x86. Performed a detailed case study on the Code Red Worm (buffer overflow based) 	PROF. BERNARD MENEZES (Sept - Dec '20)
Software Systems	Google Forms and Survey Management <ul style="list-style-type: none"> Designed own Form and Survey Management system like Google Forms with user authentication Allowed <i>modular</i> question design (paragraph, file upload, dropdown, checkbox, radio button), form validation (constraints like alphanumeric, range, email-ID, .pdf only), adding collaborators and shareable forms (surveys) Data analyzable by numeric plotting (Matplotlib), learning dependencies in responses and summaries of subjective answers. Used Django for backend, Sqlite3 for database structure, Bootstrap for responsiveness 	PROF. AMITABHA SANYAL (Sept - Nov '19)
Natural Language Processing	Sentiment Analysis by BERT <ul style="list-style-type: none"> Achieved 91 % accuracy in predicting positive/negative sentiments on the IMDB reviews dataset Used BERT from the Hugging Face <i>transformers</i> library and Pytorch for preprocessing and funetuning the model 	SELF PROJECT (July '20)
Operating Systems	File System <ul style="list-style-type: none"> 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 	PROF. MYTHILI VUTUKURU (Oct - Nov '20)
Operating Systems	Custom Linux Shell <ul style="list-style-type: none"> Built a shell in C with support for background, serial & parallel processes, and kill signal & exit 	PROF. MYTHILI VUTUKURU (Aug '20)

Machine Learning	Pure Numpy Implementation of CNN	PROF. GANESH RAMAKRISHNAN (Nov - Dec '20)
	<ul style="list-style-type: none"> Implemented the Fully Connected, Convolution, Avg and Max Pooling layers in pure numpy. Trained the model on the MNIST and CIFAR10 datasets to achieve accuracies of 94% & 53% respectively 	
Computer Networks	Distributed Spanning Tree Protocol	PROF. VARSHA APTE (Feb - Mar '20)
	<ul style="list-style-type: none"> Simulated the network bridge topology as a <i>distributed system</i> of nodes, communicating via messages, in C++ Configured nodes to run the protocol and agree upon a <i>loop-less</i> logical topology to prevent a <i>broadcast storm</i> 	
Logic for CS	SAT Solver	PROF. ASHUTOSH GUPTA (Jan - Feb '20)
	<ul style="list-style-type: none"> Designed a SAT Solver using z3 in Python, to check satisfiability in CNF (Conjunctive Normal Form) Solved the <i>NQueens</i>, <i>Sudoku</i> and <i>Graph Colouring</i> problems with the solver, using DPLL (backtracking algorithm) 	
Data Analysis	PCA for Fruit Image Generation and MNIST	PROF. SUYASH AWATE (Oct - Nov '19)
	<ul style="list-style-type: none"> Plotted closest representations of RGB fruit images, using <i>PCA (MultiVariate Gaussian fitting)</i>. Generated new images by random sampling (representative of the dataset), using the closest representations, in MATLAB Performed <i>PCA</i> on the MNIST dataset to visualize principal modes of variation (<i>MultiVariate Gaussian fitting</i>), in MATLAB, decided on number of <i>degrees of freedom</i> of digits and inferred handwriting tendencies. 	
Data Analysis	Non Parametric Estimation & Cross Validation	PROF. AJIT RAJWADE (Sept - Oct '19)
	<ul style="list-style-type: none"> Compared non parametric methods (histograms & Kernel Density Estimation), analyzed the <i>rate of convergence</i> Implemented Cross Validation in MATLAB (<i>bandwidth selection</i> giving maximum likelihood & minimum deviation) 	

Technical Skills

Languages	C++, PYTHON, JAVA, C#, C++/CLI, BASH, MATLAB
ML Libraries	PYTORCH, KERAS, TENSORFLOW, SCIKIT- LEARN, RAY, HYPEROPT, ROUGE
Web Tools	HTML5, CSS3, JAVASCRIPT, BOOTSTRAP, DJANGO, SQLITE3, MS-SQL, ASP.NET, NODE.JS
Tools and Softwares	GIT, L ^A T _E X, AUTOCAD, SED, AWK, MAKEFILES, CMAKE, SCIPY, YAML, TOML, NS3, Z3, WIRE-SHARK, PROVERIF, TAMARIN, SAPIC, GROBID, BEAUTIFUL SOUP, NEO4J, SPARK

Scholarships and Recognition

2018 - 19	Bagged the Institute Academic Award , given to the Top 25 out of a batch of 1000+ students for <i>exceptional</i> academic performance in the first year of Undergraduate Study at IIT Bombay
2018	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
2016, 2018	Felicitated by The Governor of West Bengal , with the <i>Mamraj Agarwal Rashtriya Puraskar</i> for exemplary performance in the ICSE and by <i>Mr. S.K.Birla</i> , industrialist & trustee of Birla High School with a Gold medal
2018	Received a Letter of Appreciation from Ms. Mamata Banerjee, Chief Minister of West Bengal for <i>exemplary</i> performance in the CBSE Examinations along with the <u><i>Swami Vivekananda Scholarship for Undergraduate Study</i></u>
2016, 2018	Granted the <i>Ramawatar Gupt Pratibha Puraskar</i> and a cash award by Sanmarg Foundation for securing 99% in Hindi in the ICSE Examinations, the Times of India EduShine for stupendous performance in the Grade 12 Board
2016	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

Positions of Responsibility

Ongoing	Teaching Assistant	CS347 + CS333 - Operating Systems
May 2021 - Present	Department Academic Mentor	IIT Bombay
	<ul style="list-style-type: none"> Responsible for guiding eight sophomore students through their academics and curriculum 	
Jul - Nov 2019	Teaching Assistant	CS101 - Computer Programming and Utilization
	<ul style="list-style-type: none"> Selected based on academic prowess in the subject. Involved in teaching and assisting students within and outside lab hours, with problems, conceptual doubts and other clarifications on a one-to-one basis 	
2017-18	Interact Coordinator — Community Service	Rotary Club of Calcutta Visionaries
	<ul style="list-style-type: none"> Coordinated blood camps, health camps, eye camps, newspaper collection drives Organised sports for <i>village children</i> in Lakshya Bagan, Sunderban, West Bengal Conducted free computer classes for <i>underprivileged</i> children of Sambhu Sadan Vidayala, Kolkata 	
2020	Events Coordinator, Techfest	IIT Bombay
	<ul style="list-style-type: none"> Spearheaded a team of 15+ in conceptualizing and organizing Technoholix, featuring performances and concerts from renowned International performers, and a part of the <i>Techfest World MUN 2020</i> team Involved in organizing PAN India workshops about investment education along with NISM, NSE and SEBI as a part of the <i>Financial Literacy Initiative</i> to promote financial literacy among the youth 	