Devansh Chandak

Third Year Undergraduate
Computer Science and Engineering
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Education

2018 - Present **Bachelor of Technology in Computer Science and Enginnering**
Indian Institute of Technology Bombay, Mumbai, India
Cumulative GPA : 9.52 / 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 Attained a Semester Performance Index (**SPI**) of **perfect 10** in the First Semester

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

Apr - May 2020 **Research Intern** | ***Cryptography*** INRIA, Nancy, France
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 - 20 **Quantitative Research Analyst** Indian School of Business, Hyderabad
Guide(s): Prof. Prasanna Tantri, Prof. Nitin Kumar and Ravi Ranjan

Deep Learning : Applying **NLP** techniques to **Time Series Analysis** for Stock Futures :

- Designed and implemented an intuitive approach to storing the history of a stock in the form of a vector using a Ticker Embedding Model, similar to that in a Word Embedding model
- Incorporated a number of technical indicators such as Momentum, Trailing Volatility, Asset Class and average return across each asset class along with these embeddings for time series analysis
- Designed, trained and tested an **LSTM** classifier (built using **PyTorch**) on a time series of multiple stock tickers to predict the Expected Return and to study non linearity and inter asset class correlation
- Expanded the base LSTM to incorporate **attention**, and *retrain* over the latest data *while testing*
- 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: Implementation in **Python** :

- Worked towards developing, modifying and implementing **PAIRS**, **Betting against Beta** and **Momentum** trading algorithms on the Indian Stock market at the NSE Trading Lab
- Beta was calculated by regression on the **CAPM** equation with a 6 month rolling window :
  - The strategy was implemented with daily, weekly and monthly *rebalancing* of the portfolio
  - Performed and anaylzed the difference in output on equal weighted and value weighted portfolios
- Modified the PAIRS strategy on a rolling window of 1 year with 12% CAGR and 0.71 overall Sharpe
- Researched the intricacies in Pitroski's F-Score, Mohanram's G-Score, Accruals, PEAD and Momentum crashes

June - July 2019 **Data Analytics Intern** — Spencer's Retail Ltd.- RPSG group
Guide: Mr. Amit Ambekar (Vice President)
- **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, used **deep dive** into individual SKU level performance to come up with solutions to counter degrowth, in the *MGF Gurgaon Hyper* store and the *Vizag Hyper* store

May - June 2019 **Machine Learning Intern** — Indian Institute of Technology, Kanpur
Analysis of ML Algorithms for Spam Email Classification in Python: *Guide: Prof. Vipul Arora*
- 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 *Keras*, Pandas, Numpy and *Scikit-learn*
- Compared accuracies for various data sets and **categorised the best method** for each data set

Nov - Dec 2018 **Software Engineering Intern**
Guide: Mr. Mohsin Ali (Project Manager) — Citytech Software Pvt. Ltd.
- Configured and enhanced a **chatbot** for Paylite Leave Application using the **Microsoft LUIS** platform
- Helped in introducing VOICE to TEXT feature (using Bing API) from Microsoft Azure
- Research on **Human Resource Automation** and **comparative study** between *LUIS*, *Google Dialog Flow* and other developments in *Google Assistant, IBM Watson, Alexa and Cortana*

Projects & Key Assignments

COLING 2020 **Textgraphs-14 | COLING** — NLP Conference Workshop | *(July '20 - Present)*
Shared Task on **Multi-Hop Inference for Explanation Regeneration:**
- Optimizing the *tf.idf* baseline to construct gold explanations for science questions, using the WorldTree corpus
- Linking facts based on **lexical overlap** to select *next-hop* explanations, using **BERT** for reranking

EMNLP 2020 **Scholarly Document Processing | EMNLP** — NLP Conference Workshop | *(Apr '20 - Present)*
LongSumm: Shared Task for *Generating long summaries* of scientific documents:
- Parsed PDFs to extract individual sections of scientific papers using GROBID and *Beautiful Soup*, in **Python**
- Combining *abstractive* & *extractive* summarization and exploring *Reinforcement Learning* techniques
- Used ROUGE between sentences in target summary and document, to generate target sectional summaries
- Building models based on **PreSumm** (**SciBERT** with pretrained encoders), to summarize each section seperately

Computer Networks **Distributed Spanning Tree Protocol** — prof. varsha apte | *(Feb - Mar '20)*
- 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* logical topology to prevent a *broadcast storm*

Logic for CS **SAT Solver** — prof. ashutosh gupta | *(Jan - Feb '20)*
- Designed a SAT Solver using **z3 in Python**, to check satisfiability in CNF (Conjunctive Normal Form)
- Solved the *NQueens and Sudoku* problems with the designed solver, using **DPLL** (a backtracking algorithm)

Software Systems **Google Forms and Survey Management** — prof. amitabha sanyal | *(Sept - Nov '19)*
- Designed own Form and Survey Management system like the Google Forms with own **user authentication**
- Allowed for *modular* design of questions (single and multi line, file upload, drop down, checkbox, radio button, rating scale and toggle) and form validation (can give constraints on each answer such as alphanumeric, numeric, range, email-ID, .pdf only), and added a feature of adding **collaborators** to your form
- Developed shareable forms, useable as surveys and quizzes. Data acquired is analyzed by plotting of numerics (using **Matplotlib**), learning dependencies among responses and summarized presentation of subjective answers
- Used **Django** for backend, **Sqlite3** for the database structure, **Bootstrap** for responsiveness

Data Structures and Algorithms **Efficient Memory Allocator** — prof. ajit diwan | *(Aug - Sept '19)*
- Designed a simulator in **C++** for the efficient dynamic allocation of memory to a large number of processes
- Utilized the **first-fit strategy** to decide the locations at which memory should be allocated
- Handled allocation, deallocation and termination requests for upto 10^6 requests simultaneously

Data Analysis **Fruit Image Generation and PCA** — prof. suyash awate | *(Oct - Nov '19)*
- *Principal Component Analysis* was performed on RGB images of 100 fruits, and the closest representations were plotted, in **MATLAB**, using the mean and the four eigenvectors corresponding to the four most significant eigenvalues of the covariance matrix. A *MultiVariate Gaussian* was fitted on the entire dataset
- New Fruit images were generated by random sampling, using the closest representations, which were distinct from any fruit in the dataset, but representative of the dataset

Data Analysis **PCA on MNIST data** — prof. suyash awate | *(Oct - Nov '19)*
- Given the MNIST dataset, **Principal Component Analysis** was performed on the images of each digit to visualize their principal modes of variation about the mean (by fitting a *MultiVariate Gaussian*) in **MATLAB**
- The number of principal eigenvalues were found, to decide on the number of *degrees of freedom* of each digit
- Attributed reasons to why the number of significant eigenvalues are far lesser than total, and also concluded behavioural patterns in writing digits based on the principal modes of variation

Data Analysis **Non Parametric Estimation & Cross Validation** PROF. AJIT RAJWADE | *(Sept - Oct '19)*

- Compared various non paramteric estimation techniques like histogramming and Kernel Density Estimation and anaylzed the *rate of convergence* and their optimum value
- Implemented the Cross-Validation procedure in **MATLAB** by finding out the bandwidth parameter which gives the maximum joint likelihood and a minimum deviation between the empirical and the actual PDF

Software Systems **Image Reconstruction & Compression** PROF. AMITABHA SANYAL | *(Aug '19)*

- Transformed **distorted** images by cleaning out noises such as *salt and pepper* noise using **Numpy** & **Scipy**
- Used *KMeans++* algorithm to flatten out coloured images across several K values to get the **Enhanced** Image

Scholarships and Recognition

2018 - 19 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 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 *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

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*

2016, 2018 Granted the *Ramawatar Gupt Pratibha Puraskar* 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

Jul - Nov 2019 **Teaching Assistant**
CS 101 - Computer Programming and Utilization under Prof. Purushottam Kulkarni IIT BOMBAY

- **Only sophomore** to be selected for the TA-Ship on the basis of 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 ROTARY INTERNATIONAL

- Coordinated **blood camps, health camps**, eye camps, newspaper collection drives
- **Organised sports** for *village children* in Lakshya Bagan, Sunderban, West Bengal
- Conducted free **computer classes** for *underpriveleged* children of Sambhu Sadan Vidayala, Kolkata

Apr 2019 - Jan 2020 **Events Coordinator, Techfest**
Asia's largest Science and Technology Festival, footfall of 175,000 + IIT BOMBAY

- Spearheaded a team of **15+** in conceptualizing and organizing **Technoholix**, featuring performances and concerts from renowned **International** performers, and a part of the *Techfest World MUN* 2020 team
- Involved in organizing **PAN India** workshops about investment education along with **NISM, NSE and SEBI** as a part of the *Financial Literacy Initiative* to promote financial literacy among the youth

Technical Skills

Languages C++, PYTHON, JAVA, BASH, MATLAB

ML Libraries PYTORCH, KERAS, TENSORFLOW, SCIKIT- LEARN, RAY, HYPEROPT, ROUGE

Web Tools HTML5, CSS3, JAVASCRIPT, BOOTSTRAP, DJANGO, SQLITE3, MARKDOWN

Tools and Softwares GIT, LaTeX, AUTOCAD, SED, AWK, MAKEFILES, CMAKE, SCIPY, YAML, TOML, NS3, Z3, WIRESHARK, PROVERIF, TAMARIN, SAPIC, GROBID, BEAUTIFUL SOUP

Key Courses Undertaken

Computer Science and Mathematics Data Structures and Algorithms, Discrete Structures, Algorithm Design , Abstractions & Paradigms, Data Analysis and Interpretation, Software Systems, Computer Programming & Utilization, Computer Networks, Digital Logic Design, Logic for CS, Calculus, Linear Algebra, Differential Equations

Others Quantum Physics, Electricity and Magnetism, Biology, Introduction to Electrical and Electronics Circuits