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 : 9.62 / 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 and Fifth 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

Dec - Jan 2020-21 **Software Development Intern** — Motilal Oswal Financial Servies Ltd.
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 2020 **Computational Linguistics (COLING) Conference, 2020** — NLP Conference
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 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 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 *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* 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

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, **deep dived** 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*

Nov - Dec 2018 **Software Engineering Intern**
Guide: Mr. Mohsin Ali (Project Manager) CITYTECH SOFTWARE PVT. LTD.
- Configured and enhanced a **chatbot** for 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
- Research on **Human Resource Automation** & developments in *Google Assistant, IBM Watson, Alexa & Cortana*

Projects & Key Assignments

Computer Architecture **Buffer Overflow Attacks and Defenses** PROF. BERNARD MENEZES | *(Sept - Dec '20)*
- 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)

Software Systems **Google Forms and Survey Management** PROF. AMITABHA SANYAL | *(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 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

Natural Language Processing **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

Operating Systems **File System** PROF. MYTHILI VUTUKURU | *(Oct - Nov '20)*
- 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

Operating Systems **Copy-on-Write Fork in xv6** PROF. MYTHILI VUTUKURU | *(Oct '20)*
- Implemented the CoW fork which allocates new memory pages only on modification by the child/parent

Operating Systems **Custom Memory Manager** PROF. MYTHILI VUTUKURU | *(Sept - Oct '20)*
- Implemented a memory manager to allocate and deallocate memory dynamically. Extended the allocator to be elastic and map pages only on demand

Operating Systems **Scheduler in xv6** PROF. MYTHILI VUTUKURU | *(Sept '20)*
- 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

Operating Systems **Custom Linux Shell** PROF. MYTHILI VUTUKURU | *(Aug '20)*
- Built a shell in **C** with support for background, serial & parallel processes, and kill signal & exit

Machine Learning **Pure Numpy Implementation of CNN** PROF. GANESH RAMAKRISHNAN | *(Nov - Dec '20)*
- 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

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, Sudoku* and *Graph Colouring* problems with the solver, using **DPLL** (backtracking algorithm)

Data Structures, Algorithms **Efficient Memory Allocator** PROF. AJIT DIWAN | *(Aug - Sept '19)*
- Designed a simulator in **C++** for efficient dynamic memory allocation of processes using the **first-fit strategy**
- Handled allocation, deallocation and termination requests for upto 10^6 process requests simultaneously

Data Analysis — **PCA for Fruit Image Generation and MNIST** — PROF. SUYASH AWATE | *(Oct - Nov '19)*

- Plotted closest representations of RGB fruit images, using *PCA* (*MultiVariate Gaussian* fitting). Generated new images by random sampling (representative of the dataset), using the closest representations, in **MATLAB**
- Performed *PCA* 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.

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

- Compared non parametric methods (histograms & Kernel Density Estimation), anaylzed the *rate of convergence*
- Implemented Cross Validation in **MATLAB** (*bandwidth selection* giving maximum likelihood & minimum deviation)

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 Vidyala, 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, C#, BASH, MATLAB

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

Web Tools — HTML5, CSS3, JAVASCRIPT, BOOTSTRAP, DJANGO, SQLITE3, MS-SQL, ASP.NET

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 & Math — 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