Nitin Garg

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EDUCATION

Indian Institute of Technology, Kanpur — **Bachelor of Science**
Mathematics and Scientific Computing, GPA: 9.3/10 — *Expected Graduation: June 2022*

Manu Vatika School, Budhlada — **12th Grade**
Science and Mathematics, 94.6% — *CBSE AISSCE 2018*

Manu Vatika School, Budhlada — **10th Grade**
CGPA: 10/10 — *CBSE AISSE 2016*

PROJECTS

Fixing Lugsail Lag Windows — *Jan 2021 - March 2021*
- *Prof. Dootika Vats, IIT Kanpur*

- Proposed several lag window to estimate time average covariance matrices and address underestimation.
- Analysed the relation between the sign of the spectral window generator and positive definiteness of the estimator.
- Used time series concepts such as periodograms to look at a different formulation.
- Proved a case when this can never be done.

Conversational Agent for Mental Health — *July 2020 - Oct 2020*
- *Prof. Ashutosh Modi, IIT Kanpur*

- Created a semi-automated conversational agent that serves as a cost-effective mental health regulator
- Designed a retrieval based system where the input is compared to existing conversations in the database using deep learning
- Used neural network based architectures to find out the similarity between two pieces of texts to generate a response
- Explored Natural Language Generation (NLG) techniques based on RNN and transformer based architectures

Variational Inference vs MCMC — *Aug 2019 - Dec 2019*
- *Prof. Dootika Vats, IIT Kanpur* — *github://nitingarg1000/var-mcmc*

- Got familiarised with Variational Inference & MCMC
- Implemented an R program to obtain the posterior distribution for a dataset using both Variational Inference and MCMC
- Obtained a contrast among posteriors obtained using both the techniques
- Concluded that MCMC is asymptotically exact while VI is not but also computationally expensive

Language Models — *May 2019 - July 2019*
- *Programming Club, IIT Kanpur* — *github://nitingarg1000/lang-models*

- Got familiarised with **Deep Neural Networks** by implementing the basic types of neural networks
- Learnt about the basics of Natural Language Processing and some common applications of sequence models with focus on word embeddings such as GloVe, Word2Vec, BERT, etc.
- Implemented a **SOTA** paper on **ELMo's** (Embeddings for Language Models) in Python using **Pytorch** that achieved **80%** efficiency which is close to **85.8% SOTA** values

Convex Optimization Techniques — *May 2019 - July 2019*
- *Programming Club, IIT Kanpur* — *github://nitingarg1000/convex*

- Studied the three parameter Weibull distribution and wrote a python script to maximise its likelihood function
- Got familiar with Batch Gradient Descent, Stochastic Gradient Descent and Mini-Batch Gradient Descent
- Exlpored several Matrix Factorization methods such as LU and PLU Factorization for basis B, Cholesky Factorization LLT and LDLT for Symmetric, Positive Definite Matrices B, etc.
- Further explored optimisation techniques such as Adagrad, RMSProp, AdaMax, Adam, etc.

Haskell Scrabble Solver *Aug 2019 - Nov 2019*

- Self Project *github://nitingarg1000/Haskell-scrabble-solver*

- Learnt the concepts of functional programming through Haskell, one of the most widely used functional programming languages
- Deep dived into the concepts of Type theory, Currying, Recursion, Immutability, File Systems, Pattern Matching and Laziness of Haskell
- Made a Scrabble Solver in Haskell (A Two Player version and a Play with Computer version) which used Lexicographical Search, Regex-type functions (written from scratch) and Quick Sort as the major algorithms

Advanced Competitive Programming *May 2020 - July 2020*

- Programming Club, IIT Kanpur

- Learned various algorithms like Sorting, Binary Search, Dynamic Programming, Disjoint Set Union, Hashing, String Prefix Structure, etc.
- Got familiar with several other algorithms like DFS, BFS, Sieve of Eratosthenes, STL, Meet in the Middle Technique, etc.
- Explored various Graph Algorithms like Dijkstra, Topological Sort, Floyd Warshall, Bellman Ford, Kruskal, Prim algorithm, etc.

Breaking Cryptosystems *Jan 2020 - April 2020*

- Prof. Manindra Agarwal, IIT Kanpur *Course Project*

- Performed Cyptanalysis of Substitution cipher, Block substitution cipher, Substitution-Permutation cipher
- Also analysed special cases of cryptanalysis of DES (Differential cryptanalysis), AES (SASAS attack), RSA with low exponent (Coppersmith attack)
- Learnt and worked through different attacks on weaker version on KECCAK hashing

WORK EXPERIENCE

Full Stack Development *May 2019 - July 2019*

- Web Developer Intern at IITK Summer of Code *github://nitingarg1000/HealthBuddy*

- Received intensive training in technologies involved in Full-Stack Development
- Developed a web based platform which would make the entire process of the local health centre paper-free and improve the overall experience of a visit
- Created separate end-points for various departments like reception, doctor, patient, pharmacy, etc.
- Efficient database handling for pharmacy to log in the inventory
- Used Django framework in python as the backend framework and HTML, CSS, JS and Bootstrap for frontend development
- PostgreSQL was used as the database manager

RELEVANT COURSEWORK

STATISTICS	Statistical Simulation and Data Analysis*, Topics in Probabilistic Modelling and Inference*, Machine Learning, Probability and Statistics*, Stochastic Processes**, Time Series Analysis**
MATHEMATICS	Linear Algebra, Several Variable Calculus*, Real Analysis, ODE, PDE, Topology*
PROGRAMMING	Data Structures and Algorithms, Numerical Analysis and Scientific Computing, Fundamentals of Computing

: (A) exceptional performance **: upcoming

SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 563** in JEE Advanced 2018 among the 1.64 Lakh shortlisted candidates.
- Secured **All India Rank 275** in JEE Mains 2018 among 1.2 million applicants.
- Attained **All India Rank 534** and selected for fellowship under **Kishore Vaigyanik Protsahan Yojana (KVPY)** in stream SX (2018)
- Received grade for **exceptional performance** in Probability & Statistics and Microeconomics
- Won 3^{rd} prize out of 23 projects in IITK Summer of Code

PROGRAMMING EXPERIENCE

- Secured **Global Rank 662** in Google Codejam Round 1C and Qualified for Round 2
- Secured **Global Rank 644** in Google Kickstart Round D 2020
- **Codechef** - Max Rating **2129 (Yellow: 5 stars)**
- **Codeforces** - Max Rating **1985 (Candidate Master)**
- Organised a session on various applications of Mathematics in Competitive Programming such as Hashing, Matrix Exponentiation along with some common Dynamic Programming Techniques

TECHNICAL SKILLS

LANGUAGES	R | Python | C | C++ | MATLAB | Haskell
FRAMEWORKS	Pytorch | Tensowflow | Keras | NumPy | Django | Scikit-learn

POSITIONS OF RESPONSIBILITY

Coordinator, Students' Film Society *June 2020 - Ongoing*

- Responsible for organising several Movie/TV show screenings throughout the year to keep the campus junta entertained
- Organise various meetings where the artistic aspects of a movie are discussed
- Plan to screen movies for underprivileged children
- Conduct competitions like quizzes/puzzles based on Movies/TV Shows along with workshops for film reviewing

Coordinator, Stamatics *July 2020 - Ongoing*

- Head of the student body, Dept. of Mathematics and Statistics
- Organize lectures (by students and faculty) on several interesting topics in Mathematics
- Organize Mathemania (a math quiz) and several interesting puzzles

Secretary, Research Wing AnC IITK *Aug 2019 - July 2020*

- Organized departmental sessions (by faculty) where the students were motivated towards research
- Assisted in organising *SRC 2020*, the annual reseach convention of IIT Kanpur

Secretary, Outreach Cell *Aug 2019 - July 2020*

- Organized the *Alumni Buddy Program*, contacted several Alumni personally who were willing to mentor UGs and guide them in choosing career paths
- Conducted various *Tips from the Top* sessions where esteemed speakers from several fields were invited to share their experiences