Garvit Mohata

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Research Interests

Graph Neural Networks, Message Passing Neural Networks, Computer Vision, Machine Learning, Operations Research

Education

Indian Institute of Technology (BHU), Varanasi — Varanasi, India
B. Tech. in Electrical Engineering, GPA: 9.5/10 — *July 2015 – May 2019*

Related Coursework:

Information Retrieval: A-	Probabilistic Graphical Models: A*	Machine Learning: A
Formal Logic: A	Computer Programming (DSA, OS, DBMS): A-	Mathematical Methods (Linear Algebra, PDE): A
Numerical Techniques: A	Engineering Mathematics (Calculus): A-	Mathematical Methods - Physical Significance: A*
Probability and Statistics: A	Mathematical Modeling and Simulation: A-	Digital Control System: A

Quantitative Methods for Decision Making (Operations Research, Decision/Game Theory, Queuing Theory, Markov Chains): A

Shiksha High School, Bikaner — Bikaner, India
CBSE (XII), 93.2/100 — *2015*

Bikaner Boys' School, Bikaner — Bikaner, India
CBSE (X), 10/10 — *2013*

Technical Skills

Languages: Python, C/C++, Java, MATLAB, SQL, LaTeX, JavaScript, HTML/CSS
Frameworks: Flask, Django, TensorFlow, PyTorch, ScikitLearn, NLTK, Gensim, Caffe

Experience

SAP Labs, India — Bengaluru, India
Data Scientist-II — *July 2019 – Present*

- Worked on projects pertaining to the fields of Operations Research, Optimization, Machine Learning and AI.
- Design, development and deployment of projects as cloud services or dockerized services in on-premise systems.

Goldman Sachs — Bengaluru, India
Quantitative Analyst Intern | Django, SQL, JavaScript, HTML, CSS — *May 2018 – July 2018*

- Developed a new schema, used job scheduler. Developed, deployed two Django-based web applications end-to-end to provide insights to traders through analytical and historical visualization tools for better decision making.

Research and Academic Projects

Indian Institute of Science, Bengaluru — Dr. Kunal Narayan Chaudhury
Science Academies' Research Fellowship | *MATLAB, Mex, C++* | Project — *May 2017 – July 2017*
Obj: Study and implementation of variations of the traditional Non-Local Means (NLM) algorithm for image denoising.

Indian Institute of Science, Bengaluru — Dr. Kunal Narayan Chaudhury
Research Intern | MATLAB, Python | Code — *Dec 2018*

- Implemented FISTA algorithm and investigated potential improvements in FISTA-Net for solving inverse problem
- Studied, analysed and worked on further improving Bilateral Filters and Bilateral Neural Network.

Applications of Probabilistic Graphical Models — Dr. K.V. Srinivas, Dr. Sandip Ghosh
B. Tech. Project | *Python* | *Code* — *Dec 2017 – Nov 2018*
Obj: Studied different applications of message passing algorithms and investigated their use in 5G Communication.

- Decoded Hamming Code transmitted over BSC using BPSK modulation and Monte Carlo simulation.
- Decoded Low Density Parity Check (LDPC) Codes using Sum-Product algorithm and Monte Carlo simulation.
- Solved Maximum Weight Matching problem in Bipartite Graphs using Min-Sum belief propagation.
- Developed a prototype: communicated noisy motor speed through sensors and denoised it using above algorithms.
- Performed feasibility study on using message passing algorithms as anti-jamming techniques for reducing the problem of Interference in 5G Communication.

Study on Methods for Solving Transportation Problem — Operations Research
C++, Python, CMake | *Code* — *Dec 2017 – May 2018*

- Implemented North West Corner Method, Least Cost Method, Vogel's Approximation Method, Stepping Stone Method, and MODI Method in C++, for performance comparison.

Quora Question Pair Similarity — NLP Project
Python, Git | *Code* — *Dec 2018 – May 2019*

- Performed EDA, feature extraction and generated question embeddings using TF-IDF weighted averaging on GloVe-generated word embeddings. Performance close to state-of-the-art was obtained using XGBoost.

Professional Projects

Document Classification, Detail Extraction and Processing — Computer Vision, NLP
Standard Product | *Python, Tesseract OCR, Docker* — *Apr 2020 – Dec 2020*
- Classified documents esp. invoices into types using OCR. Extended Chargrid model to Japanese language and additional field detection. Reduced model's training, inference time and increased accuracy of character detection
- Experimented on using named entity recognition for extracting single-word fields in place of annotated approach.
- Automated sales data entry from documents and cross-validation of sales and purchase related documents.

Optimal Resource Transportation in Graph Network using Min-Cost Flow — Graph Algorithms
Standard Product | *C++, Python, SAP HANA* — *Jan 2021 – Present*
- Constructed a Network Graph using location, trip information adhering to accessibility and business constraints.
- Used K-Shortest Path Algorithms (Yen's, Iterative-DFS) to find cost optimal routes based on factors (time, distance, money). Used Network Simplex Algorithm to generate optimal schedule for timely resource availability.
- Accounted for minimum, maximum safety stock limit and customer priority for resource allocation.

Covid-19 Optimal Resource Allocation and Relief Request Classification — Operations Research, NLP
Developed for ***Government of Karnataka*** | *Python* | *Code* — *Apr 2020 – June 2020*
- Constructed a graph of supply and demand locations and used Transportation Problem's algorithmic variants to optimally allocate relief resources.
- Classified free-text queries into predefined grievance and relief request types (food, medical etc.) for their redressal

Efficient Cylindrical Pipe Loading in Transportation Vehicle — Space Optimization
PATENT | *Python, SAP HANA* — *Aug 2019 – Oct 2019*
- Developed a greedy heuristic solution: proposed a decreasing diametric pipe arrangement, along with telescoping of smaller diameter pipes in larger ones.

Nest on Electric Pole Detection to curb Electricity Outages — Computer Vision
Python, Flask — *Nov 2019 – Mar 2020*
- Detected electric poles via InceptionV3 model, developed a custom model to detect nests on already identified poles. Used GAN, Neural Style Transfer and standard image augmentation techniques.
- Achieved training accuracy of 97% and validation and testing accuracy of 95%.

Honors and Achievements

- **Qualified** for ACM ICPC India Regionals. 2018
- **One of 95** engineering students selected **All India** for IISc, Bengaluru under Science Academies' Summer Research Fellowship Programme, the esteemed research fellowship programme of India. 2017
- **3rd place**, Circuit Simulation Event in Udyam, the annual technical festival of Electronics Dept. 2016
- **International Rank 13 and State Rank 3**, Finals of SOF's International Mathematics Olympiad, **International Rank 20 and State Rank 5**, Level 1 of SOF's International Mathematics Olympiad. 2015
- **All India Rank 96 and National Achiever**, National Science Talent Search Examination. 2015
- **All India Team Rank 98**, Technothlon (Hauts Squad Category), organised by IIT Guwahati. 2014
- **Top 99.9 percentile**, IIT-JEE Advanced and IIT-JEE Mains. 2015

Extra-Curricular

SAP Labs, Collegiate
- **Finalist**, SAP Academy for Engineering Program 2019
- **Participant**, Industry Innovation Challenge, SAP Labs. 2019
- **Co-coordinator**, Diversity and Inclusion Workshops in SAP IBSO division. July 2019 - Present
- **Senior Member**, Content and Editing Team, IIT BHU Institute Newsletter. July 2017 - May 2019
- **Coordinator**, Industry Defined Problem in Prastuti, the annual technical festival of Electrical Dept. 2018
- Certificate of Excellence for Involvement in Green Revolution Global Certification Program to Educate, Inspire and Act against Climate Change. 2015
- **College Societies :** Institute Newsletter, The Lit Club, Indian Music Club.
- **Hobbies :** Creative Writing, Singing, Playing Synthesizer.

Creative Writing
- **1st place**, Indipex State Letter Writing Competition at World Philatelic Exhibition, New Delhi. 2011
- **2nd place**, Collegiate Fresher Poem Competition for the poem 'Vigor'. 2016
- **Participant**, Goi Peace Foundation International Essay Contest for Young People. 2019, 2020, 2021

Volunteer Work

- Developed a Covid-19 Optimal Resource Allocation and Relief Request Classification application for Government of Karnataka. 2020
- As a member of 'Pravah', taught underprivileged children of Susuwahi Basti. July 2016 - May 2018
- Served meals in college Gurudwara langar. 2019