



Manan Sharma
Current: Google Research India
Past: Indian Institute of Technology Bombay
Major: Civil Engineering
Minor: 1) Computer Science & Engineering
2) Artificial Intelligence

Bachelor of Technology (B.Tech.)
DOB: 29/08/2000
Ph: (+91)7821930111
Email: manan2908@gmail.com
Webpage: <https://manan-s.github.io>

Examination	University	Institute	Year	CGPA / %
Graduation	IIT Bombay	IIT Bombay	2021	9.24 (Ranked 4)
Intermediate/+2	CBSE	MDS Senior Secondary School	2017	89.0
Matriculation	CBSE	Step By Step High School	2015	10.00

INDUSTRIAL RESEARCH EXPERIENCE

Pre-doctoral Researcher | Google Research India

August 2022 - Present

Earth Observation Sciences Group

Bangalore, India

- Working on large-scale soil moisture estimation models using computer vision techniques on multi-modal data.
- Built pipelines for large-scale time-series and satellite imagery extraction across the earth for spatiotemporal modelling.

Pre-doctoral Research Fellow | Microsoft Research India

July 2021 - July 2022

Machine Learning and Applied Sciences Group

Bangalore, India

- Worked on proposing a novel piecewise-polynomial filtering based model for node classification over graph datasets, conducted theoretical analysis and performed ablative studies. Work accepted at **ECML'22** and **ICLR-GTRL'22**.
- Worked on improving generalization by proposing deep Bayesian Polynomial Filtering approaches for GNNs for semi-supervised node prediction task. Working on uncertainty quantification for heterogeneous graphs

Anomaly Detection System for E-Commerce Pricing | Amazon Development Centre

April - June 2020

Software Development Engineering Intern, Automated Advertising Team

Bangalore, India

- Developed scalable, **real-time anomaly detection system**, to tag incoming current product prices with a reliability score, using historic data, for the recommendation engine to output reliable recommendations to the customers
- Surveyed, implemented and tested multiple state-of-art autoregressive, forecasting & intelligent algorithms including **DeepAR**, **Gaussian Process** classifier, **Exponential Smoothing** & formed weighted ensemble to minimize errors
- Designed and hosted the entire end-to-end architecture on **AWS** cloud, hosting the models on **SageMaker**

RESEARCH EXPERIENCE

Zero-shot Cross-task Domain Adaptation with Instructions

Ongoing

Prof. Nanyun Peng, CSE | Research Intern

University of California LA

- Improved cross-task adaptation on unseen tasks of large language models by instance filtering to improve predictions
- Strengthened BART based models, filtering using RoBERTa classifiers.
- Working on a novel GAN-based data augmentation technique to enhance few-shot QA performance.

Deep Sequential Models and Sensitivity Analysis in Hydrological Modelling

August 2020 - July 2021

Prof. Riddhi Singh, Civil Engineering Dept | Bachelors' Thesis

IIT Bombay

- Designed **LSTM** based Bayesian sequential models for rainfall-runoff prediction in ungauged basins, across the USA.
- Implemented **Bayesian Neural Network**, evaluated model sensitivity via **variational inference** over parameters

Deep Bayesian Active Learning on Graph Data

Autumn 2020

Prof. Abir De, CSE Dept | R&D Project

IIT Bombay

- Worked on active learning on graph data, obtaining mutual information among **Bayesian Graph Convolution Network's** parameters & label as acquisition function
- Used **MMSBM** for parametric random graph generation and ran **MCMC inference** for approximating the posterior

Multi-label Image Classification using Graph Neural & Attention Networks

Summer 2019

Prof. Biplab Banerjee, CSRE Dept | Research Project

IIT Bombay

- Extracted multiple segment-wise visual descriptors from images **oversegmented** using **SLIC** algorithm and formed **region adjacency feature graphs** from the image dataset using **OpenCV**
- Trained multi-layered **graph convolution network**, by formulating convolution and pooling operations as aggregating feature information from the spatial structure of graph; achieving a state-of-art accuracy of **64%**

Data Engineering Intern | Praktice AI

December 2018

- Built **near-real-time web-analytics platform**, to analyse user engagement via capturing raw events
- Structured scalable, efficient **NoSQL** format & improvised queries to analyse effectiveness and performance of product

SELECTED PROJECTS

Shortest Path in a maze via a Markov Decision Process formulation

Autumn 2020

Prof. Shivaram Kalyankrishnan, CSE Dept | Course Project

IIT Bombay

- Modelled 2D maze as **Markov Decision Process** with appropriate states, actions, rewards & transition probabilities
- Found optimal policy, solving MDP using **Howard's Policy Iteration, Value Iteration & Linear Programming**

Blind Super-Resolution Kernel Estimation using Internal-GAN

Spring 2020

Prof. Suyash Awate, CSE Dept | Course Project

IIT Bombay

- Implemented a **GAN** variant that predicts the blurring **kernel** of a low-resolution image in a **single-shot setting**
- Trained the generator to downscale images with an **implicit kernel** and discriminator to learn the distribution by formulating **L1-normed loss** & designed a **regularizer** to decrease hypotheses space to subset of plausible kernels

A Generative Adversarial Approach for Zero-shot Learning for Noisy Texts

Autumn 2019

Prof. Biplab Banerjee, CSRE Dept | Course Project

IIT Bombay

- Leveraged GANs to imagine unseen categories from text descriptions from Wikipedia by simulating conditional distribution of visual features of corresponding class using generator & leveraging discriminator for supervised classification
- Added **visual pivot regularization** for preserving inter-class discrimination, improving the accuracy by up to **6.5%**

Music Genre Classifier

Spring 2019

Prof. Biplab Banerjee, CSRE Dept | Course Project

IIT Bombay

- Formed normalized descriptors by extracting high-level features like **MFCC, Chroma frequencies** from audio files
- Trained an ensemble classifier by implementing **k-NN, SVM** with kernels, **Decision Tree, Naive Bayes, softmax** classifiers & a neural network for the task of classifying musical pieces in 10 genres, achieving mean accuracy of **78%**

Automatic Water Supply Network Solver

Spring 2019

Prof. Riddhi Singh, CE Dept | Course Project

IIT Bombay

- Automated the process of approximating the discharge in pipe networks by modelling the network structure as a connected graph, simulating the flow as traversal across this directed graph, and performed **BFS** for detecting loops
- Used various analytical methods of **Hardy-Cross** and **Newton-Raphson** for approximating multiple hydrological parameters and optimized the algorithm to produce accurate results in time linear in network's nodes and edges

Killer Sudoku Solver

Spring 2018

Prof. Krishna S, CSE Dept

IIT Bombay

- Implemented **backtracking** algorithm under multiple constraints imposed by addition of cages to Sudoku puzzle
- Analysed performance of solving component & determined the **fastest** and most effective order of execution of rules

SCHOLASTIC ACHIEVEMENTS

- Ranked **4th** in the department, in the batch of 102 students [2021]
- Obtained SPI of **perfect 10** with AA in all courses in 6th and 7th semester [2020]
- Among top **99.7 percentile** in JEE-Mains 2017 and top **98.9 percentile** in JEE-Advanced 2017 [2017]
- Qualified aptitude test for Kishore Vaigyanik Protsahan Yojana (**KVPY**) scholarship [2015]
- Achieved National Rank **75** in National Level Science Talent Search Examination (NSTSE) in 2016 [2016]

TEACHING AND MENTORING EXPERIENCES

Teaching Assistantships

Autumn 2018 - Present

- **MA108, Differential Equations**, Spring 2021 & 2019: Conducted tutorials for batch of 50 freshmen, held tutorial solving and doubt clearing sessions and held special sessions for language challenged students
- **MA106, Linear Algebra**, Spring 2021: Conducting tutorials for batch of 46 freshmen, additionally holding special sessions for advanced topics in linear algebra for higher level undergraduates
- **MA111, Vector Calculus**, Autumn 2020: Conducted tutorials for batch of 46 freshmen, providing periodic individual assistance and doubt solving sessions, formulating and grading the quizzes
- **CS101, Computer Programming and Utilization**, Autumn and Summer 2019: Provided individual assistance to students and helped conducting C++ programming laboratories for 600+ students in a team of 11 undergraduates
- **BB101, Physical Biology and Biomedical Engineering**, Autumn 2018: Conducted tutorial sessions for class of 50 freshmen & evaluated the answer scripts. Helped students weak in English by conducting separate discussions

Mentor | Summer of Science

Summer 2020

- Mentored 3 students on **Data Structures and Algorithms, Cryptography & Neural Networks and Deep Learning** by providing them periodic assistance, occasional discussions and guiding them to relevant resources

TECHNICAL SKILLS

Programming

C/C++, Python, R, Julia, SQL, HTML, XML, CSS

Software/Frameworks

MATLAB, OpenCV, Tensorflow, Keras, Pytorch, L^AT_EX, Git, AWS, OpenGL

KEY COURSES UNDERTAKEN

Machine Learning	Automatic Speech Recognition, Optimization in Machine Learning, Introduction to Stochastic Control, Foundations of Intelligent & Learning Agents, Theoretical Machine Learning, Advanced Machine Learning (Probabilistic Graphical Models), Machine Learning for Remote Sensing 1 & 2, Medical Image Computing, Reinforcement Learning (edX), Deep Learning Specialization (Coursera)
Computer Science	Data Structures & Algorithms, Computer Networks, Operating Systems, Design & Analysis of Algorithms, Cryptography and Number theory, Computer and Network Security
Maths & Statistics	Calculus, Linear Algebra, Differential Equations I and II, Probability and Statistics
Miscellaneous	Introduction to Electrical & Electronics Circuits, Psychology, Economics, Quantum Physics

Note: Unless stated, all the above courses mentioned were done as coursework requirements in IIT Bombay

EXTRACURRICULARS

- Served as a coordinator in **Techfest** and **E-Cell**, helping in planning,organizing and conducting of the events [2018]
- Trained in classical **carnatic Violin** under yearly NSO Cultural course for freshmen [2017-18]
- Awarded certificate of appreciation from Mahatma Gandhi Hindi Rashtrabhasha Hindi Prachar Sanstha for **first division performance** in its National Bhasharatna Examination in 2014
- Trained in **Abacus** and **Mental arithmetic** for 3 continuous years by UCMAS