

# Avinandan Bose

SOPHOMORE UNDERGRADUATE · INDIAN INSTITUTE OF TECHNOLOGY KANPUR

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## Education

### Indian Institute of Technology Kanpur

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

- Cumulative Performance Index(CGPA): **9.40/10.0**

Kanpur, Uttar Pradesh

July, 2018 - PRESENT

### South Point High School

HIGH SCHOOL, 12TH GRADE

- Central Board Of Secondary Education, CBSE: **95%**

Kolkata, West Bengal

May 2008 - Apr 2018

## Experience

### Bayesian Tensor Completion for Traffic Estimation

UNDERGRADUATE RESEARCH PROJECT UNDER PROF. KETAN RAJAWAT [REPORT]

Dept of Electrical Engineering, IITK

Aug, 2019 - PRESENT

- Studied and understood papers on Variational Bayesian Inference for Robust Streaming Tensor Factorization and Completion by Cole Hawkins and Zheng Zhang and Traffic Estimation via Online Variational Bayesian Subspace Filtering by Ketan Rajawat
- Studied and understood Tensor Algebra, Low rank Tensor Factorization
- Studied the basics of Time Series and looked up popular models like ARIMA and SARIMA
- Extended the findings in the above two papers by deriving an expression such that Tensor Factorization and Completion follows first order Auto Regressive model for its temporal variation.
- Implemented the proposed model in MATLAB.

### Change Point Detection in Textual Data

UNDERGRADUATE RESEARCH PROJECT UNDER PROF. SOUMENDU SUNDAR MUKHERJEE

Interdisciplinary Statistical  
Research Unit, ISI, Kolkata

Dec, 2019 - PRESENT

- Studied Change Point Detection Methods such as Page's, Barnard's, Shiryaev's and Lorden's procedures and newer approaches like Wild Binary Segmentation
- Studied Latent Dirichlet Allocation for Topic Modelling
- Studied the basics of NLP
- Working on finding change points in textual data such as topics in news articles over the years and writing styles across different eras

### Probabilistic Machine Learning and Applications

SUMMER PROJECT [CODE] [REPORT]

Programming Club, IITK

May, 2019 - Jul, 2019

- Studied and understood preliminaries of Bayesian Inference, Non-Conjugacy and Conditional Conjugacy, Linear Models and Exponential Families, Latent Variable Models, Expectation Maximization Algorithm, Variational Inference and Markov Chain Monte Carlo
- Implemented model in NumPy for density estimation using Gaussian Mixture Models on MNIST dataset
- Built a Recommender System using Bayesian Matrix Factorisation and studied and understood Poisson Matrix Factorisation
- Built a Variational Autoencoder model on PyTorch to learn a low dimensional representation for handwritten digits

### Generative Adversarial Networks

SEMESTER LONG PROJECT [CODE]

Association of Computing  
Activities, IITK

Jan, 2019 - Apr, 2019

- Implemented Deep Residual Nets for Image Recognition using skip connections between layers and studied the improvement in results without skip connections
- Learned the basics of Autoencoders and Generative Adversarial Networks, ideas of Distribution Matching, Minimax Games and Divergence Minimization via Adversarial Learning
- Implemented models such as Minimax GAN, LSGAN, Wasserstein GAN. Used evaluation metrics such as Inception Score and Frechet Inception Distance in PyTorch and TorchGAN

### Algorithms in Depth

SUMMER PROJECT [CODE]

Programming Club, IITK

May, 2019 - Jul, 2019

- Studied and understood Graph Traversal Methods such as BFS, DFS, Dijkstra and Kruskal
- Studied and understood topics on Game Theory such as Game of Nim and Grundy numbers
- Explored and implemented KMP, Huffman Coding and Disjoint Set Union

### Centralized Inventory and Purchasing

SUMMER INTERN PROJECT [CODE]

Dept. of CSE, IITK

May, 2019 - Jul, 2019

- Developed a web app for efficient inventory management across various departments of the NGO Vitrage Vigyaan by facilitating transfers and managing purchase tenders.
- Technologies used: NodeJS, MongoDB, ReactJS

## Honors & Awards

2019	<b>Academic Excellence Award</b> , Awarded to top 5 percent freshmen based on Academic performance	IIT KANPUR
2018	<b>CLASS OF 1990 SCHOLARSHIPS</b> , awarded to top three rankers of institute	IIT KANPUR
2018	<b>All India Rank 104</b> , Joint Entrance Examination Advanced 200,000 candidates	India
2018	<b>All India Rank 554</b> , Joint Entrance Examination Main 1.5 million candidates	India
2017	<b>All India Rank 68</b> , KVPY Scholarship Indian Institute of Science and Government of India	Bangalore, India
2018	<b>All India Rank 1</b> , West Bengal Joint Entrance Examination	West Bengal, India
2018	<b>Gold Medal</b> , Indian National Physics Olympiad	Mumbai, India
2015	<b>Gold Medal</b> , Indian National Junior Science Olympiad	Mumbai, India
2017	<b>3rd in State, National Top 1 %</b> , National Standard Examination in Physics	India
2017	<b>3rd in State, National Top 1 %</b> , National Standard Examination in Chemistry	India
2017	<b>2nd in State, National Top 1 %</b> , National Standard Examination in Astronomy	India
2016	<b>3rd in State, National Top 1 %</b> , National Standard Examination in Astronomy	India
2016	<b>State Top 1 %</b> , National Standard Examination in Physics	India
2014	<b>State Top 1 %</b> , National Standard Examination in Junior Science	India
2016	<b>Scholar</b> , National Talent Search Examination	India

## Skills

<b>Languages</b>	Proficient : C, C++, Python Familiar : Javascript
<b>Deep Learning Frameworks</b>	PyTorch
<b>Data Science Libraries</b>	NumPy, SciPy, Pandas, Scikit-Learn
<b>Operating Systems</b>	Windows, Ubuntu
<b>Utilities</b>	Linux Shell Utilities, Git, $\text{\LaTeX}$ , MATLAB
<b>Development</b>	Familiar: Node.js, React, MongoDB

## Course Work

Real Analysis and Multivariable Calculus A*	Fundamentals of Programming A*
Linear Algebra and Ordinary Differential Equations	Data Structures and Algorithms
Discrete Mathematics for Computer Science	Introduction to Electronics
Convex Optimization in Signal Processing and Communication <sup>i</sup>	Introduction to Bayesian Analysis <sup>i</sup>
Computer Organization <sup>i</sup>	Software Development and Operations <sup>i</sup>
Logic and Probability for Computer Science <sup>i</sup>	Introduction to Machine Learning <sup>@</sup>
A* : Grade for exceptional performance	i : in progress
@ : audit	

## Positions of Responsibility

### Programming Club IIT KANPUR

Kanpur, India

SECRETARY

Mar. 2019 - PRESENT

- Responsible for conducting contests and activities for campus community and conducting lectures and workshops on various topics for interested students

### Special Interest Group in Machine Learning (SIGML) IIT KANPUR

Kanpur, India

SECRETARY

Sept. 2019 - PRESENT

- Responsible for delivering and conducting talks for presenting papers, the speaker's research work, and lectures on specialized subfields of Machine Learning
- Responsible for conducting sessions aimed at Student and Faculty Researchers in Machine Learning for discussion of their current research problems and cross-pollination of ideas and insights