

# 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): **9.32/10.0**

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 paper on Variational Bayesian Inference for Robust Streaming Tensor Factorization and Completion by Cole Hawkins and Zheng Zhang
- Studied and understood Tensor Algebra, Low rank Tensor Factorization
- Studied and understood paper on Traffic Estimation via Online Variational Bayesian Subspace Filtering by Ketan Rajawat
- Extended the findings in the above two papers by deriving an expression such that Tensor Factorization and Completion follows first order autoregressive model for its temporal component.
- Currently implementing the proposed model in MATLAB.

### 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 Vigyan 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\*  
Linear Algebra and Ordinary Differential Equations  
Discrete Mathematics for Computer Science<sup>i</sup>  
Convex Optimization in Signal Processing and Communication<sup>n</sup>  
Computer Organization<sup>n</sup>  
Logic and Probability for Computer Science<sup>n</sup>

*i : in progress*

*A\* : Grade for exceptional performance*

Fundamentals of Programming A\*  
Data Structures and Algorithms<sup>i</sup>  
Introduction to Machine Learning<sup>@</sup>  
Introduction to Bayesian Analysis<sup>n</sup>  
Software Development and Operations<sup>n</sup>

*@ : audit*

*n : Registered for upcoming semester (Jan20 - Apr20)*

## 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