

Education	Indian Institute of Technology, Kanpur (2012 - present) Bachelor of Science, Mathematics and Scientific Computing Cumulative Performance Index: 8.13
	All India Senior School Certificate Examination (2011) SS Vidya Mandir, Madhupur; Aggregate : 90.6%
	Indian Certificate of Secondary Education Examination (2009) Carmel School, Madhupur; Aggregate : 95.2%
Research Interests	<ul style="list-style-type: none">• Machine Learning, Natural Language Processing• Statistical Learning Theory, Optimization
Projects and Internships	<p>An Attempt to Escape the Deep Saddle Points [proposal] (Ongoing) Prof. Purushottam Kar, Indian Institute of Technology, Kanpur</p> <ul style="list-style-type: none">• Studied non-convex optimization problems like tensor decomposition, sparse recovery and how the saddle point problem can be averted using first order information.• Proposed extending the work by Ge et al [link] to generate guarantees for SGD to escape saddle points in the classical two-layer neural network settings.• Expand the analysis of the classical two-layered neural network to encompass the deep learning paradigm in general. <p>Label Relation Graphs to Encode Prior Knowledge [proposal] (Ongoing) Prof. Piyush Rai, Indian Institute of Technology, Kanpur</p> <ul style="list-style-type: none">• Studied the work by Ding et al [link] on HEX and PHEX graphs for incorporating structured label space information into a visual object recognition model.• Adapt the model to Visual Question Answering with a restrictive answer space and relations extracted from semantic dictionaries and evaluate its performance.• Proposed to extend the framework to other machine learning problems wherein the label space exhibits a rich structure. <p>Cross-lingual Plagiarism Detection [poster] [report] (Ongoing) Prof. Amitabh Muherjee, Indian Institute of Technology, Kanpur</p> <ul style="list-style-type: none">• Performed joint learning of word vectors in unified multilingual distributional space from document aligned comparable corpora.• To estimate the robustness of the multilingual word space, two tasks: Bilingual Lexicon Extraction and Suggested Word Translation in Context are performed.• Trained a Deep Recursive Autoencoder with dynamic pooling to generate phrase representations which are fed to an SVM for paraphrase detection. <p>Domain Invariant Transfer Kernel Learning [slides] [report] (Fall'15) Prof. Harish Karnick, Indian Institute of Technology, Kanpur</p> <ul style="list-style-type: none">• Based on the work of Long et al [link], proposed to implement a learning model which generalizes across training and testing data with different distributions.• Designed a family of spectral kernels by extrapolating target eigensystem on source samples to reduce the Nystrom Approximation error in the RKH Space.• Plugged the obtained domain-invariant Kernel matrix to an SVM which outperformed the traditional SVM on benchmark text and image datasets.

N-body Simulation using Sampling [\[poster\]](#) (Summer Internship'15)

Prof. Geoffrey Fox, Indiana University, Bloomington, USA

- Worked on optimising the n-body formulation of Deterministic Annealing, used to perform Multi-dimensional scaling of a high dimensional data.
- Studied methods of solving n-body problems such as Hierarchical partitioning data structures, treecodes, fast multi-pole methods and Barnes-hut simulation.
- Designed a topological spherical embedding to distribute point into near and far groups, wherein the contribution of the near points are to be approximated.
- Used Importance sampling to heuristically to sample from a distribution different from the inherent distribution.

Aspect based Sentiment Analysis [\[poster\]](#) [\[report\]](#) (Spring'15)

Prof. Amitabh Mukerjee, Indian Institute of Technology, Kanpur

- **Sem-Eval 2015 task** [\[link\]](#): Identification of every entity E and attribute A pair E#A in a text towards which an opinion is expressed, and adjudging it's polarity.
- Constructed features based on word-vectors, n-grams, parse trees, POS tag and out-of-domain, publicly available sentiment lexica (wordnet, sentiwordnet).
- Trained a Conditional Random Field(CRF) for sequential learning of aspect term, and a Maximum Entropy Classifier to adjudge the polarity.

Forest Cover-type Classification Problem [\[report\]](#) (Spring'14)

Prof. Amit Mitra, Indian Institute of Technology, Kanpur

- Attempted the **Kaggle challenge** [\[link\]](#) of classifying forest cover type by building classification models based on the dataset.
- Employed various classification techniques such as Neural Networks, SVM, Logistic Regression, Naive-Bayes classifier, CART and Random Forests.
- Classification by Random Forests on a 10-fold cross validation training set was the most accurate with an accuracy of 87%.

Random Graph models of Social Networks [\[slides\]](#) (Spring'15)

Prof. A K Lal, Indian Institute of Technology, Kanpur

- Studied Random Graphs and their properties, degree distributions, scale-free graphs and small-world networks.
- Studied about phase transitions and random graph models such as Erdos-Renyi model, Configuration model and preferential attachment model.

Phonotactic Constraints in McGurk Fusion [\[poster\]](#) [\[report\]](#) (Fall'14)

Prof. Amitabh Mukerjee, Indian Institute of Technology, Kanpur

- On cognitive audio-visual speech perception establishing the role of Phonotactic constraints towards producing a bias in McGurk Effect.
- Conducted experiments to conclude that Phonotactic constraints can diminish McGurk fusion rate when phonetic licensing biases against the fusion expected.

Causal Relationships Between Econometric Parameters [\[report\]](#) (Fall'14)

Prof. Amit Mitra, Indian Institute of Technology, Kanpur

- Used Time Series Econometric modelling to analyze the data of the policy macroeconomic variables using Augmented Dicky-Fuller and Granger Causality test.
- Established that both FDI inflows and Exports have a direct causal linkage with the GDP of India but there is no reciprocal causality between them.

Summer Intern at Aurus Network Infotech Pvt. Ltd. (Summer'14)

- Worked with a team of developers towards building a novel e-commerce educational platform, based on the PHP framework Yii.

- Developed the Relevance Algorithm module to sort courses based on an aggregated scoring system parametrized on sale, recency and rating-reviews.
- Implemented SMS-based phone-number verification using SMS service APIs.

Philosophical Problems from the Standpoint of AI [\[term paper\]](#) (Spring'15)
 Prof. A.V. Ravishankar Sharma, Indian Institute of Technology, Kanpur

- Compiled a brief summary of the paper "Some philosophical problems from the standpoint of artificial intelligence" by John McCarthy and Patrick J. Hayes
- Attempted to put forth a concise version of this 50 page paper while keeping the main ideas intact.

Scholastic Achievements

- Ranked in **Top 0.5%** (amongst 0.5 million students) in IIT-JEE 2012.
- Ranked in **Top 0.3%** (amongst 1.1 million students) in AIEEE 2012.
- Recipient of **Inspire** Scholarship awarded by Department of Science and Technology, Government of India.
- Secured **99.2 percentile** in National Cyber Olympiad 2009.
- Awarded the 3rd best position for manufacturing a working model of an engineering design(rope-making machine) amongst over 400 students in the course.

Relevant Coursework

Machine Learning:

- Artificial Intelligence Programming
- Learning with Kernels
- Probabilistic Machine Learning
- Online Learning and Optimization
- Natural Language Processing
- Stats. and AI Tech. in Data Mining
- Time Series Analysis

Mathematics:

- Linear & Abstract Algebra
- Probability and Statistics
- Topics in Topology
- Real & Complex Analysis
- Graph Theory
- Partial Differential Equations

Other Relevant Courses:

- Introduction to Programming
- Introduction to Electronics
- Introduction to Cognitive Science
- Data Structures and Algorithms
- Theory of Computation

Online Courses:

- Machine Learning (Andrew Ng)
- NLP (Dan Jurafsky)
- Deep Learning (Nando de Freitas)
- Cryptography (Dan Boneh)
- Data Scientists Toolbox (Jeff Leek)

Technical Skills

Programming: C, C++, Java, Python, R
Web Development: HTML, PHP, JavaScript, Yii, Node.js
Other Tools: Bash, Matlab, Git, \LaTeX , Android SDK, Visual Studio, Adobe Photoshop
Operating Systems: Windows, Linux(Ubuntu)

Extra-Curricular Activities

- An active member of [Quiz Club](#), participated in various Intra and Inter-college Quizzes.
- An Active Member of Special Interest Group on Machine Learning([SIGML](#)).
- Worked with [Pulkit Aggarwal](#) in Winter Hackathon'14 to develop Infexious, spatially local Social Networks, working on Android devices employing Bluetooth-L.E.
- First Runner-up in Internet of Things competition for building a smart-mirror, at the 4th Inter-IIT Technical meet.

- Among the top 10 best coded applications in the country for Hitch-a-ride, a taxi-pooling Windows phone app in Microsoft Code.fun.do
- Co-ordinator, Crypto ([Techkriti](#)): Formulated questions for the online cryptographic treasure hunt, which witnessed participation from more than 1000 people.
- Secured 1st position in App development competition([Takneek](#)) with SOS, an Android application which facilitates Disaster Relief efforts to aid Uttarakhand flood victims.

References Available on request.