

## Nitish Srivastava

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### Areas of Interest

Artificial Intelligence, Machine Learning, Computer Vision and Data Mining

### Education

Degree	Year	CGPA/Marks
Bachelor of Technology, IIT Kanpur. Major: Computer Science and Engineering	May 2011 (expected)	9.6 / 10.0
Senior Secondary School (CBSE)	2007	93.8%
High School (ICSE)	2005	97.0% (India rank -2)

### Major Academic Achievements

- **Summer Undergraduate Research Grant for Excellence (SURGE)** 2009 by IIT Kanpur for working on a research project at Ecole Centrale Paris.
- **India Rank 2** (out of nearly 300,000) in IITJEE -2007 (IIT Joint Entrance Exam).
- **Aditya Birla Group Scholarship** 2007-2011 (awarded to only 10 engineering students in India).
- **Goldman Sachs Global Leader Award** 2009 by Goldman Sachs Foundation and Institute of International Education (IIE) in recognition of "superior academic achievement and leadership potential" (given to 29 students in India across all disciplines)
- **Academic Excellence Award** by IIT Kanpur for 2007-08 and 2008-09.
- Was among the 30 students to be selected from India for participating in the prestigious **Nurture Programme** (2007-11) organized by the National Board for Higher Mathematics.
- Indian National Mathematics Olympiad Scholarship 2007-08.
- India Rank 1 and Gold Medal in the National Science Olympiad 06 (conducted by Science Olympiad Foundation, New Delhi).

### Publications

- Rakesh Agrawal, Sreenivas Gollapudi, Krishnaram Kenthapadi, **Nitish Srivastava**, and Raja Velu, **Enriching Textbooks Through Data Mining**, in Proceedings of the First Annual ACM Symposium on Computing for Development (ACM DEV), Association for Computing Machinery, Inc., December 2010 to appear. [\[pdf\]](#)
- Philippe de Reffye, Sebastien Lemaire, **Nitish Srivastava**, Fabienne Maupas, and Paul-Henry Cournede. 2009. **Modeling Inter-individual Variability in Sugar Beet Populations**. In Proceedings of the 2009 International Symposium on Plant Growth Modeling, Simulation, Visualization, and Applications (PMA '09). IEEE Computer Society, Washington, DC, USA. [\[paper website\]](#) [\[pdf\]](#)

### Internships and Work Experience

- **Research Intern at Microsoft Research, Search Labs, Mountain View, CA, USA** *(May – July 2010)*  
Mentors: Dr Sreenivas Gollapudi, Dr Krishnaram Kenthapadi, Dr Rakesh Agrawal
  - Worked on "**Enriching Textbooks Through Data Mining**"
  - Used NLP techniques, Bing N-Gram Service, Wikipedia pages to identify important concepts from the text
  - Built a graph over the concepts and used PageRank to find the best pages to be linked from the book.
  - Entire system was developed in C# and interfaced with SQL Server, several NLP toolkits and the online Bing service. (5000+ lines of code). The system is in the process of deployment for real time use.
  - Paper based on this work accepted in ACM-DEV 2010 [\[pdf\]](#)
- **Research Intern at Applied Mathematics and Systems Lab (MAS), Ecole Centrale Paris, France.** *(May – July 2009)*  
Mentor: Dr Paul-Henry Cournède, Professor
  - Worked on "**Modelling Heterogeneity and Uncertainty Propagation in Plant Population Models**".
  - Studied propagation of uncertainty in parameters of the GreenLab plant growth model (a discrete time dynamic Lindenmayer-System based model).
  - Was able to achieve variability results much faster than by Monte-Carlo Simulations.
  - Gained key insights into analyzing stability and uncertainty propagation in mathematical models.
  - Work involved formulating a mathematical framework to integrate complex inter-dependent sources of variability in plant population. Implemented the framework (C++, 2000+ lines) to simulate the model.
  - Paper accepted at International Symposium on Plant Growth Modelling and Applications 2009. [\[pdf\]](#)

### Relevant Courses Taken (or will be taken by May 2011)

Machine Learning and Knowledge Discovery, Artificial Intelligence Programming, Computer Vision and Image Processing, Special Topics in Computer Science (Generative Topic Models), Special Topics in Computer Science (Computational Modelling of Metaphor), Randomized Algorithms, Optimization, Applied Stochastic Processes, Discrete Mathematics, Theory of Computation, Linear Algebra and Complex Analysis, Real Analysis and Multivariate Calculus.

## Selected Research Projects

### **Deep Learning**

*BTech Project, Mentor: Dr Harish Karnick, Dept of Computer Science, IIT Kanpur*

**(Fall 2010)**

- Studied **Deep Belief Networks** as auto-encoders which reduce the dimensionality of the input and permit approximate reconstruction of the original input from the reduced dimension.
- Formalized the notion of learnability in this scenario using a PAC-like framework and tried to bound sample complexity for learning certain types of probability distributions.

### **Computational Modelling of Metaphor**

*Special Topics in CS (Independent Research project) Mentor: Dr Amitabha Mukerjee, Dept of CS, IIT Kanpur*

**(Fall 2010)**

- Built a metaphorically structured model for learning concepts.
- It learns new and abstract concepts by mapping them to concepts in the physical domain (spatial and temporal).
- This physical grounding explains the emergence of metaphors and lexical polysemy in natural language.

### **Learning Size and Structure of Document Ontologies using Generative Topic Models**

*Special Topics in CS (Independent Research project) Mentor: Dr Harish Karnick, Dept of CS, IIT Kanpur*

**(Spring 2010)**

- Designed an algorithm for finding the interlinked hierarchy of topics which underlies a given document corpus.
- Found relations between topics by mapping the problem to finding a max-clique on a sparse graph.
- Wrote python script to collect data from the Open Directory Project and experimented with it.

### **Automated Conversation Summarization Using Speech**

*Winter school team project at IIIT Hyderabad Mentor: Dr Bhiksha Raj, School of Computer Science, CMU, USA,*

**(Dec 2009)**

- Developed a system for extracting relevant portions of a group conversation given the speech signal.
- Used SVM for learning features of a relevant speech from statistics of pitch, intensity and cepstral coefficients.

### **Radio-xenon monitoring for verification of the Comprehensive Nuclear Test Ban Treaty**

*Course project in CS 674: Machine Learning, Mentor: Dr Harish Karnick, Dept of CS, IIT Kanpur*

**(Spring 2010)**

- Worked with the ICDM 2008 dataset (Radio-xenon measurements from five CTBTO monitoring sites)
- Aim was to find the best data mining techniques to verify compliance of the global ban on nuclear tests.
- Experimented with different classifiers and techniques for handling class imbalance

### **Exploring Effects of Intrinsic Motivation in Reinforcement Learning Agents**

*Course project in CS 365: Artificial Intelligence, Mentor: Dr Amitabha Mukerjee, Dept of CS, IIT Kanpur.*

**(Spring 2010)**

- Used Intrinsic Motivation as a reward framework for reinforcement learning by modelling the emotion of surprise
- Modelled skills using SMDPs. Agent was able to learn skills and compose them to perform complicated tasks.

### **Identification of Prototypical and Peripheral Handwritten Digits using Manifold Learning**

*Course project in SE367: Cognitive Science, Mentor: Dr Amitabha Mukerjee, Dept of CS, IIT Kanpur.*

**(Fall 2009)**

- Learned prototypical hand-written digits from the MNIST dataset in an unsupervised way.
- Used ISOMAP to learn a low dimensional manifold embedding using tangent distance as the distance metric.
- Learned a Gaussian mixture model on the manifold. Centres of these Gaussians gave prototypical digits.

See [project page](#) for abstracts, presentations and reports

## Experiences

**2010 Winter School on Machine Learning and Computer Vision (organized by Microsoft Research India and CIFAR) (Jan 2010)**

Attended talks and tutorials by prominent researchers, was introduced to current challenges and different research perspectives in ML and vision. [\[Program website\]](#)

**National Board for Higher Mathematics Nurture Programme**

**(June 2008)**

Studied Combinatorics, Group Theory, Real Analysis and Linear Algebra at Indian Statistical Institute, Bangalore (one of the best mathematics institute in India). [\[Program website\]](#)

## Technical Skills

- Extensive programming experience in C, C++, Java, python, C#
- Softwares/libraries used: Matlab, OpenCV, NLTK, Verilog (HDL)

## Positions of Responsibility Held

- Secretary, Programming Club, IIT Kanpur (2008-09) – responsible for organizing weekend programming contests, lectures.
- Secretary, Software Corner, Techkriti 2008 (Technical festival IIT Kanpur) – organized programming events in Techkriti.
- Student Guide, Counselling Service, IIT Kanpur (2008-09) – Helped the 2008 freshman batch to settle down in IIT Kanpur.
- Coordinator of Academics, Mathematical Society, Delhi Public School RK Puram, New Delhi (2006-07).

## Extracurricular Activities

- Participated in Robotics and Programming events in Techkriti, the annual technical festival of IIT Kanpur.
- Won 1<sup>st</sup> prize in International Online Programming contest (IOPC) in Techkriti 2010.
- Volunteer for Musical Events, Anataragni 2007 the cultural festival of IIT Kanpur.
- “Automated Conversation Summarization using Speech” won 1<sup>st</sup> prize in Eureka, the paper presentation competition in Techkriti 2010.