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Indian Institute of Technology Madras

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EDUCATION

Indian Institute of Technology, Madras — **Aug 2013 - May 2018**[e]

B.Tech. and M.Tech. in Computer Science and Engineering; ***CGPA: 9.39/10*** — *Chennai, India*

- Major: **Computer Science and Engineering**; Minor: **Industrial Engineering**
- Courses:
  - AI: Topics in Deep Learning[†*], Deep Learning[*](A), Natural Language Processing[*](A), Machine Learning[*](S), Kernel Methods[*](S).
  - Math: **Theory** - Convex Optimization[*](A), Number Theory[*](A), Linear Algebra(S), Probability(S), Graph Theory(A), Calculus I and II(S and B). **Application** - Economics(S), Operation Research(S), Industrial Engineering(S), Computer Simulations(A).
  - Key Undergraduate Courses: **Theory** - Data Structures and Algorithms[+], Distributed Network Algorithms[*], Topics in Complexity Theory[*], Language Machines and Computation. **Hardware** - Computer System Design[+], Computer Organization[+], Switching Theory and Digital Design[+]. **System** - Software Engineering[+], Operating Systems[+], Computer Networks[+], Introduction to Database Systems, Compiler Design[+], Principles of Communication.

Scholastic Achievements

- Among fifty awardees selected for **S.N. Bose Scholarship** in India to be sponsored by the **Department of Science and Technology, Govt. of India** to undertake a research internship in the United States for the summer of 2017.
- Secured **16th rank** in **YouTube-8M Video Understanding Challenge**[!] 2017 hosted by **Google**.
- Secured **211st rank** in India under SX program in **Kishore Vaigyanik Protsahan Yojna** 2013 organised by **IISC**.
- Secured **1st rank** in machine learning contest conducted as a part of Machine Learning Course 2015 at IIT Madras.
- Placed under **national top 1%** students in India in **National Standard Examination in Physics** 2013 and represented my state in **Indian National Physics Olympiad** organised by **HBCSE TIFR**.
- Placed **under top 20** students in **Regional Mathematical Olympiad** 2011 in Chhattisgarh state and represented my state in **Indian National Mathematical Olympiad** 2012 organised by **HBCSE TIFR**.
- Institute topper in first semester and got a branch change to CSE Department based on academic excellence.
- Secured **rank 1053/1.4 million** in JEE Mains 2013 and **rank 899/150 thousand** in JEE Advance 2013 in India.

Extra-Curricular Activities and Position of Responsibility

- Currently working with Ramakrishna Mission in Narainpur District, helping underrepresented high school students from Abujhmadh (Bastar, Chhattisgarh) to appear and qualify competitive exams like JEE, AIPMT etc.
- Currently working for child nutrition and education with an NGO called Childline India in Rajnandgaon, Chhattisgarh.
- Teaching Assistant for Computer System Design Course, where I plan logistics of course; design and evaluate assignments and coordinate with other fellow Teaching Assistants and the Professor.
- As a Saathi coordinator, mentored five freshmen for a year and helped them with any difficulties they might have faced.
- Taught English to visually challenged in a blind school at Chennai, India under NSS IITM.
- Helped cheer up children suffering from cancer in children cancer hospital under NSS IITM.
- Worked on the beaches of Chennai, protecting eggs of endangered turtle species under Students Sea Turtle Conservation with NSS IITM.

Professional Experience

1. Machine Learning Department, Carnegie Mellon University — **May-July 2017**

Learning of Structure and Motion from Video — *Pittsburgh, USA*

- Worked on 3-D geometry aware deep neural networks that decomposes frame-to-frame pixel motion in terms of camera motion, object depth, rotation and translation; predicts meaningful depth maps from the single monocular 2-d image, estimates motion and segments moving objects even though such supervision is never provided.

2. IBM Research Lab — **May-July 2016**

Dictionary Building and Sentence Template Matching for Unstructured Data — *Bangalore, India*

- Developed a ML pipeline for mining sentences loosely following an input template from raw text (language independent) achieving precision and recall of 0.76 and 0.65 respectively outperforming many current techniques.

Key Projects (Research and Development)

1. Visual Dialogue **Aug 2017-May 2018[e]**
Dual Degree Project, Advisor - Prof. Mitesh Khapra *IIT Madras*

- Developing visual dialogue systems using deep neural networks (currently working).

2. YouTube-8M Video Understanding Challenge[!] **Jan - May 2017**
Deep Learning, Course Project, Advisor - Prof. Mitesh Khapra *IIT Madras*

- Multilabelled video classification on large dataset (1.7TB) and 4716 classes (3.4 labels/video) using deep learning.

3. Polysemy Resolution in Word Embeddings **August - December 2016**
NLP Course Semester Project, Advisor - Prof. Sutanu Chakraborti *IIT Madras*

- Suggested sense embedding to tackle polysemy in word2vec; outperforming word2vec on word similarity & relatedness.

4. Context Sensitive Spell Check **July - August 2016**
NLP Course Project, Advisor - Prof. Sutanu Chakraborti *IIT Madras*

- Context sensitive Spell-checker utility based on the noisy channel model & word-cooccurence counts.

5. Custom Linux Shell **October - November 2016**
Operating Systems Course Project, Advisor - Prof. Chester Rebeiro *IIT Madras*

- Custom Linux shell that supports standard commands & operations like piping, forking, redirection etc in C

6. Algorithm Theatre **April 2015**
Advanced Programing lab Course Semester Project *IIT Madras*

- Interactive java API with 4K+ lines of code; gives animation of working of various data structures and algorithms with customized real time input given by the user.

- Development:
  1. **Tic Tac Toe Game** - Implemented GUI based N×N (N - user input) Tic Tac Toe game in C.
  2. **Sudoku Solver** - Implemented fast Sudoku solver in C.
  3. **Big Int And Complex Number Library** - Implemented mathematical operations like addition, multiplication and division for Big-Int and Complex number in C.
  4. **Library for DSA including Graph algorithms** - Coded a simple C library for many different graph algorithms and other complex data structures and algorithms.
  5. **Functional Programming in Haskell** - Implemented several algorithms including graph algorithms in Haskell.
  6. **Out-Of-Order Super-Scalar Processor Simulator** - Designed and coded processor simulator in C consisting of register-renaming, centralized reservation station, re-order buffer, operand forwarding, load forwarding features etc.
  7. **Vehicle Counter** - Laser and sensor based intelligent and scalable working model which counts number of vehicles crossing campus gate without counting pedestrians which also calculates average speed and length of the vehicle.
  8. **Computer Simulation Systems** - Designed and coded several Computer Simulation Systems such as Random Number generator, queues, stocks and inventory etc.
- Systems and Development
  1. **JOS Operating System** - Modules for booting, memory management and preemptive multitasking in JOS OS.
  2. **'Ghost' Processor** - CPU model in Verilog with sixteen basic hardware operation like ADD, SHIFT etc under constraints using basic logic gates.
  3. **Assembly Programming** - Basic programs including matrix multiplication and operating system primitives like segmentation, paging and task switching in x86 assembly language.
  4. **Compression Codec** - Codec based on Huffman code. Simulated a small network to send large compressed files between two machines.
  5. **Human Friendly Graph Language** - Defined a human friendly graph language; designed and implemented efficient compiler for that.
  6. **Language Translators** - Designed and coded language translators translating high level language to assembly language.
- AI:
  1. **Spam Filter** - A ML model for classifying spam emails.
  2. **Community Detection using Map-Reduce Algorithm** - Developed distributed community detection algorithm for large graphs using Map-Reduce framework Spark.
  3. **Extensive Machine Learning Experiments** - Classification using SVM, Decision Trees and DCNN; Dimensionality reduction using PCA, Autoencoders and stacked autoencoders; Regression using NN, GMM etc; Novelty detection and clustering using K-Means, Kernel K-Means, DB Scan, Hierarchical clustering etc and unsupervised learning.
  4. **Neural Networks with Back Propagation from Scratch** - Implemented Neural Networks and Back Propagation algorithm from scratch in Matlab for multi-class classification.
  5. **Bounds on LSTM gradients** - Proved and demonstrated how LSTMs solves the vanishing gradient problem.

Professional Skills

- ***Languages***: Proficient in C and comfortable with Java, C++, Matlab, Haskell, X86 Assembly Language, SQL
- ***Tools and Libraries***: TensorFlow, Scikit-Learn, Numpy, Gensim, NLTK, Latex, Eclipse, Sublime-Text, Weka

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* : post-graduate level course; + : course with Lab; † : audit course; e : expected date; ! : no coding contribution; Many entities in resume have hyperlinks, click the entity to know more.