Sasank Chilamkurthy

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Education

Indian Institute of Technology, Bombay *July 2011 - May 2015*
Bachelors of Technology, Electrical Engineering with Honours

CPI : 9.59/10

Minor : Mathematics

Key Courses : Foundations of Machine Learning, Convex Optimization, Stochastic Optimization, Computer Vision, Image Processing, Algorithms for Medical Image Processing, Advanced Probability and Random Processes, Graph Theory, Information Theory and Coding

Internships and Research Experience

Resolution of Crossing Fibers in Diffusion Tensor MRI Images using Sparsity *Spring 2015*
R&D Project, Prof. Suyash P. Awate, IIT Bombay

- Proposed an iterative reweighting algorithm extending **Non-Negative Sparse Coding** to better extract underlying overcomplete dictionary
- Solved resolution of crossing fibers problem in diffusion tensor MRI using **Compressive Sensing**
- Extended compressive sensing solution using a iterative reweighted algorithm to better levarage sparsity pattern of fiber crossings

Scheduling for Energy Harvesting Wireless Networks *Autumn 2014*
B.Tech Project, Prof. Abhay Karandikar, IIT Bombay

- Simulated a point to point communications link which is powered by a battery recharged with energy harvested from renewable source with random fluctuations
- Showed through simulations that average expected throughput over slots admit a quasi concave relation with waterlevel parameter of water-filling policy
- Proposed a **Stochastic Approximation algorithm** based on infinitesimal perturbation analysis to **maximize throughput** of such link

Coded Modulation for Coherent Optical Communication Systems *Summer 2014*
Internship, Prof. LA Rusch, Centre d'optique,photonique et laser (COPL), Quebec

- **Simulated** 16 QAM coherent modulation for optical communication system in **MATLAB** and performed **Monte-Carlo** simulations to obtain BER vs OSNR curves for various lasers and signal constellations
- Collected raw data from back-to-back **experiments** and extracted phase data from raw data with offline carrier **Phase Recovery DSP** algorithms
- Analysed this data to evaluate the coding gain of **Multi-level coded modulation** (MLCM) for a constellation designed to mitigate ENOB limitations of DAC used in modulation

Fractional Fourier Transform and Chirp Parameter Estimation *Summer 2013*
Internship, Prof. V.M.Gadre, IIT Bombay

- Surveyed literature on Fractional Fourier Transform and on various ways to discretize it
- **Formulated** and **proved** correctness of a **DSP algorithm** to estimate chirp parameters from noisy samples. Evaluated accuracy of the algorithm in presence of noise by simulating the setup in MATLAB
- Proved **Uncertainity Principle** for a new generalised transform extending fractional Fourier transforms

Scholastic Achievements

- Received **Undergraduate Research Award** for outstanding research on Fractional Fourier Transform under supervision of Prof. VM Gadre, IIT Bombay
- Awarded **Institute Academic Prize** for exceptional academic performance in the year 2013-14
- **One of 14** selected from India for **ITCSC-INC Winter School** 2014 organized by Chinese University of Hong Kong on Information Theory
- Ranked **28th** in India in **IIT JEE** 2011 exam taken by more than 500,000 students
- Secured **3rd rank** in **EAMCET** 2011 written by 300,000 students

- Won **Gold medal** in Indian National **Chemistry Olympiad** and attended the Orientation cum Selection Camp for International Chemistry Olympiad 2011
- Among the **Top 300** in the country to be selected for Indian national **Physics** olympiad and Indian national **Astronomy** olympiad

Academic Projects

Interactive Foreground Extraction using Iterated Graph-Cuts *Spring 2015*
Computer Vision, Prof. Ajit Rajwade, IIT Bombay

- Extracted foreground from image where foreground is loosely indicated by drawing a box around it
- Modeled foreground/background intensities using **Gaussian Mixture Models** and formulated **discrete optimization** problem on graph (Graph-Cuts) using these models to iteratively solve for segmentation

Portfolio Optimization with Linear and Fixed Transaction Costs *Spring 2015*
Convex Optimization, Prof. Ganesh Ramakrishnan, IIT Bombay

- Formulated portifolio optimization as a **convex optimization problem** with linear transaction costs and constraints on exposure to risk, short-sell constraints, etc.
- Solved **non-convex problem** of portifolio optimization with fixed transaction costs approximately using a **heurstic** solving a number of related convex problem

Compressive Sensing for Magnetic Resonance Imaging (MRI) *Spring 2015*
Algorithms for Medical Image Processing, Prof. Suyash P. Awate, IIT Bombay

- Decreased number of measurements required for Magnetic Resonance Imaging (MRI) using **Iteratively Reweighted Least Squares** (IRLS) Algorithm for Compressive Sensing
- Reconstructed **cardiac MRI** images using this algorithm

Traffic Sign Recognition using various Machine Learning Techniques *Autumn 2014*
Digital Image Processing, Prof. Ajit Rajwade, IIT Bombay

- Trained classifiers using challenging **German Traffic Sign Recognition Database** cotaining traffic sign photos of various sizes in various lightings
- Implemented **Random Forests**, **Linear Discriminant Analysis** and **Fisher's Linear Discriminant** on **Histogram of Oriented Gradients**(HOG) features to achieve test set classification accuracy of 97%

LZW compression algorithm and decoding LDPC codes *Spring 2014*
Data Structures & Algorithms, Prof. Ganesh Ramakrishnan, IIT Bombay

- Programmed **Lempel-Zev-Welch** compression and uncompression algorithm in **Java** and achieved about **50 % compression** ratio in the compressing large text files
- Implemented decoding of **LDPC codes** using **sum-product algorithm** in Java using specially designed data structure: Factor Graph

Pipelined ARM Processor *Spring 2014*
Processor Design, Prof. Virendra Singh, IIT Bombay

- Architected a **6-stage pipelined** processor based on the **ARM7TDMI** Instruction Set
- Simulated the execution of instructions after designing the processor using **Verilog HDL**

Wireless Communication using Amplitude Shift Keying (ASK) *Autumn 2013*
Communications Lab, Prof. J.Mukherjee, IIT Bombay

- Designed **Analog circuits** for ASK modulation and demodulation for medium wave band and transmitted and received the modulated waveforms wirelessly through **monopole antennae**
- Used a microcontroller to send bit data and another to receive the data using **UART protocol** over this channel, thereby transmitting a text message wirelessly

Photodetection using LEDS *Spring 2013*
Digital Cicuits Lab, Prof. S.Lodha, IIT Bombay

- Used LEDs to **sense light** rather than using photodiodes using a lesser known technique
- Described hardware using **Verilog** and implemented it on **FPGA** to sense light incident on LED array
- Displayed the pattern of incident light on **graphic LCD** accurately

Positions of Responsibility

Teaching Assistant

MA 105 : Calculus *Autumn 2012,13,14*

MA 106 : Linear Algebra *Spring 2014*

MA 108 : Differential equations *Spring 2014*

- **Tutored** 40 strength class **once a week** clarifying doubts among other duties like scrutinizing quizzes

Joint Secretary, Electrical Engineering Students Association *2013-14*

- Restructured the policy of SPAS to streamlined functioning in coordination with **50 professors** which led to a 50 % increase in number of projects floated and a **70 % increase** in successfully completed projects
- Planned and successfully executed 2 outings for 300 students handling a budget of **INR 1,20,000**

Publicity Manager, Aagomani 2013, Annual festival of EE Department *2012-13*

- Increased outreach of events leading to increase in footfall by 200% by handling budget of **INR 30,000**
- Collaborated with Technophilia in publicizing in colleges all over India

Extra-Curricular Activities

- Attended NSERC summer school on **effective communication** at McGill university, Montreal. Practiced presenting **status reports** and **pitching in a project** in presence of industry experts.
- Awarded *bien* grade in Basic **French** course attested by Alliance Francaise de Bombay
- Attended the **Annual Training Camp** organised by 2, MAH Regiment NCC and passed the B certificate examination under the authority of Ministry of Defence, Govt. of India
- **Coordinator** for competitions group of Techfest 2012. Planned and organised the event International Robotics Challenge which had 300 participants from over 5 countries