Ramchandran Muthukumar

Personal Data

Institution	**Cornell University**
Designation	Research Assistant
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Education

Institution	Birla Institute of Technology and Science Pilani, Goa Campus
July 2013 -	Master of Science in Mathematics +
May 2018	Bachelor of Engineering in Computer Science
	GPA: 7.82/10

Research Experience

Fall 2017
Ongoing

Low Memory Algorithms for Dynamic Optimization

Research Supervisor - Dr. Madeleine Udell , Dr. Drew Kouri

- Using low rank matrix approximations to develop a novel space optimal algorithm
- Exploiting low rank observations of state data in dynamic optimization problems arising in real life with pde constraints.

Fall 2017

Carnatic Music Classification using Hidden Markov Models

Research Supervisor - Dr. Mayank Goel

- Modelling Carnatic Music (specifically Ragas) as a HMM
- Raga based classification and automatic-generation of musical sequences

Fall 2016

Sign-Language Gesture Translation

Project Supervisor - Dr. Ashwin Srinivasan

- Exploration of gesture recognition using HOG-SVMS, DPM etc
- Long term intention to deploy on raspberry-pi device

Spring 2016

Random Graphs modelling for Network Analysis

Research Supervisor - Dr. Kinjal Banerjee

- Literature Survey on Random Graph models based on Bella Bollobas's work

Summer 2015

Feedback Vertex Sets and applications to Parameterized Complexity

Summer Research Student, Theoretical-CS Dept. IMSC,Chennai

Research Supervisor - Dr. Venkatesh Raman

- Worked on a Literature Review on Feedback Vertex Set Problems and Fixed Parameter Tractable algorithms
- Extensively explored recent research papers linking the effect of high girth on feedback vertex set in planar graphs

Related Coursework

Optimization

Mathematical Programming (ORIE 6300@Cornell), Statistical Principles (ORIE 6700@Cornell), Elementary Real Analysis, Functional Analysis, Topology, Graphs and Networks

Algorithms

Data-Sparse Matrix Computations (CS 6220@Cornell) , Machine Learning , Data Structure and Algorithms , Logic in CS , Analytics Edge (Edx MOOC)

Software Projects

Summer 2016 | **Presolve Routines for LP and SDP - Google Summer of Code Project**
Mentor - Dr. Madeleine Udell

- Implementing fast Presolving algorithms discussed in recent literature in scientific computing language - Julia
- Benchmarking against existing solvers for speed and efficiency

Summer 2016 | **Python Wrapper for LowRankModels.jl**
Participant in Data-Driven Discovery of Models Darpa Program. Mentor - Dr. Madeleine Udell

- Implementing Python wrapper for the julia package LowRankModels.jl such that it fits into the D3M framework
- Testing for imputation problems on standard datasets.

Talks and Conferences

Summer 2016 | JuliaCon 2016 at Massachusets Institute of Technology, Cambridge
Talk on Presolving Optimization problems and plan outline for summer work with GSOC

Reports

Fall 2017 | **Space-Optimal PDE-Constrained Optimization Presolving LP**

- Master's Thesis

Summer 2017 | **Presolving LP**

- Report on pre-solve routines for LP problems based on GSOC project.
- Elaboration of primal and dual presolve theory.

Fall 2015 | **Convex Optimization**

- Report on theoretical fundamentals of Convex Optimization.
- Compiled notes based on a reading course.

Summer 2010 | **AM-GM Inequality project**

- Report on AM-GM inequality and their usefulness in Olympiad competitions.
- Compilation of solved problems from various International Olympiads.

Teaching and Mentoring Experience

- Machine Learning (under Professor Ashwin Srinivasan)
- Graphs and Networks (under Professor Tarkeshwar Singh)
- Discrete Mathematics (under Professor Kinjal Banerjee)

Positions of Responsibility

- Secretary of Mathematics Association, BITS Goa - 2014-2015
- Co-ordinator of Mathfest 2015

Programming Languages

- Julia , C , C++ , JAVA, Python , R , Mathematica , MATLAB

Sports

- Member of BITS Goa Tennis Team