Divyanshu Shende

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Education

B.Tech - M.Tech Dual Degree (CPI (PG): 9.0/10.0)
Department of Computer Science and Engineering
Indian Institute of Technology Kanpur. Expected: May 2018

Thesis

Adviser: Dr. Raghunath Tewari
Main focus of the thesis, at the moment, is to find out whether Directed Mangrove Graph Reachability can be done using only Logarithmic Space. The question has links to L vs NL problem which is a major problem in Computational Complexity.

Skills

Programming Languages: C, C++, Python, Octave, R, Matlab, Haskell
Operating Systems: Ubuntu, Debian, Fedora, Arch Linux, Windows
Machine Learning: Scikit Learn, Tensorflow, Keras, Theano
General Purpose: LaTeX, Git, Bash
Web Related: HTML/CSS, Javascript, jQuery, Jekyll, Liquid, Markdown

Projects

- Depth Recognition using Deep Network (Mar 17 - Apr 17) - *Visual Recognition Course Project*
  - Looked at a Deep Network for Depth Map Estimation based on the work of David Eigen et. al. and implemented part of their model.
  - Implemented their network in Keras on Kitti dataset. The dataset consists of 3D image matrix along with a heat map which can be converted into a depth map.
  - The model uses a coarse stack to obtain a coarse depth map and sends this output to a fine component stack that outputs a finer depth map. Both maps have resolution 1/4th that of the original image.
- Protein Folding and Markov Chains (Mar 17 - Apr 17) - *Markov Chains Course Project*
  - Surveyed the use of Markov Chains in understanding the Protein Folding problem.
  - Protein Folding has important links to diseases like Alzheimer's.
  - The use of Markov Chain Monte Carlo Methods on Self-Avoiding Walks was explored.
- Human Centered Computing (Jan 17 - Apr 17) - *Human Centered Computing Course Projects*
  - First Project involved scraping Train delay data and drawing useful inferences like finding best train between two stations. For the project, best meant the one with minimum average delay.
  - Second Project was to look into browsing history and make inferences from it using topic modeling. The rationale was to draw inferences about the user based on browsing history.
  - Third Project was to look at call records, bluetooth and survey data (from a study at MIT) and infer user behavior. Traits like introversion, expansion of friends circle, physical proximity, etc.
- Groupoid Interpretation of Type Theory (July 16 - Nov 16) - *Under Graduate Project 2*
  - Reading project on the paper *Groupoid Interpretation of Type Theory* by Hofmann and Streicher. The paper answered an important question about Uniqueness of Identity Proofs defined in Martin-Löf Type Theory.
  - Looked at the Groupoid Interpretation of Type Theory and it's use in modeling Dependent Types.
- Computer Networks Projects (July 16 - Nov 16) - *Computer Networks Course Mini-Projects*
  - First project: Implemented a HTTP server which supported GET, multiple requests, directory listing.
  - Second project: Implemented a HTTP proxy capable of handling multiple clients and send text, images, gifs.
  - Third project: Implementing Sliding Window Protocol over STCP (based on the TCP).
  - Fourth project: Implement a virtual router. Handled ARP requests and tracerouting.
- Real Time Object Detection (Feb 16 - Apr 16) - *Machine Learning Course Project*
  - Problem Statement: Detect and classify objects into pedestrians, 2/3/4 wheelers based on CCTV footage.
  - Three stage approach used - Feature Extraction, Classification, Foreground Extraction.
  - SIFT and SURF features explored for Feature Extraction. Random Forests and SVMs used as classifiers.
  - Libraries used were OpenCV (for feature and foreground extraction) and Scikit Learn (for classifiers)
- C# to x86 compiler in Python (Jan 16 - Apr 16) - *Compiler Design Course Project*
  - Built a compiler from scratch to compile C# code into x86 assembly using PLY(Python Lex-Yacc).
  - Supports functions, scoping, nested loops, namespaces, arrays. Is able to support one class per program well.
- NachOS Operating System (July 15 - Dec 15) - *Operating Systems Course Project*
  - First Assignment implemented 12 system calls handling functions like join and fork.
  - Second Assignment implemented parts of scheduler and implemented scheduling policies like FCFS, round robin,, etc.
  - Third Assignment implemented shared memory support, paging and semaphores.
- Partitioning into Expanders (July 15 - Dec 15) - *Under Graduate Project 1*
  - Reading project on the paper *Partitioning into Expanders* by Luca Trevisan and Shayan Oveis Gharan.
  - Explored the area of Spectral Graph Theory and it's connections to Computer Science.

- Programming Language for bots (Jan 14 - Apr 14) - *Association for Computing Activities, IITK*
  - Designed and Implemented a Programming Language for virtual robots
  - Language had commands like MOVE, TURN, SHOOT and REPEAT TIMES
  - Used Python's Turtle GUI implementation.

Relevant Coursework

- *Other Departments*: Calculus, Linear Algebra and ODE, Probability and Statistics
- *Computer Science (Theory)*: Data Structures and Algorithms (I-II), Discrete Mathematics (I-III), Theory of Computation, Algorithmic Game Theory, Computational Complexity, Markov Chains, Topics in Game Theory and Collective Choice*
- *Computer Science (Systems)*: Computing Laboratory(I-II), Operating Systems, Computer Networks, Compiler Design, Computer Organization
- *Computer Science (AI/ML)*: Machine Learning, Human Centered Computing, Visual Recognition, Probabilistic Machine Learning*#

  #- *auditing* * - *in progress*

Activities

Core Team Academics, Counselling Service (2015-2016)
Academic Mentor, Counselling Service (2014 - 2015)
Teaching Assistant, Data Structures and Algorithms (July 2017 - Present)
Data Structures and Algorithms, Course Co-Instructor, ACA Summer School, IITK (June 2017)
DUGC Nominee, CSE Department, IITK (2015 - 2016)
Executive, Startup Internship Program, E-Cell, IITK (2014 - 2015)
Editorial Team, NERD IITK (2013 - Present)