Shubham Gupta

Contact Information

Senior Undergraduate,
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Research Interests

Machine Learning, Computer Vision, Social Network Analysis

Education

Indian Institute of Technology Kanpur

B.Tech. in Electrical Engineering **2010 – present**

- Cumulative Performance Index (CPI) of 9.4 (on a scale of 10)

Publications and Posters

S. Gupta, A. Kumar, K. Gupta and B. Vasan Srinivasan, "Stemming of Information Flow in a Network", to be submitted at the 8th International AAAI conference on Weblogs and Social Media(ICWSM-14).

Invention Disclosure

Filed a U.S. patent application entitled *"Identifying Target Customers To Stem The Flow Of Negative Campaign"* as one of the inventor.

Poster

"Self-Evolution of Target-Tracking Behaviour in Mobile Robots using Direct Competition" presented at first International workshop on *Advances in Robotics* held at IIT Delhi.

Awards and Achievements

- Ranked among **Top 1% in the institute** (out of 820 students) and **Top 5% in the department** (out of 125 students) with a **CPI of 9.4/10.0** after 6 semesters
- Ranked in **Top 0.1%** (amongst 475,000 students) in IIT-JEE 2010
- Received **Academic Excellence Award** for the term 2011-12
- Awarded **NTSE Scholarship** (National Talent Search Examination) by NCERT in 2008
- Shortlisted among **Top 1%** (amongst 40,000 students) for National Chemistry Olympiad, 2010
- Awarded **CBSE Merit Scholarship** by Central Board of Secondary Education, India in 2010

Internships

Adobe Technology Labs - "Stemming the Flow of Information in a Social Network"
Mentored by Balaji Vasan Srinivasan, Computer Scientist at ATL-India (May 2013 - July 2013)
Developed an end-to-end system for stemming the flow of information in a network starting from estimation of information flow in a network and based on this finding a set of nodes/users who would be instrumental in checking the spread of this information. The main contribution of this work was devising of novel mathematical functions based on *Modified Betweenness Centrality, Page Rank* and predicted information flow pattern for finding the *susceptibility* of a node.

Research Experience

Final year Project- "Saptio-Temporal Face Recognition in Surveillance Videos"
Mentored by Prof. Aditya K. Jagannatham, IIT Kanpur
Funded by Board of Research in Nuclear Sciences, Bhabha Atomic Research Centre (August 2013 - present)
Implemented Weber Faces and Non Local Means normalization techniques for achieving an illumination insensitive representation of face images. This was integrated with Evidence Integration based recognition for development of a pose and lighting invariant recognition system. *Currently working on developing a complete end-to-end system involving face extraction, illumination correction and recognition in cascade for surveillance videos to be deployed at BARC facility.*

"Self-Evolution of Target-Tracking Behaviour in Mobile Robots Using Direct Competition"
Mentored by Prof.Laxmidhar Behera, IIT Kanpur (May 2012 - July 2012)
Developed a self-learning robot-controller capable of training itself to explore a new environment and track its target through *evolution.* Implemented a fitness function evaluation scheme based on direct-competition of controllers for reducing human bias in evolution process. The better performing controllers are selected, mutated and propagated to perform the task again in an iterative process that mimics some aspects of natural evolution.

Projects and Presentations

"Movie Rating Predictor"
Course Project for CS771, Prof. Harish Karnick (September 2013-November 2013)
Built a movie rating predictor system for a new/unknown user whose simple demographics are available(*Cold Start* Problem). Extended the standard *Matrix Factorization* algorithm to incorporate the user demographics and movie genre information and capture the implicit attribute-movie relation present in the ratings.

"Cumulative Modeling of USD/INR, Gold and Oil"
Course Project for MTH517, Prof. Amit Mitra (September 2013-November 2013)
Modelled the behavior of the Oil, Gold and USD prices in the Indian Scenario (INR Denomination) using a Vector Auto Regressive process and used the model to forecast the future data. Also observed the effect of the impulses in price of one of the commodities on the rest.

"Parsing Natural Scenes using Neural Network"
Course Project for CS365, Prof. Amitabha Mukerjee (January 2012-April 2012)
Explained and analysed the implementation of *Recursive Neural Network* based architecture for parsing and identifying different classes in a natural scene image(For e.g sky, building, water). The key idea was to find similarities between neighboring segments of an image and merge them accordingly.

"Gamma Correction in Images using a Locally Adaptive Approach"
Term Paper for EE604, Prof. Sumana Gupta (September 2013-November 2013)
Implemented a locally adaptive gamma correction method involving estimation of different gamma values for different regions of a given image using 2 different feature vectors namely pixel intensity histograms and dispersion vs. location distributions.

"Design of Artificial Neural Networks"
As part of Course EE698B, Prof. Laxmidhar Behera, IIT Kanpur (July 2012-December 2012)
Designed multilayered neural networks using *back propagation algorithm.* RBFN along with BPTT, RTRL were designed and used for system identification with final RMS tracking errors of the order of 0.001 and less.

"Computer Vision with Microsoft Kinect"
Funded by Dean, Resource Planning & Generation, IIT Kanpur (January 2012-April 2012)
Created a *3D-point cloud* using the Kinect module and detected ground plane and implemented obstacle avoidance for navigation using *RANSAC algorithm.* Implemented face detection algorithm using Face Tracking SDK on Kinect.

Relevant Courses

Machine Learning and Algorithms: Machine Learning, Mathematics for Machine Learning*, Artificial Intelligence, Data Structures and Algorithms, Fundamentals of Computing
Control Systems: Control System Analysis, Intelligent Control Systems
Mathematics Courses:Time Series Analysis, Statistical Simualtion & Data Analysis*, Real Analysis, Linear Algebra, Probability and Statistics, Complex Analysis, Differential Equations
Communication and Signal Processing: Convex Optimization*, Image Processing, Principles of Communications, Communication Systems, Digital Signal Processing, Signals Systems and Networks
**to be done next semester*

Technical Skills

Programming Languages - C, C++, Java, Python, Verilog, VHDL, HTML, Assembly
Softwares/Tools - MATLAB, D3, GNU Octave, OpenCV, SPICE, Eclipse, AutoCAD, Player-Stage, Xilinx ISim, LaTeX
Hardwares - Microsoft Kinect SDK, dsPIC, Atmel AVR, Arduino, Bluetooth Modules, Accelerometers

Positions of Responsibility

Core Team Member, Entrepreneurship Cell - Pioneered the Institute's Deferred Placement Program. Conceptualized a new TEDx experience by introducing speakers from queue entertainment, unconventional sports and experience.
Head, Technical Cell, Science and Technology Council - Led a team of 41 club coordinators and executives for conducting various workshops, lectures, seminars encompassing various fields like electronics, robotics, business, aeromodelling etc. within a total budget of Rs 2 million
Link student - Mentored the assigned academically deficient students and provided them academic tutoring for various courses.
Student Guide - Guided a group of 9 students to help them settle in the new environment of IITK.