

Pulkit Agrawal

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EDUCATION

University of California, Berkeley

Ph.D. Student in Computer Science

GPA: 3.9/4.0

(Aug 2011 to present)

Indian Institute of Technology, Kanpur

Bachelor of Technology in Electrical Engineering

GPA: 9.4/10.0

(2007-2011)

ACADEMIC AWARDS

- **International Fulbright Science and Technology Award 2011-14**
- **Director's Gold Medal** for best all round achievement and leadership in graduating class of 2011 at IIT Kanpur.
- **Academic Excellence Award** for the year 2007-08, 2008-09 and 2009-10 IIT Kanpur, for distinctive academic achievements.
- **Sridhar Memorial Prize** for best student in Electrical engineering department based on academic performance at the end of 3rd year.
- **Smt. Saraswati Singh Scholarship** for best student in Electrical engineering based on GPA at the end of 3rd year.
- **Goldman Sachs Global Leadership Award 2009**
- **OP Jindal Engineering and Management Scholar (OPJEMS) 2009**
- First Prize in paper presentation competition, Eureka in Techkriti- 10, National Level Intercollegiate technical festival.
- First Prize in Electromarket, Digital & Analog circuit design competition in Techkriti-10.
- Runner-up, in Prayog, Experimental Science Competition, Techkriti 09.
- Runner-up in Advanced level, embedded circuit design competition Techkriti-08.

RESEARCH INTERESTS

Understanding how brain represents visual information, Computer Vision, Computational Neuroscience, Brain Reading and Deep Learning.

PUBLICATIONS

Agrawal P., Girschick R., Malik J., *Analyzing the performance of multilayer neural networks for object recognition*, European Conference on Computer Vision (ECCV) 2014.

Gweon G., **Agrawal P.**, Udani M., Raj B., Rose C., *The automatic assessment of knowledge interaction processes in project teams*, International Conference of Computer Supported Collaborative Learning (CSCL) 2011 (**Best Student Paper Award**)

PRE-PRINTS

Agrawal P., Stansbury D., Malik J., Gallant J., *Pixels to Voxels: Modeling visual representation in the human brain*, arXiv 1407.5104, 2014.

PATENTS

Agrawal P., Majumdar S., Invariant object representation in images using spiking neural networks, US Patent 14/228,065 (Filed)

Agrawal P., Majumdar S., Gupta V., Invariant object representation in images using spiking neural networks, US Patent 14/228,071 (Filed)

INTERNSHIPS

Research Intern, Corporate Research and Development, Qualcomm, San Diego, USA

(May to Aug 2013)

Qualcomm Zeroth: Brain Inspired Computing

with Dr. Blythe Towal & Somdeb Majumdar

- Developed algorithms for saliency and object recognition for "Zeroth processor" based on spiking neural networks.

Research Intern, School of Computer Science, Carnegie Mellon University, USA

(May to July 2010)

Automatic assessment of student 'reasoning' process in face to face interaction using speech

with Dr. C. Rose & Dr. Bhiksha Raj

- Given the speech recordings of 'N' speakers in a conversation, we automatically detect important segment of conversations (i.e. involving reasoning) using acoustic features only (without speech to text conversion).
- Given the skewed nature of the data, remarkably, precision of 0.51 and F-Score of 0.56 was achieved.

Gaver's Hypothesis testing

with Dr. Bhiksha Raj

- o Two models, a Multi Gaussian mixture model and another employing adaboost were developed for computationally validating the Gaver's Hypothesis for environmental sound classification.

Student Intern, University of Melbourne, Australia

(May to July 2009)

Estimation of Rosacea using Image Processing

with Dr. Jonathan Manton

- o A colour based skin model capable of objectively tracking changes in severity of skin disease Rosacea from photographs of patients taken over a period of few months while they were under medication was developed and tested.

SELECTED PROJECTS

Latent Variable Models and Fisher Vectors for Scene Classification

with Dr. Ross Girshick and Dr. Jitendra Malik

- o Developed a HOG based model for discovering discriminative mid-level parts for scene classification. (41.5% accuracy on MIT Indoor data set). Experiments with Fisher Vectors yielded much better results with 62.5% on MIT Indoor and 42% on SUN dataset.

A Probe into decoding brain activity using fMRI and MEG

with Dr. Jack Gallant

- o Implemented ridge regression models to predict voxel responses for given visual stimuli with high correlations.
- o Explored combining information between MEG and fMRI using canonical correlation analysis, regression techniques etc.

Towards Generative Model of Images using Restricted Boltzmann Machines

with Dr. Bruno Olshausen

- o Probability distribution of image patches drawn from a binary image was modelled using restricted Boltzmann machine (RBM).
- o A RBM based prior for sparse coding of image patches was developed.

Dynamic Safe Feature Elimination for LASSO

with Dr. L. El Ghaoui

- o Dynamic safe feature elimination is the process of identifying irrelevant features by exploiting the structure of data in real time.
- o Such a formulation was proposed and implemented for solving L1 regularized least square programs (LASSO). Empirical evaluation and conditions on data sparsity, magnitude of L1 penalty leading to faster convergence were reported.

Collocation based approach for training Recurrent Neural Networks

with Dr. Pieter Abbeel

- o Formulated training of RNN as a trajectory optimization problem. Collocation method was implemented using cvx and mosek. The training turned out to be slower than back-prop for simple networks and failed for more complex ones.

Scene Analysis using Trajectory Clustering in Surveillance Videos

with Dr. A. Mukerjee

- o Proposed a cognitive experiment to measure relative effects of speed, orientation and location on similarity of trajectories.
- o Implemented hierarchical clustering incorporating the same metric to obtain usual and unusual trajectory clusters.

Modeling Responses of V1 Neurons to Natural Vision Movies

with Dr. A. Mukerjee

- o Method of reverse correlation was used for estimating spatio temporal receptive fields (STRF) of individual neurons in response to the stimuli of natural vision movies. Average correlation of 0.16 was obtained between actual and predicted spiking activity.

OTHER PROJECTS

- o Affordance Based Object Recognition, GIST Based Scene Classification.
- o System Identification and Filtering with Artificial Neural Networks.
- o Autonomous Line following Robot, Robust Two Degree of Freedom Vehicle Steering Controller Design.
- o Micro-controller based Chat Client capable of communicating with desktop computer.

PROJECTS MENTORED

CMU – NITK Winter School, India (Dec 2014; [Link](#))

with Dr. Bhiksha Raj and Dr. Rita Singh

- o Emotion Recognition with *Dhruv Goel, Satish Palaniappan and Skand Arora*
- o Never Ending Learning of Sound with *Aditi Bhatnagar, Amog Hiremath, Ankit Shah, Parnika Nervaskar and Rohan Badlani*
- o What makes image popular on social media with *Chirag Nagpal, Kodali Naveen, Megha Arora, Nimisha Sharath and Rohan Katyal*
- o Voice Forensics with *Priya Soundararajan, Sathkivel S., Tejeswini Sundaram and Utkarsh Patenge*
- o Predicting Crime Rates for Predictive Policing with *Aman Kumar Singh, Lavanya Gupta and Priya Selvan*
- o Generating visual storyboards from text with *Akshay Uttamai, Jay Bothra, Ashwin Kalyan and Harsha Vardhan*
- o Automatic Commentary Generation for Lawn Tennis with *Akshay Varun, Satya Narayana, Siddhant Manocha and Vanya Jauhal*
- o Predicting Hospital Readmission Rates in Diabetes Patients with *Ankit Kumar, Bhuvan MS, Vinith Kishore and Adil Zafar*
- o Comic Translation with *Akshay Dixit, Gaurav Bansal, Selva Priyanka, Aman Raj, Harshvardhan Solanki and Farhat Abbas*
- o Learning Features with Color and Depth Images with *Arvind Srinivas, Kumar Krishna, Vinith Venkatesan, Pulkit Pattnaik and Ayush*

Winter Hackathon, IIT Kanpur, India (Dec 2013; [Link](#))

with Anubhav Singla

- o Object Tracking with AR2 Drone with *Ankita Pasricha*
- o Infexious: Spatially Local Social Networks with *Thirukovalluru Raghuvveer and Enayat Ullah*.
- o RoboMan: Interactive Social Robot with *Nitish Gupta, Saket Kanodia and Vivek Kumar*
- o Clustering Research Papers with *Pankaj Gupta*

COURSES AND SKILLS

- o Statistical Learning Theory, Advanced Robotics, Computer Vision, Convex Optimization, Neural Computation, Digital Signal Processing, Visual Neurophysiology, Cognitive Sciences, Probability and Statistics, Artificial Neural Network, Image Processing, Applied Stochastic Processes, Data Structures and Algorithms.
- o Programming and toolboxes: Matlab, Python, C++, Java, cvx, Mosek, OpenCV

LEADERSHIP

- o General Secretary, Science & Technology Council, IIT Kanpur (Elected) (2010-11)
- o Vice-Captain, Institute Aquatics Team (IIT Kanpur) (2009-10)
- o Coordinator, Cryptography Contest-Techkriti-09 (Inter-Collegiate Technical Festival of IIT Kanpur) (2009)
- o Secretary, Ritambhara, The Fashion Show – Antaragini (Inter-Collegiate Cultural Festival of IIT Kanpur) (2008)
- o Student Guide, Counselling Service, IIT Kanpur (2008-09)

REFERENCES

Available on request