

Pulkit Agrawal

Graduate, Department of Electrical Engineering, Indian Institute of Technology Kanpur

E-mail: pulkitagrawal.mail@gmail.com

Phone : +(91)9935590072

Home Page: <http://home.iitk.ac.in/~pulkit>

Education

Year	Degree / Certificate	Institution	CGPA / %
2011	B.Tech, Electrical Engineering	IIT Kanpur	9.4/ 10.0
2007	Class XII : CBSE	Puranchandra Vidyaniketan, Kanpur	94.4%
2005	Class X: CBSE	Puranchandra Vidyaniketan, Kanpur	92.4%

- **Certificate of merit** in Mathematics & Chemistry in All India Senior Secondary Certificate Examination 2007
- Selected among **top 1%** students in among 40,000 students in National Physics Olympiad 2006-07

Awards and Accomplishments

- **International Fulbright Science and Technology Award.**
- **Director's Gold Medal** for best all round achievement and leadership in graduating class of 2011 at IIT Kanpur.
- **Goldman Sachs Global Leadership Award 2009:** It is awarded to the most accomplished 150 sophomores from all disciplines from over 90 top ranked universities in 19 countries for *academic excellence and leadership potential*.
- **OP Jindal Engineering and Management Scholar (OPJEMS) 2009:** The scholarship is awarded to meritorious students of the leading Engineering and Management institutes in India.
- **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 CPI at the end of 3rd year.
- **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**, Prayog, Experimental Science Competition, **Techkriti 09.**
- **Runner-up** in Advanced level, embedded circuit design competition **Techkriti-08.**
- **Gold Medal** in Water polo championship, Inter IIT Aquatics Meet 2009 and 2010.
- **Sangeet Prabhakar** in Instrumental Music (Guitar) (*Equivalent to Bachelor of Art, awarded by Prayag Sangeet Samiti Allahabad*)

Academic Interests

- Understanding how does the brain work, more specifically finding out how concepts/ideas are represented in neural circuits.

Internships*

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

Mentor: Prof. C. Rose & Bhiksha Raj

- Given the speech recordings of 'N' speakers in a conversation, the goal was to automatically detect statements when speakers were saying something important (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.

EEG data analysis and Gaver's Hypothesis testing

Mentor: Prof. Bhiksha Raj

- 129 channel EEG data was analyzed using ICA for exploring presence of characteristic activations capable of predicting semantic and temporal coherence in audio-visual stimuli presented to subjects. Work indicated absence of a basis for such independent activations.
- Two models, a Multi Gaussian mixture model and another employing adaboost were developed for computationally validating the Gaver's Hypothesis for environmental sound classification.

University of Melbourne, Australia

(May to July 2009)

Estimation of Rosacea using Image Processing

Mentor: Prof. Jonathan Manton, Dep of Elec. Eng.

- 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.

Research Papers

- *The automatic assessment of knowledge interaction processes in project teams*, Gahgene Gweon, **Pulkit Agrawal**, Mikesch Udani, Bhiksha Raj, Carolyn Rose, submitted to International Conference of Computer Supported Collaborative Learning (CSCL) 2011
- *Automatic assessment of student "reasoning" processes in face-to-face interactions using speech data*, Gahgene Gweon, **Pulkit Agrawal**, Nitish Srivastava, Abhilash Jindal, Shantanu Agarwal, Marietta Sionti, Bhiksha Raj, Carolyn Rose (2010)
- *Estimation of improvement in Rosacea using image processing*, **Pulkit Agrawal**, Jonathan Manton, Weng-Hung Chung, 2009

Relevant Courses: Computer Vision and Image Processing, Cognitive Sciences, Artificial Neural Networks, Bio-engineering and Bio-Electronics, Data Structures and Algorithms, Discrete Math, Randomized Algorithms, Probability and Statistics, Digital Signal Processing, Communication and Information theory, Differential Equations, Real Analysis and Multivariate Calculus, Signals and Systems.

Technical Skills

- C/C++, Java, Verilog(HDL), HTML, Latex, Matlab, Open CV, TagHelper tools, Microcap, Spice, Eagle

Projects*

Scene Classification (Group Project: 3 members)

Mentor: Dr. Simant Dube, Dep. of Comp. Sc., IIT Kanpur

- Given an input image, a model for classifying images into **8 classes** (Mountain, forest, city, street, highway etc) was built.
- Features were extracted using Gabor filters and **naive Bayes** classifier along with **linear discriminant analysis** to build a classification scheme in form of a decision tree.
- 89% accuracy** for Artificial v/s Natural categorization, **71%** for classification of highways and **60.2%** overall accuracy was obtained.

Modeling Responses of V1 Neurons to Natural Vision Movies

Mentor: Dr. A. Mukerjee, Prof., Dep. of Comp. Sc. Eng., IIT Kanpur

- 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. The goal was to predict the number of spike responses in each 16ms interval of time when the stimuli was presented to subjects. Average correlation of 0.16 was obtained as the result. I am still working on this project.

Scene Analysis using Trajectory Clustering in Surveillance Videos

Mentor: Dr. A. Mukerjee, Dep. of Comp. Sc. Eng., IIT Kanpur

- A cognitive experiment was designed to obtain an objective measure of similarity of trajectories based on parameters like orientation, direction of travel, velocity of agent etc. A novel approach for clustering trajectories based on these parameters was proposed thereof.

Design of Artificial Neural Networks

Mentor: Dr. L. Behera, Associate Professor, Dep. of Elec. Eng., IIT Kanpur

- Multilayered 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.
- Network with quantum activation function using the Schrodinger's wave equation was designed for **stochastic filtering** of signals.

Robust Two Degree of Freedom Vehicle Steering Controller Design

Mentor: Dr. R. Potluri, Dep. of Elec. Eng., IIT Kanpur

- Using Loop Shaping techniques a robust controller providing stable yaw dynamics for single track model of car under realistic driving conditions was designed. A desirable characteristic was fading of controller response in accordance with driver's response.
- Monte Carlo Simulations** were used to demonstrate achievement of response time of 0.35s, and robustness to mass(1300kg to 1700kg), moment of inertia (1700 to 2100 kgm²), velocity (10m/s to 50m/s) and coefficient of friction (0.2 to 1).

Autonomous Line following Robot

Individual Project with Robotics Club

- Designed an autonomous robot using Atmega-16 MCU which could follow a white curve. The robot was capable of detection of crossings in a grid of white lines & efficiently took 90 & 180 degree turns. The robot employed TSOP sensors & 200 rpm dc motors powered by a 12V battery. **PD control** algorithms were used increasing the efficiency.

Chat Client

Team of 2

- Interfaced the **Atmega-16 Microcontroller** with a computer which emulated a chat environment with multiple clients. **A PS/2 Keyboard & an LCD screen** were also interfaced with the MCU to enable the client to communicate with the virtual clients in the emulated environment. The Project was successfully demonstrated & ended up **winning 2nd prize in Techkriti-08**.

Positions of Responsibility

General Secretary, Science & Technology Council, IIT Kanpur

(2010-11)

- Led a team of **26 club coordinators/executives** for conceptualizing and planning activities of **8 clubs** within a total budget of **Rs 0.5 Million** in order to help students pursue their hobbies in the field of science and technology.
- Organized **summer projects** for the year 2010 involving more than 200 students overall.
- Lead a team of **44 Coordinators** to organize **Takneek** - The Inter Hostel Science and Technology Competition of the institute
 - It saw students participating in **31 competitions**, a hacking workshop by Kyrion Pvt Ltd. and a lecture on Scientoons.
 - Introduced new competitions which were met with enthusiasm and provided avenues for learning and fun.
- Initiated projects like online lecture hall booking, system for efficient dissemination of information among students etc.
- Introduced the SnT magazine, SnT-Day, SnT T-shirt, the SnT Hall of fame, Codathon and Campus App contest.
- Worked towards bringing all technology related activities such as SAE, Robocon etc under one banner.
- Conceptualized and saw to the successful implementation of the Inter-Hall General Championship with other gymkhana executives.

Vice Captain, Institute Aquatics Team

(2009-10)

- Conducted practices and co-lead the team towards winning swimming and water polo championship both, in Inter-IIT aquatics meet 2009 for the first time in history.

Coordinator, Cryptography Contest-Techkriti-09 (Inter-Collegiate Technical Festival of IITK)

(2009)

- Organized a contest of its nature for the **first time** and was involved in problem statement design and publicity of the same.

Secretary, Ritambhara, The Fashion Show – Antaragini (Inter-Collegiate Cultural Festival of IITK)

(2008)

Student Guide, Counselling Service, IIT Kanpur

(July-08 to August 2009)

Extra Curricular Activities

- Robocon*: Built 2 autonomous and one manual robot as a member of team of 12 to compete in this prestigious competition. **(2008)**
- Cycling Expedition*: Part of the adventure club trip (15 people) to Sikkim where we bicycled 160 Km in 5 days. **(March 2009)**
- Music*: Participated in solo Indian Classical Instrumental music competition in Rendezvous, Antaragni and Mood Indigo. **(2007)**

Hobbies: Playing Mohan Veena, Adventure Sports, Reading, Solving Puzzles and Debating.