ANMOL POPLI

B.Tech. Electrical Engineering with Minor Spec in Mathematics · UG (IV Year I Semester)

Indian Institute of Technology, Roorkee

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Fields of Interest

Computer Vision, Robotics, Artificial Intelligence

Academic Details

2018 (Expected)	**Bachelor of Technology**	Indian Institute of Technology Roorkee	*CGPA: 8.85/10*
2014	**Higher Secondary Certificate Examination**	Central Board of Secondary Education	*Percentage: 91.20%*
2012	**Secondary School Certificate Examination**	Central Board of Secondary Education	*CGPA: 10/10*

Research Projects and Internships

Human-Computer Interaction Robot (Mitacs GRI 2017)

University of Alberta, Edmonton

Prof. Anup Basu, Department of Computing Science — *May-July 2017*

- The Mecannum robot's NVIDIA Jetson TX2 processor obtains visual feedback of its environment through web camera and transmits it to the server over WiFi via User Datagram Protocol.
- Face Detection using Viola Jones algorithm and Face Recognition using Local Binary Patterns Histograms algorithm are performed on the input video feed on the server. The server transmits User Interaction data to robot and the robot communicates with the user through audio interface employing Festival API for Text-to-Speech Synthesis and CMU Sphinx API for Speech Recognition.
- The motor control data is transmitted from server to the robot, which then transmits it to its Arduino microcontroller via USB, thereby enabling wireless motion control of the robot. [Git Repo]

3D Scene Reconstruction using Deep Learning

EE Department, IIT Roorkee

Prof. G N Pillai, Department of Electrical Engineering — *August 2017 -*

- The objective is to formulate a data-driven method to learn a local geometric as well as color descriptor for establishing correspondences between RGB-D data. The two descriptors are complementary because RGB features can provide correspondences when geometric information is insufficient, while geometric signals are helpful where there are drastic viewpoint or lighting changes.
- Inspired by 3DMatch, the idea is to perform multimodal deep learning with its architecture comprising a two-stream CNN. The first is a 3D ConvNet for depth data and the second is a 2D ConvNet for RGB data, which are eventually combined with a fusion network.

ABU ROBOCON Problem Statement (Member, Team Robocon IITR)

Models and Robotics Section, IIT Roorkee

Faculty Advisor: Prof. Abinash Kumar Swain, IIT Roorkee — *2015-17*

- Developed a Computer Vision application on Raspberry Pi using Pi Camera for Frisbee trajectory tracking and pole detection. [Git Repo] [Video] [Report]
- Developed a Computer Vision application on Android platform employing phone camera for Vision based navigation of a Robot on a track with varying configurations. Comprises algorithms to segment and follow white line, intelligently implement motion control based on the region of track, and to keep track of the white line in presence of background noise. [Report]
- Worked on Magnetometer based Navigation Algorithm for a four-wheel Omni drive using concepts of Machine Learning. [Report]
- Participated in ABU-ROBOCON INDIA - 2016. Secured 5th rank among 105 teams.

Analysis and Implementation of Fast Bilateral Filter (SRFP 2016)

IISc Bangalore

Dr. Kunal Narayan Chaudhury, Department of Electrical Engineering — *May-June 2016*

- Analyzed and implemented fast algorithms of the Gaussian filter in MATLAB and C. Studied existing papers on the fast approximation of the edge-preserving Bilateral filter, focusing on a series of papers that approximate the Range kernel using trigonometric polynomials.
- Analyzed the effect of various parameters on approximation, and introduced several optimizations to develop an algorithm which performs fast filtering for a wide range of Spatial and Range kernels. Developed a parallelized C library of the algorithm, which can perform bilateral filtering in almost real time on images as large as 1 MP.
- The C library and an article has been published on IPOL Research Journal. [Publication & Code] [Report]

Swarm Robotics

Models and Robotics Section, IIT Roorkee

Srishti 2017 — *2016-17*

- The server receives continuous video feed of the arena through webcam and applies Vision algorithms to detect configurations of the 4 robots, which it then transmits to all robots over WiFi so that each robot is aware of all robots' positions and orientations.
- The desired configuration of robots is transmitted from an Android app to the server, which further transmits it to each of the robots.
- Without the intervention of the server, the robots process all information - comprising current and desired configuration - and optimize their motion in such a way that the desired configuration is finally achieved. [Git Repo]

Satellite Image Classification

Techfest 2016-17 IIT Bombay

Competition: Resemblance

October 2016

- Classification of four-channel Satellite imagery into 7 land cover classes employing Support Vector Machines. RBF kernel was used to linearize data in infinite dimensional space. Parameters gamma and C were tuned by performing 5-fold cross-validation on training data. Performance measures were computed. [Git Repo] [Report]

Virtual Piano

Electronics Section, IIT Roorkee

Srishti 2015

March 2015

- Structure of octave keyboard along with volume control was drawn on a sheet of paper. Web camera continuously captured images which were processed in real time using MATLAB's Image Processing Toolbox to play corresponding sound or change sound volume.

Academic Achievements

2017	**Selected as intern**	Mitacs Globalink Research Internship
2016	**Selected as Intern**	Science Academies' Summer Research Fellowship Programme
2014	**All India Rank 1672**	JEE-Advance
2013	**All India Rank 1111**	Kishore Vaigyanik Protsahan Yojana (KVPY)
2013	**All India Rank 30**	Technothlon

Technical Skills

Languages C, C++, Python, PHP, Javascript, Unix Shell

Tools MATLAB, Simulink, OpenMP, OpenCV, Marvin, Android Studio, CMU Sphinx, Festival TTS, NI Multisim, Eagle CAD, LaTeX

Courses Taken

At IIT Roorkee

Programming in C++, Mathematics-I, Electromagnetic Theory, Network Theory, Mathematical Methods, Applied Physics, Control Systems, Engineering Analysis and Design, Microprocessors and Peripheral Devices, Advanced Control Systems, Single Chip Microcontroller and its Applications, Robotics and Control, Optimization Techniques, Data Mining for Business Intelligence, Graph Theory, Intelligent Control Techniques*, Advanced System Engineering*, Advanced Numerical Analysis*, Financial Mathematics*.

Others

Convolutional Neural Networks for Visual Recognition - Online Course from Stanford University, Fundamentals of Digital Image and Video Processing - Online Course from Northwestern University, Signals and Systems - Online Course from MIT.

* on going

Extracurricular Activities

Srishti | Annual Techno-Hobby Exhibition of IIT Roorkee

March 2017, March 2016, March 2015

- 2017 - Mentored Freshman Students for the project 'Virtual Air Hockey'.
- 2016 - Mentored Freshman Students for the project 'Light Painting Robot'.
- 2015 - Won First Prize for Quadcopter.

Cognizance | Annual Technical Festival of IIT Roorkee

March 2017, March 2016, March 2015

- 2017 - Worked as Coordinator at the event IDEAZ-B.
- 2016 - Worked as Co-Coordinator at the event IDEAZ-A.
- 2015 - Won First Prize in Breach Wars (robotics competition).

IIT HEARTBEAT | Inter-IIT Magazine

2014-16

- Worked as Web Developer for the magazine.

National Cadet Corps (NCC) | Cadet during Session 2014-15

2014-15

- Participated in the Guard of Honour on Republic Day 2015.

Research Publications

- Pravin Nair, Anmol Popli, Kunal N. Chaudhury, "A Fast Approximation of the Bilateral Filter using the Discrete Fourier Transform", in IPOL (Image Processing On Line) Research Journal, 2017.