VIRAJ SHAH

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Senior Undergraduate ⋄ Electrical Engineering
Indian Institute of Technology, Roorkee

INTEREST AREAS

Computer Vision, Digital Image Processing, Digital Signal Processing, Computational Photography

EDUCATION

2016 (Expected)	Bachelor of Technology, Electrical Engineering, IIT Roorkee **CGPA: 8.90/10**
2012	Higher Secondary Certificate Examination Gujarat State Education Board **Percentage: 91.67%**
2010	Secondary School Certificate Examination Gujarat State Education Board **Percentage: 94.63%**

ACADEMIC ACHIEVEMENTS

- Currently ranked in **top 5%** among 144 students in EE Department, IIT Roorkee.
- Secured All India Rank **1650** in JEE-Advance 2012 among 0.6 million students across the country.
- Secured All India Rank **798** & State Rank **14** in AIEEE 2012 among 1.1 million students from country.
- Secured medals in National Science Olympiad, 2012 (*National Rank 50*), International Mathematics Olympiad, 2012 (*International Rank 55*) & Ramanujan Regional Maths Olympiad, 2011 (*State Rank 9*).

RESEARCH PROJECTS & INTERNSHIPS

Utilizing knowledge of multiple learners for Zero Shot Inference with Transfer Learning in Neural Networks — Bachelor's Thesis Project August, 2015 - current
Prof. G N Pillai, IIT Roorkee [Report]

- The work focuses on applying learned knowledge of multiple neural networks, trained to recognize different image classes, to improve on zero shot inference performance of the system as a whole.
- A word embedding space is used with semantically connected words. A deep network learning the connections to embedding space is taken as the basis for inferring unknown object classes from the embedding space.
- The proposal is to show that the performance on unknown classes by a single large network can be made more robust by using knowledge of multiple networks and weighting the decision based on classification confusion.

Edge-based Registration for 3D morphing of facial expressions from image data May to July, 2015
Prof. Patrick Horain, Department of Electronics & Physics, Telecom SudParis [Report]

- Developed a system to morph 3D face model to a facial expression provided by RGB image. Blend shape model was used to describe the human face mathematically. Non-commercial library FaceTracker was used for initial estimation of 8 camera and 55 blend shape parameters by performing Haar detection followed by parametrized mean shift optimization under physical constraints.
- Average distance of occluding edges of 3D model from facial edges was calculated and was minimized for accurate registration. Obtained results displays significant improvements in terms of speed, accuracy and quality of final morphs.

Optimizing the motion & vision of the Humanoid Robot system for Robo-soccer game July, 2014
Dr.Siti Norul Huda, Faculty of Information Science and Tech., National University of Malaysia (UKM)

- Robot soccer game uses global camera to track the ball and humanoids. The obtained data is used to take decisions. Task was to improve accuracy and speed in terms of color detection, ball tracking and motion prediction.
- To improve ball tracking and prediction system of global camera and motion gaits of Humanoid, system was developed using OpenCV, Visual C++ & RoboPlus software package by Robotis.
- Morphological operations (Erosion and Dilation) were successfully implemented along with Image moments function using OpenCV for highly improved accuracy and detection.
- Motion gaits of humanoid robot were improved to realize Human-like walking based on CoG calculations using Roboplus software module.

Textural Analysis for Land cover classification of RADARSAT-2 Data June, 2013
Dr. Dipanwita Haldar, & Dr. Manab Chakraborty, SAC, ISRO, Ahmedabad

- Processed 3 channel, 8 bit, dual polarized SAR data acquired by RADARSAT 2 by filtering it using speckle filters and enhancing it using Image enhancement algorithms.
- 9 different GLCM based texture measures was calculated using PCI Geomatica 9.0 and ENVI 4.2 software packages.
- Classified the Image data with Maximum Likelihood Classification Algorithm with and without Texture Measurement Data. Improved classification accuracy observed with textural measurements.

Head Motion Detection and Tracking with application in gaming control March, 2015
Electronics Section, IIT Roorkee [Report]

- The goal of the project was to control a javascript based Pacmen game by detecting and tracking the head movements.
- Implemented using OpenCV Library in Python, the algorithm uses Haar feature-based cascade classifiers to detect movement of head precisely in real-time. The project was exhibited at Electronics Section in annual techno-cultural exhibition, Shrishti, 2015.

COURSE PROJECTS

Determining the religious inclination of countries from non-relevant and non-intuitive symbolic features
Prof. G N Pillai, IIT Roorkee Course: *Artificial Neural Networks*

- Symbolic data from National flag has been converted to numerical values selecting certain features which seem non-intuitive and non-relevant with the aim, but with the use of robust ANN architecture, accurate classification can be obtained even with non-relevant and non-intuitive symbolic features.
- 3 methods, Perceptron, Multi-layer Perceptron network with back-propagation and MLP with back-propagation and momentum term are compared here to get optimum classification accuracy.

Comparing Writing Styles using Word Embedding and Dynamic Time Warping
Prof. P Sumathi, IIT Roorkee Course: *Digital Signal Processing*

- The development of plot or story in novels is reflected in the content and the words used. The flow of sentiments, which is one aspect of writing style, can be quantified by analyzing the flow of words.
- This flow was quantified and compared by analyzing the text using word embedding models to generate time series for novels and then compare the resulting series using dynamic time warping to find similarities.
- Considering time series analysis rather than a pure statistical one can capture the flow of the works and thus the similarities generated will provide a metric for comparing the novels based on the progression.

TECHNICAL STRENGTHS

Programming	C/C++, Python, OpenCV, PHP
Software packages	MATLAB, NI LabView, MS Visual Studio
Web aids	HTML, css, javascript, LaTeX

COURSES TAKEN

At IIT Roorkee

Electromagnetic Waves Theory, Engineering Mathematics, Computer systems and Programming, Data Structures*, Digital Signal Processing*, Digital Image Processing#, Nuclear Magnetic Resonance Spectroscopy#, Computer Graphics, Artificial Neural Networks, Intelligent Systems#, Fractals and Applications, Operations Research.

Others

- Artificial Intelligence — *Extra course taken during internship at UKM, Malaysia* [Transcript]
- Robotics Vision* — *Online course from University of Queensland*
- Machine Learning* — *Online course from Prof. Andrew Ng, Stanford University*

* *on going*, # *courses planned for Spring 16*

EXTRA-CURRICULAR ACTIVITIES

Mentorship, IEEE Students Branch & Academic Reinforcement Program

- Project Manager, Fresher Students Mentorship Program, IEEE IIT Roorkee Students Chapter with 32 students and 8 mentors (Academic year 2014-2015).
- At present, Aid Teaching Environment Sciences course to more than 80 freshman students every weekend as a part of Institutes Academic Reinforcement Program.

Co-ordinator, IEEE IIT Roorkee Students Branch & IEEE Special Interest Group
Working with team of 2 coordinators,4 executives and more than 20 participants to:

- Conduct weekly meets with activities like collectively reading review papers, sharing technical skills, presentations over different fields in EE.
- Regular Interaction with professors, graduate students to increase research awareness among undergrads.

Front-end Designer & Web-developer, Information Management Group (IMG), IIT Roorkee

- IMG is the group of 40 students of IIT Roorkee, for development and maintenance of the IIT Roorkee Intranet & Internet system. Group developed several intranet based web applications as well as IIT Rs Website.
- These applications are entirely designed, programmed and maintained only by the IMG members.

Volunteer, Bharatvandan, a voluntary campus group, IIT Roorkee

- Bharatvandan is a voluntary campus group with activities such as weekly teaching sessions for rural kids below class 10th and semester-end rural trips to explore issues and possible technical and sustainable solutions in the local context.

REFERENCES

Dr. Patrick Horain, patrick.horain@telecom-sudparis.eu
Professor, Department of Electronics and Physics, Telecom SudParis, France.

Dr. Siti Norul Huda Sheikh Abdullah, snhsabdullah@ukm.edu.my
Associate Professor, Center for Artificial Intelligence Technology, Faculty of Information System and Technology, National University of Malaysia (UKM), Malaysia.

Dr. G N Pillai, gnathfee@iitr.ac.in
Associate Professor, Department of Electrical Engineering, IIT Roorkee.

Dr. Dipanwita Haldwar, dipanwita@sac.isro.gov.in
Scientist, ATDD/ATDG/EPSA, Space Application Centre, ISRO, India.