Rohan Jain

CONTACT INFORMATION

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SUMMARY

Rohan is a graduate student at UC Santa Barbara, majoring in Signal and Image processing with a perfect academic record. His research interests lie at the intersection of Biomedical Image Analysis and Computer Vision.

EDUCATION

University of California Santa Barbara

M.S., Electrical and Computer Engineering **Sept. 2014 – Dec. 2015**

- *Major:* Signal and Image Processing
- *GPA:* 4.0/4.0
- *Advisor:* B.S. Manjunath
- *Courses:* Pattern Recognition, Computer Imaging, Digital Image Processing, Computer Vision, Signal Compression, Stochastic Processes, Computational Neuroscience
- Graduate Teaching Assistant for the course ECE 178 on Digital Image & Video Processing (Fall 2015)
- Graduate Teaching Assistant for the course ECE 160 on Multimedia Systems (Spring 2015)

Indian Institute of Technology Kharagpur

B.Tech (Hons.), Electrical Engineering **2010 – 2014**

- *Major:* Instrumentation Engineering
- *GPA:* 8.04/10

RESEARCH INTERESTS

Biomedical Image Analysis and Computer Vision.

PROJECTS UNDERTAKEN

Bio-Image Segmentation using Deep Learning **July 2015 – Present**

Graduate Research Assistant at Center for Bioimage Informatics and Vision Research Lab, UCSB

Working on Segmentation of Electron Micrograph images using Deep Convolutional and Deconvolutional networks. Combined with Neurohn Tracing and Synapse detection, this work aimn to obtain the connectome of the animal brain.

Activity Recognition in Videos using 3-D Salient Point Signatures **April – June 2015**

Term Project for ECE 281B Computer Vision, UCSB.

We implemented a modular activity recognition system and tested it on a multi-class classification problem using the publicly available KTH dataset. Our optimal method detects spatiotemporal interest points in a subject video using SURF, and characterizes these keypoints using local HOG3D features to produce a Bag of Visual Words (BOVW) representation for each activity. This histogram-like feature is then combined with a global R-transform feature via an innovative feature fusion technique and finally incorporated into a supervised learning framework. Our implementation achieves an average accuracy of 84.1% on the KTH Dataset, while state of the art methods report an average accuracy of 92.1%.

Detection and Characterization of Epileptic Seizures **April – June 2015**

Term Project for ECE 594E Machine Learning, UCSB.

In this project, we explored various methods of constructing patient-specific classifiers and characterizations of epileptic seizure state using multichannel noninvasive scalp EEG. Specifically, we implement both a binary state classifier using a kernelized SVM and a generic characterization using KDA. By constructing a patient-specific manifold using the recently developed method of spectral regression for KDA (SR-KDA), we show how to track the state trajectory to observe the gradual (rather than abrupt) transition from normal to seizure-like dynamical states.

Graph based Video Segmentation **January – March 2015**

Term Project for ECE 278A Image Processing, UCSB.

The goal of this project was to create a user-friendly library for graph-based video segmentation in Python. Working on building an implementation, referred to as the "Godfather Algorithm", which aims to highlight the generic applicability the graph-based method presented originally by Felzenszwalb et al. and extended to video by Grundmann et al. This algorithm is based on the basic idea that each (n-dimensional) voxel ultimately belongs to a larger voxel group (supervoxel) that is identified by one voxel label, the "Godfather". Using a medley of merging predicates to determine if a particular voxel or group of voxels belongs to a particular family headed by a Godfather.

Detecting Pulse from Human Head Motion on Android **January – March 2015**

Term Project for CS290I Computer Imaging, UCSB

Created "Trackbeat", an Android application for detecting the human pulse just from a video of the Human head by capturing the subtle head motions caused by a beating heart. Used OpenCV for Android to carry out Face Detection and Tracking, followed by Principal Component Anaylsis for identifying predominant frequency corresponding to heart beat frequency. Projected the trajectories onto the principal components and anaylsed frequency spectrum of each trajectory. Carried out a Peak detection algorithm on the most periodic trajectory to obtain the heart rate of the subject.

Temporal Pattern Recognition using Neural Networks **June 2014 – August 2014**

Research Assistantship at Image Analysis and Biometrics Lab, IIIT Delhi.

Worked on Face recognition in videos from Youtube Face database using Recurrent Neural Network models. Derived pattern recognition and classification methods from relatively new Reservoir Computing paradigm. Understood complete working and implementation of Reservoir Computing toolbox for MATLAB. Formulated an innovative algorithm which uses Reservoirs for Feature Enhancement and then trains an SVM/ RDF for classification task. Carried out comparison of our method with established algorithms like LBP (Local Binary Patterns).

Automated Detection of Pulmonary Nodules in CT images **July 2012 – August 2013**

Research Internship under the guidance of Professor Sudipta Mukhopadhyay, IIT Kharagpur.

Proposed a CT image based Computer-Aided Detection (CAD) method for detection of solid parenchymal and pleural nodules. Conceptualized a new method of nodule detection via mathematical morphology techniques consisting of opening, closing, and logical XOR operations. Critically analyzed several three-dimensional shape and intensity based features for carrying out rule based classification of possible nodule candidates. Validated on 25 subjects from publicly available image database resource initiative (IDRI) database. Achieved excellent sensitivity (88%) and much reduced false positive nodules (0.52 FP per patient).

Adaptive Filter Design for Sparse System Identification **Sept. 2013 – March 2014**

Final Year Undergraduate Project supervised by Professor Goshaidas Ray, IIT Kharagpur

Critically analyzed popular adaptive algorithms for identification of sparse impulse response using Monte Carlo simulations (taking ensemble average of many independent runs of each algorithm). Tested a modified activation factor for IAF-PNLMS Algorithm (Individual Activation Factor - Proportionate Normalized Least Mean Squares). Achieved fastest convergence in terms of Normalized Misalignment among recently proposed algorithms, with uncorrelated input signal.

Lithium ion Battery Modeling for Simulation of HEV's **May – July 2013**

Internship at Robert Bosch Engineering and Business Solutions Limited, Bangalore, India.

Developed a dynamic model of a Li-ion battery under the MATLAB/ Simulink environment for general Hybrid Electric Vehicle simulations. Formulated adjacent thermal model of battery for run time prediction of battery temperature under different operating cycles. Achieved improved battery state of charge prediction by proposing 2 correction factors to take care of non linearities with respect to operating conditions. Presented the Battery Model at *Bosch Technical Forum*. Submitted to *FEBER (Internal Scientific Journal of Bosch)*(under Review).

Publications

R. Tibrewal, **R. Jain**, A. K. Dhara, S. Mukhopadhyay and N. Khandelwal, "Automated Detection of Solitary Pulmonary Nodule from Lung CT Images using Rule Based Classifier", *IEEE International Conference on VLSI and Signal Processing (ICVSP 2014), Kharagpur, West Bengal, India*, 2014.

Technical Skills

Programming languages: C, C++, Python, SQL, Java.

Scientific Computing and Libraries: MATLAB, Simulink, OpenCV, Android, NumPy, SciPy, Matplotlib, FFMPEG.

Academic Distinctions

Secured a rank of 384 (99.97 percentile) out of 1000,000 candidates in All India Engineering Entrance Examination (2010).

Secured a rank of 1547 (99.7 percentile) out of 500,000 candidates appearing for IIT Joint Entrance Examination (2010).

Awarded Gold Medal, Blue Coat, Blue Tie for exceptional academic performance in school, over a period of 7 years (2003–2009).

Qualified for the *Junior Science Talent Search (JSTS)* examination, securing a rank of 10 all over India (2006).

Extra-Curricular Activities

Initiated a project on improving soil fertility characteristics of 2 nearby villages in collaboration with Rural Development Centre, IIT Kharagpur; collected 8 soil samples and formulated a framework for their testing in the institute labs.

Mentored and guided 4 undergraduate freshmen under the Student Mentorship Program moderated by Dean of Student Affairs, IIT Kharagpur (2012–present).

Part of varsity football teams for both undergraduate college and school.

Studied French as a foreign language in school over a period of seven years (2001–2008).