

# Anand Raja

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## OBJECTIVE

Seeking a full-time position in computer vision and image processing algorithm development.

## EDUCATION

- Master of Science (M.S.), Electrical Engineering, The Pennsylvania State University  
**G.P.A.: 3.83/4** December 2010
- Bachelor of Engineering (B.E.), Electronics & Telecommunications, University of Mumbai  
**G.P.A.: 71.65/100 (Distinction)** June 2008

Relevant Coursework

Digital Image Processing I and II, Computer Vision I and II, Vision-based Tracking, Pattern Recognition, Probability & Random Processes, Discrete-Time Signal Processing.

## EXPERIENCE

- **Research Assistant – Computer Vision, LPAC** October 2009 – January 2011  
*Project: Activity Recognition from realistic videos*  
Robust motion features are extracted from neighborhoods around detected space-time interest points in the video. A classifier is trained to recognize activities. Code development is done in MATLAB and OpenCV with C++.  
*Project: Visual-story boarding for movies*  
Multiple characters are detected and tracked in each shot of a video. Online-learned character specific classifiers are learned that discriminate between characters in the shot and are used to propose character matches across different shots. Character tracks in each shot, matches across shots and actions performed by each character are used to build a visual story-board.
- **Intern, Imaging Technologies Lab, GE Global Research, Bangalore** May 2009 – July 2009  
*Project: Lung Segmentation for Pneumoconiosis Detection*  
Developed a shape based multi-resolution level set segmentation algorithm. Prototyping was in MATLAB and optimized code was developed in C++ using ITK. Extensive testing and performance tuning on 2 large datasets containing over 1000 images were carried out. Achieved mean dice overlap of 88%.  
*Project: Clavicle Detection from Chest X-rays*  
An algorithm for detection of clavicle bone from PA-view Chest X-rays was developed using mean curvature and Radon transforms. Development was done in MATLAB followed by C++ with ITK.
- **Intern, Indian Institute of Science, Bangalore** May 2007 – June 2007  
*Project: Demosaicking for Digital Cameras*  
Implemented a unified demosaicking and zooming algorithm to reduce noise artifacts seen in zoomed color images for digital cameras. A MATLAB prototype was developed.

## COMPUTER SKILLS

- **Languages:** C, C++, STL, MATLAB/Mex.
- **Libraries:** ITK, OpenCV, POSIX threads, libsvm.
- **Tools and IDE:** Microsoft Visual Studio.
- **Systems:** Windows, Linux/ UNIX.

## SELECTED ACADEMIC PROJECTS

### Object Tracking

Developed a color-based object tracker using the Expectation-Maximization algorithm. The object to be tracked is modeled by a mixture of Gaussians and tracked using computed posterior probabilities. A Viola-Jones face detector is used to incorporate face tracking. MATLAB prototype was developed. [links: [1](#), [2](#), [3](#)]

### HMM Based Human Activity Recognition

A set of Hidden Markov Models was trained on extracted silhouettes and optic flow features from a set of videos. The model maximizing the likelihood of the observation sequence from a video is recognized as the activity. MATLAB prototype was developed and validated using leave-one-out on the Weizmann dataset. 92% classification accuracy is achieved.

### **Video Stabilization**

A Harris corner detector is used to extract interest points from two consecutive images in a video sequence. Point correspondences are established by fitting a projective transformation and warping image co-ordinates. RANSAC is used to reject outliers. This is repeated over the entire video. MATLAB prototype was developed.

### **Machine Learning Algorithms**

Implemented algorithms for linear discriminant analysis, k-means, hierarchical clustering, expectation maximization and Gaussian mixture models, bag-of-words classifier and validated on various datasets. Implementation was done in C++ and MATLAB.

### **PUBLICATIONS**

- [1] P. Annangi, S. Thiruvankadam, **A. Raja**, H. Xu, X. Sun and L. Mao “[A region based active contour method for X-ray lung segmentation using prior shape and low-level features.](#)” accepted at *IEEE ISBI 2010*.
- [2] P. Annangi, **A. Raja**, X. Sun, L. Mao “Lung partitioning for X-ray CAD applications.” accepted at *SPIE Medical Imaging 2011*.