Rajat Aggarwal

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I am a senior year undergraduate student at *International Institute of Information Technology- Hyderabad*. My research interests include Computational Photography, Computer Vision & Graphics, Pattern Recognition and Human-Computer Interaction.

Education

Academic Qualifications

- **International Institute of Information Technology- Hyderabad**
  B Tech and MS by Research in Computer Science and Engineering, CGPA–8.68 *2012–2017**
  Undergraduate Honors in Computer Vision & Pattern Recognition at Center of Visual Information Technology (CVIT) under the guidance of **Dr. Anoop M. Namboodiri**.

Publications

- **Rajat Aggarwal**, Amrisha Vohra and Anoop M. Namboodiri, ***"Panoramic Stereo Videos Using Single Camera"*** Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016.
- **Rajat Aggarwal**, Sirnam Swetha, Anoop M. Namboodiri, Jayanthi Sivaswamy and C. V. Jawahar, ***"Online Handwriting Recognition using Depth Sensors"*** Proceedings of the Thirteenth International Conference on Document Analysis and Recognition (ICDAR), 23-26 Aug 2015, Nancy, France.

Achievements

- Awarded Dean's Merit List, IIITH for academic performance in 2012-13, 2013-14 and 2014-15.
- Awarded Dean's Research Award, IIITH in year 2014-15.
- Ranked 3^{rd} in City in High School Certificate Examination, CBSE with 95%
- School Topper in Senior School Certificate Examination, CBSE with 91%.
- Secured All India Rank- 690 in All India Engineering Entrance Examination – 2012.
- Secured National Rank -4 in International Science Talent Search Examination -2008.
- Merit holder in Mathematics (CBSE), Chemistry (CBSE), International Mathematics Olympiad, International Olympiad of Science, National Level CBSE Science Exhibitions, Children Science Congress, National Level Declamations & Debates, and Unified Cyber Olympiad etc.
- Awarded with Certificate of Social Service by Help Age India in 2009.

Research Projects

- **Light Field Representation Using Intrinsic Properties**
  Dr. Anoop Namboodiri *Oct 2016*
  This project aims at representing the 4D Light Field using the physical properties of an object. Multiple Views of an object are captured and intrinsic properties like shape, illumination, shading and reflectance are estimated using a single optimization framework. This work is currently under review process.

- **Imaging the Anterior Segment of the Eye**
  Shantanu Sinha, Ramesh Raskar (Camera Culture, MIT Media Labs) *May 2015*
  The ophthalmic slit lamp is a purely qualitative device that is big, expensive and requires a trained physician to operate, making it unsuitable for resource constrained settings.This project is about developing a low-cost,wearable solid state device with no moving parts,for3D reconstruction of the anterior segment of the eye,to exhibit functionality similar to that of a slit lamp.

- **Capturing Dynamic Scenes with an Omnistereo Mirror**
  Dr. Anoop M. Namboodiri *Jan 2015*

  In this work, we present a solution for generating 360 degrees stereo panorama around a central observer. Recently, solutions that use multiple cameras with fish-eye lenses have been proposed that alleviate the problem with dynamic scenes. Our approach improves upon the existing solutions in two significant ways: It solves the problem using a single camera, thus avoiding the calibration problem and providing us the ability to convert any digital camera into a stereo panoramic capture device.

- **Segmentation of Specular Regions in a scene**
  Dr. Anoop M. Namboodiri *Jun 2014–Jan 2015*

  This work is based on computer vision problem of segmenting specular regions in a scene. We propose a camera-projector sensor which automatically segments specular regions with projective information into the world. It involves an expectation-maximization solution to the problem using state-of-the-art segmentation techniques. This work is currently under review process.

- **Real- Time Air based handwriting recognition using depth sensors**
  Dr. Anoop M. Namboodiri & Dr. C.V Jawahar *Nov 2014–Jan 2015*

  The work proposes n-HCI evolution which involves the natural way of handwriting by hand in the air. With most of the depth sensors such as Kinect and Leap Motion, people can actually communicate with the machine by their air handwriting. These systems have been proved to be useful for teaching purposes, blind-deaf communication and it introduces sixth sense technologies in most of the commonly used devices.

- **Fast Separation of Direct & Global Illumination of Light**
  Dr. Anoop M. Namboodiri *Jun 2014–Present*

  This work aims at fast separation of direct and global components of a scene measured by a camera-projector system using projective patterns. Direct components helps in finding the nature of material and further used for post-processing in segmentation problems.

- **Discovering Recurring Patterns in Images**
  This work aims at discovering patterns which are similar in images. We experimented greedy approach to find the recurring patterns with unsupervised object segmentation. This is one of the state-of-the-art segmentation method and is very useful in Image Forensics and Biometrics.

- **Wavelet based feature extraction in Pattern Recognition tasks**
  This work aims at the assessment of process parameters or states in a given application using the features extracted from the wavelet coefficients of measured process signals. It is tested on the dataset of 400 textured images of woods from their wavelet coefficients. Learning for the recognition tasks is done on probabilistic neural networks which reported an accuracy of 94%.

- **Intelligent Video Surveillance in Automatic Teller Machines**
  This project aims at detecting threats by detecting masks on human faces from the surveillance videos. It is based on state-of-the-art facial features detection methods.

Technical Projects

- **Comprehensive Shop Billing system SAAS application using Cloud Platform**
  Dr. Ganesh Iyer, Progress *Sept 2013–Nov 2013*

  A SAAS Shop billing application deployed on AWS which provides the system on demand service to both users, customers and the retailers. It is a handy application which provides retails choice of interface and billing needs. This application is the part of *Progress Rollbase Demo Applications*.

- **Digital Logic Design Virtual Lab – Android Version**
  Dr. P.J. Narayanan (CVIT) *May 2013–July 2013*

  An Android app that allow users to design and simulate any digital combination or sequential circuit. It allow the users to play with the virtual circuit and outputs the desired results whilst the circuit is running. This application is the Android version of *Digital Logic Design Virtual Lab, IIITH*.

- **Online Notater**
  Dr. Vikram Pudi, IIIT-H *Feb 2013–Apr 2013*

A web based application on web2py framework ,designed for note taking and archiving. A note can be a piece of formatted text, a full webpage or webpage excerpt, a photograph, a voice memo, or a handwritten "ink" note. Notes can also have file attachments. Notes can be sorted into folders, then tagged, annotated, edited, given comments, searched, and exported as part of a notebook.

Work Experience

- **LVP-MITRA** **Hyderabad**
  Research Intern *May 2015 - July 2015*
  I worked on a research problem on imaging the anterior segment of the Eye. The project is in the collaboration with the Camera Culture, (MIT Media Labs) group. Currently I am working for the publication of this work.

- **Virtual Labs for Engineering & Architecture Design** **IIIT-H**
  Research Assistant *Sept 2013–Jan 2014*
  I developed an interactive digital logic circuit design and simulation package in Android which allow the users to control the circuit and explore down inside hierarchical sub-components whilst the circuit is running. It is an integrated learning system which is monitored by the application.

- **Teaching Assistant**
  For courses Structured System Analysis & Design (Monsoon '14) , Graphics (Spring '15), & Statistical Methods in AI (Monsoon '15), & Computer Vision (Spring '16).

Technical skills

- **Programming Languages:** C, C++, Python, Matlab, Java, Bash, PHP
- **Web Languages:** HTML/HTML5, CS/CSS3, Javascript, Jquery, Ajax, XML
- **Frameworks:** OpenCV, Android, Rollbase, SAAS, Drupal, Web2py, Rails, Django
- **Others:** MySQL, OpenGL, WebGL, Backtracking & Penetration testing, Socket Programming
- **Courses Taken (Major):** Computer Vision, Optimization Methods, Machine Learning, Statistical Methods in AI, Artificial Intelligence, Digital Image Processing, Graphics, Advanced Computer Networks, Digital Signal Analysis, Operating Systems, Computer Organization, Data Structures & Algorithms, Software Engineering, Database Systems.

Other Activities

- I love to contribute in Open Source. I am associated with **BinPy** which is an electronic simulation library written in Python. The organization was one of the selected organization in *Google Summer of Code, 2014*. I am one of the top contributors of the organization. My github handle is *rajat974*.
- **Coding handles :** rajataggarwal (codeforces)