Alankar Kotwal

Detailed Résumé

Education

2012–2017 **Dual Degree, B. Tech and M.Tech in Electrical Engineering**,
Indian Institute of Technology, Bombay, *CPI – 8.78/10*.
Communication and Signal Processing, Minor: Computer Sciences and Engineering

2010–2012 **Intermediate Examination**,
Ratanbai Walbai Junior College of Science, Mumbai, *Percentage – 93.83*.

2001–2010 **Matriculation**,
SVPT's Saraswati Vidyalaya, Thane, *Percentage – 95.27*.

Achievements

Aug 2012 **Gold Medal, International Olympiad on Astronomy & Astrophysics**,
Brazil, International Rank 4, Special Prize for Best Data Analysis.

Sep 2011 **Bronze Medal, International Earth Sciences Olympiad**,
Italy, Special Prize for Best Performance in Hydrosphere section.

Apr 2012 **All India Rank 105**, *IIT-JEE*,
among around 5,90,000 participants for entrance to the IITs.

2009–2012 **Olympiad Orientation-cum-Selection Camps**,
Selected for the following camps, among the top 30 students in India (Astronomy: 2012 & 2010, Earth Sciences: 2011, Junior Sciences: 2010 & 2009).

2010 **Kishore Vaigyanik Protsahan Yojana Scholarship**,
Awarded by the Government of India to students interested in research.

2008 **National Talent Search Examination Scholarship**,
Awarded by the Government of India to students interested in research.

2011–2012 **Infosys Award for Olympiad Medallists**.

Dec 2013 **Inter-IIT Messier Marathon**,
Secured IIT Bombay the second position by putting on board 72 messier objects including the entire Virgo cluster of galaxies.

2013 **Other competitions**,
Won the Innovation Cell recruitment contest for freshmen and the Astronomy Quiz conducted by the Astronomy Club, IITB in 2012 and BITS Goa in 2013.

+91-9969678123 • *alankar.kotwal@iitb.ac.in*
alankarkotwal.github.io • *www.github.com/alankarkotwal*

Experience: Electrical Engineering and Computer Sciences

Summer 2015 **Research Internship, The Robotics Institute**,
Stereo odometry from a downward-facing stereo camera on a vehicle,
Prof. Sebastian Scherer and Stephen Nuske, Carnegie Mellon University.

- Explored correlation-based stereo odometry for quadcopter localisation applications
- Implemented gradient-descent for tracking and homography fits to obtain 6-DoF pose

Summer 2014 **Google Summer of Code**,
A New Pixel-Level Method for Determination of Photometric Redshifts,
Prof. R. Brunner & M. Kind, Laboratory for Cosmological Data Mining, UIUC.

- Used SDSS photometry to extract pixel information for machine learning algorithms
- Worked on parallel programming and performance enhancement
- Validated the approach and got consistent predictions for redshifts in the testing set

2013–2015 **Computer Vision, The IITB Mars Rover Team**,
A Student Initiative at IITB.

- Exploring stereo vision for autonomous navigation and obstacle avoidance
- Implementation of the rover software stack on ROS
- Hardware interfacing for peripherals on-board and debugging

Summer 2014 **The Arkaroola Mars Robot Challenge**,
A joint venture of the Mars Society Australia and Saber Astronautics.

- Tested the Mars Rover prototype in the harsh conditions of the Australian outback
- Participated in a series of exercises in Mars operations research conducted by Saber Astronautics including simulated extra-vehicular activities in simulated space-suits

Featured in Clarke et al., "Field Robotics, Astrobiology and Mars Analogue Research on the Arkaroola Mars Robot Challenge Expedition", Australian Space Research Conference

Spring 2015 **Laparoscopic Image Dehazing**,
Using the Dark Channel Prior to De-Haze Laparoscopy Images,
Prof. S. Awate, Department of Computer Sciences, IIT Bombay.

- Used the statistical properties of natural images to remove haze effects
- Working on an optimization model for the same process

Paper "Joint De-smoking and Denoising of Laparoscopy Images Using Bayesian Image Modeling and Inference" to be submitted to the International Symposium on Biomedical Imaging (ISBI), 2016

Spring 2015 **Stereo Visual Odometry from Pointclouds**,
Using point-set registration for localization,
Prof. A. Rajwade, Department of Computer Sciences, IIT Bombay.

- Explored kernel-correlation maximisation for point-set registration
- Implemented coherent point drift for pointclouds in C++

Autumn 2014 **Gravitational Lens Identification Using Image Processing Techniques**,
A PCA-based Method for Identifying Lenses in Databases,
Prof. A. Rajwade and S. Awate, Department of Computer Sciences, IIT Bombay.

- Improvised on source-subtraction algorithms for lens subtraction
- Implemented the algorithm in Matlab and got a good identification rate lenses

Autumn 2014 **Microprocessor Design**,
Design, Implementation and Validation of Three Processors in Verilog,
Prof. V. Singh, Department of Electrical Engineering, IIT Bombay.

- Designed and simulated a pipelined processor with the Little Computer Architecture
- Designed, implemented and tested a multi-cycle RISC processor using the LC-3b ISA

Experience: Astronomy and Astrophysics

Dec 2013 **National Initiative for Undergraduate Studies – Astronomy**,
An X-Ray Study of Black Hole Candidate X Norma X-1,
Prof. Manojendu Choudhury, Center for Basic Sciences, University of Mumbai.

- Analysed timing information from RXTE to detect quasi-periodic oscillations
- Fitted obtained spectra & observed unusual oscillations in the inner radius

Dec 2012 **National Initiative for Undergraduate Studies – Astronomy**,
Estimation of Photometric Redshifts Using Machine Learning Techniques,
Prof. Ninan Sajeeth Philip, IUCAA, Pune.

- Estimated redshifts from colour information obtained from SDSS using neural networks
- Worked on generation of training data from available data by redshifting spectra

Positions of Responsibility

Autumn 2015 **Teaching Assistant**, *CS663 – Digital Image Processing*,
Prof. A. Rajwade and S. Awate, Department of Computer Sciences, IIT Bombay.

- Involved in setting & evaluating assignments & exams
- Mentoring students with the course material & projects

May 2013 – May 2014 **Resource Person**,
Indian National Astronomy Olympiad Programme, HBCSE – TIFR, Mumbai.

- Student facilitator for the Astronomy Camp for mentoring & evaluating students
- Involved in generating problems for the Indian National Astronomy Olympiad

Relevant Skills

Languages C/C++, Python, Shell Scripting, Matlab, SQL, HTML, PHP, LaTeX

Special Software ROS/Gazebo, OpenCV, The Point Cloud Library, SPICE Circuit Simulation, EAGLE PCB Design, SolidWorks CAD, AutoCAD, LabView

Science Software Python packages: NumPy, SciPy and Matplotlib, GNUPlot, Scikit-learn, Astropy, SExtractor, SDSS tools

Hardware *Microprocessor Architectures*: 8051, 8085, AVR and PIC, CPLDs and FPGAs, *Embedded Platforms*: Arduino, RaspberryPi, standard digital logic families

Relevant Courses Undertaken

Computer Sciences Computer Graphics, Computer Vision, Algorithms for Medical Image Processing, Machine Learning, Convex Optimisation, Digital Image Processing, Design and Analysis of Algorithms, Data Structures and Algorithms, Discrete Mathematics

Electrical Engg Estimation and Identification, Speech Processing, Digital Signal Processing, Controls, Probability and Random Processes, Digital Communication, Communication Systems, Microprocessors, Signals and Systems, Digital and Analog Systems, Electronic Devices and Circuits, Network Theory

Physics and Maths The General Theory of Relativity, Electromagnetic Waves, Electricity and Magnetism, Classical Mechanics, Differential Equations, Linear Algebra, Complex Analysis, Calculus