

# RISHABH JANGIR

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## ACADEMIC INTERESTS

Robotics, Reinforcement Learning, Learning from demonstrations, Deep Neural Networks, Human Robot Interaction, Probabilistic Modeling and Reasoning, Self-driving vehicles, Unmanned Aerial Vehicles, Computer vision, Internet of things.

## EDUCATION

- 2013-2017 **Indian Institute of Technology Guwahati**, Guwahati, India.  
Bachelors of Technology (B.Tech), Majoring in Engineering Physics.  
Advisor: **Prof. Prithwijit Guha**, Department of Electrical and Electronics Engineering.
- 2013 Royal Senior Secondary School/Class 12, CBSE.
- 2011 Joy Senior Secondary School, Matriculation/Class 10, CBSE.

## EXPERIENCE

**Research Assistant, Institut de Robòtica i Informàtica Industrial, UPC, Barcelona.** Dec '17 - Present

Guide: Prof.Carme Torras

*Cloth manipulation through human demonstrations*

- Working as a Graduate Research assistant with the Perception and Manipulation group at IRI, a joint Research Center of the Spanish Council for Scientific Research (CSIC) and the Technical University of Catalonia (UPC).
- Exploring Imitation learning by human demonstrations based Reinforcement Learning algorithms to teach the task of **cloth manipulation** to robotic arms for helping old and disabled people.

**Research Intern, Robotics Research Centre, IIIT Hyderabad.**

May '16 -July '16

Guide: Prof.K.Madhava Krishna, Prof.Balaraman Ravindran (IIT Madras)

*Vision based learning from Demonstration*

- Worked on solving the problem of **SLAM** (Simultaneous Localization and Mapping) breakage on a monocular camera based mobile robot using **Reinforcement Learning**.
- Created an artificially intelligent agent capable of learning distinct behaviors from expert demonstrations by estimating the underlying reward functions using **Inverse Reinforcement Learning** (Abbeel and Ng, 2000). Wrote a [blog post](#) on the same and released reproduce-able code on Github which gained attention in the machine learning community.
- Successfully applied the inverse reinforcement learning algorithm in a monocular camera equipped mobile robot setting to estimate the reward function for anti-SLAM breakage behaviors. **Published** a short paper in a top-tier international conference.

**Research Intern, Robotics Research Centre, IIIT Hyderabad.**

May '15 -July '15

Guide: Prof.K.Madhava Krishna

*Object detection and Point cloud segregation on UAVs ([link](#))*

- Developed an algorithm to segregate point cloud of an identified object from the whole set of point cloud data available from visual SLAM system.
- Worked on applying various monocular SLAM techniques on a Parrot AR-Drone, namely Parallel Tracking and Mapping **PTAM**, ORB-SLAM and LSD-SLAM, evaluated them on the basis of odometry and reconstruction.

**Secretary at Robotics Club, IIT Guwahati.**

Mar '15 -Mar '16

*Student's Gymkhana Council*

- **Lead a team of over 50** robotics enthusiasts. Event organisation, fund management, to upgrade the facilities and ensure proper usage of the club resources. Develop technical skills and passion among students of IIT Guwahati to think, create and use technology for the betterment of society.

**Embedded Systems Intern at Simple Labs, Chennai**

May '14 -July '14

*Bluetooth low energy application development*

- Worked independently and developed linear and mesh network applications in **Bluetooth 4.0** protocol.
- Created a series of [tutorials](#) "Working with the Bluegiga BLE112 module" and wrote a blog on the same, the blog has more than 700 views on Quora.

## ACCEPTED PAPERS

Vignesh Prasad, **Rishabh Jangir**, K. Madhava Krishna and Balaraman Ravindran, “Data driven strategies for Active Monocular SLAM using Inverse Reinforcement Learning”, (Short paper/extended abstract) Robotics Track, AAMAS, International Conference on Autonomous Agents and Multiagent Systems, 2017.

## PROJECTS

### Convolutional Neural Networks based Behaviour Classification.

Aug’16-Mar’17

Senior year Bachelor’s Thesis Project-IIT Guwahati, Guide: Prof.Prithwijiit Guha

- Engineered a framework for automatic feature selection for reward function estimation in the context of Inverse reinforcement learning.
- Devised a method for behavior classification in an autonomous agent by using the above proposed framework.

### Pattern Recognition and Machine Learning.

Feb’16-Mar’16

Department of Electronics and Electrical Engineering, IIT Guwahati

- Built a pattern recognizer from scratch by exploring out on the **Bayesian classifier** concepts.
- Face recognition engine by employing the method of efficient computation of the basis vectors for high-dimensional data using **Principal component analysis**.

### Assistive Vision Simulator.

July’15

REDx Hyderabad Camp 2015, MIT Media Lab, Camera Culture Group

- Hardware lead, Assistive Vision Simulator ([link](#)), developed a virtual reality environment to test various modalities that enable the blind to navigate efficiently. Used audio and haptic feedback to alarm the visually impaired of any static obstacles.

### Autonomous Indoor navigation robot.

Dec’14-Aug’15

Robotics Club, IIT Guwahati

- Designed and fabricated a differentially driven robot ([link](#)) capable of autonomous indoor navigation using an RGB-D camera (Microsoft Kinect) and open-source software ROS (Robot operating system), implemented RTAB map and navigation stack packages available from the open-source ROS community.

## TECHNICAL SKILLS

<b>Languages known</b>	C, C++, Python.
<b>Software Packages</b>	OpenCV, Point Cloud Library(PCL), $\LaTeX$ , Rviz, Gazebo, Arduino IDE.
<b>Operating Systems</b>	Ubuntu, Windows, Robot Operating System (ROS).
<b>Hardware</b>	Intel 8085, Arduino, Raspberry-Pi, Beaglebone.

## RELEVANT COURSES

- **Mathematics:** Linear Algebra, Calculus, Differential Equations, Vectors, Complex Analysis.
- **Computer Science:** Introduction to Computing, Computing Laboratory (using C), Computational Physics, Machine Learning, Pattern Recognition.
- **Physics:** Advanced Classical Mechanics, Statistical Mechanics, Engineering Optics, Quantum Mechanics, Classical Electrodynamics, Heat and Thermodynamics, Atomic and Molecular Spectroscopy, Nuclear Science and Engineering.
- **Electronics:** Analog and Digital circuits, Signal processing, Semiconductor Devices, Microprocessor architecture and programming.
- **Online Courses:** Introduction to AI (UC Berkeley/edX), Machine Learning (Stanford/ Coursera), Reinforcement Learning (David Silver), Autonomous Navigation for Flying Robots (TU Munich/edX).

## ACHIEVEMENTS

- Secured **99.3 percentile** in **IIT-JEE 2013**, out of over 1.5 million students appearing for the exam.
- **Winner (for our autonomous navigation robot)**, technical exhibition competition, Techniche’15, IIT Guwahati.