Junaid Ahmed **Ansari**

Researcher | TCS Research, Kolkata, India

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Education

2016-2019 **MS in Computer Science and Engineering by Research**, International Institute of Information Technology, Hyderabad (IIIT Hyderabad), India. **GPA : 9.33/10.0**
Thesis : Monocular reconstruction of dynamic vehicles on arbitrary road profiles from a moving camera

2007-2011 **Bachelor of Engineering in Computer Science and Engineering**, Visvesvaraya Technological University (VTU), Belgaum, Karnataka, India. **Percentage : 68% (First Class)**
Final year project : Virtual Keyboard

Research/Work Experience

Research interests : Interplay of **computer vision**, **machine learning**, **robotics** and **cognitive science**.

September 2020 – Present
Researcher | Cognitive Robotics Research group, TCS Research, Kolkata, India
Working on socially compliant and test-time adaptable robot navigation from first-person RGB-D input using reinforcement learning. Also exploring how social representations learned from crowd motion/interaction data can be used to improve robot's behavior when interacting with human crowd.
Computer Vision | Robotics | Deep Learning | Reinforcement Learning | Human Visual Attention | Crowd Simulation

September 2019 – September 2020
Developer | Cognitive Robotics Research group, TCS Research, , Kolkata, India
Conducted research in perception and navigation for fast and accurate human motion forecasting on CPUs for autonomous and socially compliant robots. Worked on navigation of robots amidst dynamic humans.
Computer Vision | Robotics | Deep Learning

January 2017 – July 2019
Research Assistant | Robotics Research Center, IIIT Hyderabad, India
Conducted research in perception for autonomous driving in the areas of SLAM, monocular object pose and shape estimation, monocular multi-body SLAM, multi-object tracking and trajectory forecasting
Computer/Machine Vision | Robotics | Deep Learning | SLAM

Teaching Assistant | CSE483 Mobile Robotics (Monsoon 2018), IIIT Hyderabad, India
Co-taught the Mobile Robotics (Perception/Robotics) course with Prof. K. Madhava Krishna
Computer/Machine Vision | Robotics

July 2016 – December 2016
Research Intern | Robotics Research Center, IIIT Hyderabad, India
Worked on multi-robot SLAM project - worked on stereo visual odometry, AR Tag based map merging, data-collection and system setup of robot platforms and frontier detection for autonomous robotic exploration
Computer/Machine Vision | Robotics | Deep Learning | SLAM

July 2015 – June 2016
Research Intern, Raman Research Institute, Bangalore, India
Worked on Android device based voice activation of an electric wheelchair with Prof. Ramesh Balasubramanyam. It included interfacing with hardware and our previously developed OpenVCIK software.
Robotics | Software Architecture | Hardware | Android | Sensor Integration

June 2013 – May 2015
Temporary Project (Research) Assistant, Raman Research Institute, Bangalore, India
Worked on Voice Activated Wheelchair project with Prof. Ramesh Balasubramanyam. We developed an open-source and economic voice command interface kit (openVCIK) for voice control, obstacle avoidance and stable motion of powered wheelchair; The software was developed as a lightweight, multi-threaded and modular framework with a C++ library to support development of applications over it
Robotics | Software Architecture | Hardware | Sensor Integration

August 2011 – April 2013
Research Intern (Visiting Studentship Program), Raman Research Institute, Bangalore ,India
Worked on variety of projects with Prof. Ramesh Balasubramanyam; these include visual odometry, corridor detection in point cloud, wheelchair control, software framework design and development.
Computer/Machine Vision | Robotics | Software Architecture | Hardware

Honors and Awards

2021 **Finalist, best student paper award**. BirdSLAM, VISAPP (VISIGRAPP), 2021
2017-2018 **Winner - Qualcomm Innovation Fellowship (QInF)**, India
2017-2018 **Qualcomm Innovation Fellowship, India - Award**. Our proposal was awarded **INR 10 00 000**
2016-2019 **IIIT Hyderabad research fellowship** to cover tuition and living expenses during MS(approx. **INR 300 000**)
2018 **Microsoft Research Travel grant.** For IROS 2018 (Madrid, Spain), one of the premier robotics conferences.
2018 **IROS SDC Travel Award** for IROS 2018, Madrid, Spain.
2011-2013 **Visiting Student Fellowship** Raman Research Institute, Bangalore, India.
2010 **First Prize, Inter-state C programming competition**. organized by IEEE Student Branch,SVCE, Bangalore

Publications

BirdSLAM : Monocular Multibody SLAM in Bird's-Eye View VISAPP, 2021
Swapnil Daga, Gokul B. Nair, Anirudha Ramesh, Rahul Sajnani, **Junaid Ahmed Ansari**, K. Madhava Krishna
https://arxiv.org/pdf/2011.07613.pdf Video : https://youtu.be/ZFN35qJYDAA
Finalist - Best Student Paper Award

Multi-object Monocular SLAM for Dynamic Environments IV, 2020
Gokul B. Nair, Swapnil Daga, Rahul Sajnani, Anirudha Ramesh, **Junaid Ahmed Ansari**, K. Madhava Krishna
https://arxiv.org/pdf/2002.03528.pdf Video : https://youtu.be/cchPIaKSSvM

Simple means Faster : Real-Time Human Motion Forecasting in Monocular First Person Videos on CPU IROS, 2020
Junaid Ahmed Ansari, Brojeshwar Bhowmick
http://ras.papercept.net/images/temp/IROS/files/1944.pdf
Video : https://drive.google.com/file/d/1yvoUx3I3zryGkoLZT8S-DMpG6ruPSUUe/view

INFER : Intermediate representations for future prediction IROS, 2019
Shashank Srikanth, **Junaid Ahmed Ansari**, Sarthak Sharma, J Krishna Murthy, K. Madhava Krishna
https://arxiv.org/pdf/1903.10641.pdf Video : https://youtu.be/sHxXIX-FZoU https://talsperre.github.io/INFER/

The Earth ain't Flat : Reconstruction of Vehicles on Steep and Graded Roads from a Monocular Camera IROS, 2018
Junaid Ahmed Ansari*, Sarthak Sharma*, A Majumdar, J Krishna Murthy, K. Madhava Krishna
https://arxiv.org/pdf/1803.02057.pdf Video : https://youtu.be/C_FKg0HTfw4 (* Equal contribution)

Beyond Pixels : Leveraging Geometry and Shape Cues for Online Multi-Object tracking ICRA, 2018
Sarthak Sharma*, **Junaid Ahmed Ansari***, J Krishna Murthy, K. Madhava Krishna
https://arxiv.org/pdf/1802.09298.pdf Video : https://youtu.be/2yApZOv_VkU (*Equal Controbution)
SOTA on KITTI Tracking Benchmark-2018 | Project Page : https://junaidcs032.github.io/Geometry_ObjectShape_MOT

An Open Voice Command Interface Kit IEEE Trans. on Human-Machine Systems, 2016
Junaid Ahmed Ansari, Arasi Sathyamurthi, Ramesh Balasubramanyam
https://ieeexplore.ieee.org/document/7300400 Project : https://github.com/projectopenvcik/OpenVCIK

VACU - Voice Activated Control Unit Poster, Indo-German workshop on Neurobionics in clinical Neurology, 2012
Arasi Sathyamurthi, **Junaid Ahmed Ansari**, Ramesh Balasubramanyam, Hema Ramachandran

Projects

Scene understanding and embodied navigation for social environments 2019-Present
TCS Research,Kolkata
The main object of this project is to develop methods for scene understanding and autonomous navigation of embodied agents in social environments. As a part of this project :

- Currently, working on socially compliant and test-time adaptable robot navigation from first-person RGB-D input using reinforcement learning. In this work, we are also exploring self-supervised learning in conjunction with multi-modal trajectory forecasting to improve sample efficiency.
- Exploring how social representations learned from crowd motion/interaction data can be used to improve robot's behavior when interacting with human crowd
- Worked on real-time human trajectory forecasting in monocular first person videos on CPU.

Computer/Machine Vision | Robotics | Deep Learning | Deep Reinforcement Learning | crowd simulation | Human visual attention

Real-time monocular object SLAM system for dynamic road scenes 2017 - 2018

Robotics Research Center, IIIT Hyderabad
Worked on monocular reconstruction of dynamic (and static) vehicles and localizing them in global frame in metric scale by recovering the scale. We relied on shape priors and advances in deep learning for metric level monocular reconstruction of dynamic vehicles from a moving camera.

Computer/Machine Vision | Robotics | Deep Learning

Stereo camera based safe and feasible frontier detection for autonomous ground vehicles July - December, 2016

Robotics Research Center, IIIT Hyderabad
Developed a ROS (C++) package for detection of safe and feasible frontiers for autonomous ground vehicles. Obstacles are segmented by fitting road plane (along with camera height information) to the 3D point cloud generated using a stereo camera. Based on the obstacle information, vehicle dimension, frontier direction and plausibility, we compute all possible headings which are safe and feasible for the robot to move in.

Computer/Machine Vision | Robotics | Robot Operating System

Multi-Robot Stereo Simultaneous Localization and Mapping Project 2016 - 2017

Robotics Research Center, IIIT Hyderabad. Funded Project
Worked on stereo SLAM, stereo visual odometry, AR Tag based multi-robot map merging, collection of dataset and system setup of two mobile robot platforms.

Computer/Machine Vision | Robotics | Hardware | Robot Operating System | Sensor Integration

Voice Controlled Wheelchair Project 2013 - 2015

Raman Research Institute (RRI), Bangalore. Funded by RRI
Worked on voice activated wheelchair project. Designed and developed a light-weight and multi-threaded software framework in C++ for speech based activation of electric wheelchair. Developed all the required functionality such as motion, PID control, speed control, obstacle detection, integration of speech recognition engine, visual and auditory feedback interface, etc.

Computer/Machine Vision | Robotics | Hardware | Sensor Integration | PID Control

Short Term Projects (2011 - 2016)

Corridor detection in point cloud

Raman Research Institute (RRI), Bangalore
Corridor is detected in the point cloud by looking for a dominant parallel line separated by a distance threshold in a 2D scan generated from the 3D data captured from Kinect RGB-D sensor (we avoid plane segmentation for speed). The project was implemented in MATLAB.

Computer/Machine Vision

6D Visual Odometry Using RGB-D Cameras

Raman Research Institute (RRI), Bangalore
Implemented the full 6DoF Visual Odometry pipeline in C++ with OpenCV using Microsoft Kinect RGB-D sensor. No OpenCV functions used for the core functions.

Computer/Machine Vision

2D Error Pattern Visualization Toolkit

Raman Research Institute (RRI), Bangalore
In communication, the transmitted data is corrupted by the channel noise. Channel coding techniques are widely used to mitigate the effect of noise. To analyze the error detection capability of such codes in the presence of noise, the knowledge of patterns formed by error bits is essential. This GUI toolkit written in Processing helps visualization of such patterns by rendering the data frames as 2D grids with errors in different colors, representing their states, and helps to visualize their overall evolution in the correction process.

GUI | Processing(Java) | Visualization

EasyTestVR

Raman Research Institute (RRI), Bangalore
It is an application written in Processing (Java) for automatic analysis of ‘recognition accuracy’, ‘response time’, and other factors affecting the voice recognition of the COTS ‘non-continuous speech recognition boards’.

Voice recognition hardware | Processing (Java) | Arduino

VACU - Voice Activated Control Unit

Raman Research Institute (RRI), Bangalore
VACU is an innovative, inexpensive, and standalone embedded solution for voice activation of a powered wheelchair to enable physically challenged people become self-reliant for their locomotion. It is completely based on COTS hardware and provides interfaces for thumb-sticks, sonar sensors,and a compass sensor with PID control for steady motion and collision avoidance; it also has a visual and auditory feedback interface

Hardware | sensor integration | Arduino

Single beam reflection pattern simulator for surfaces in 2D

Raman Research Institute (RRI), Bangalore
This C++ application simulates the reflection of a user defined arrangement of arbitrary number of surfaces; it is a 2D case of a full-fledged simulator for the analysis of Radio Telescope surfaces for focus and undulation correction.

Draw-In-Air

SVCE, Bangalore
Draw-In-Air is an application for drawing, capturing images and controlling the mouse by color marker based gestures. Developed an algorithm for recognizing simple gestures employing two color markers for image capture.

Image Processing

Skills

Programming	C/C++, MATLAB, Python
Libraries	g2o, PyTorch, OpenCV, ROS, ceres-solver, ORCA
Operating System	Windows, Linux

Professional Services and Volunteering

September 2022	Mentored one of the interns in TCS Japan recruited for a short study – "Design principles for social robots"
2020, 2021	Reviewer, ICRA (IEEE International Conference on Robotics and Automation)
2020	Reviewer, WACV (Winter Conference on Applications of Computer Vision)
2020	Reviewer, AAAI (Association for the Advancement of Artificial Intelligence)
2019-Present	Reviewer, IROS (IEEE/RSJ International Conference on Intelligent Robots and Systems)
2019-Present	Reviewer, IV (IEEE Intelligent Vehicle Symposium)
2019-Present	Reviewer, RO-MAN (IEEE International Conference on Robot & Human Interactive Communication)
2018	Student volunteer in R&D Showcase, 2016, Robotics Research Center, IIIT Hyderabad, India
2016	Student volunteer in R&D Showcase, 2016, Robotics Research Center, IIIT Hyderabad, India