

# Junaid Ahmed ANSARI

## Researcher | TCS Research, Kolkata, India

🔗 Webpage : <https://junaidcs032.github.io>   [in linkedin.com/in/junaidcs032](https://www.linkedin.com/in/junaidcs032)   [github.com/JunaidCS032](https://github.com/JunaidCS032)  
@ansariahmedjunaid@gmail.com

## 🎓 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**  
Conducting research in 3D scene understanding and embodied navigation in social environments.  
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
- July 2016 December 2016** | **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
- 2007 **Fourth Prize, On-spot C programming competition.** Organized by CSE Department, 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](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/cchPlaKSSvM](https://youtu.be/cchPlaKSSvM)

### 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://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](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](https://youtu.be/2yApZOv_VkU) (\*Equal Contribution)

SOTA on KITTI Tracking Benchmark-2018

Project Page : [https://junaidcs032.github.io/Geometry\\_ObjectShape\\_MOT](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/projectopencvik/OpenVCIK](https://github.com/projectopencvik/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

### 3D 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, I have explored human trajectory forecasting in first person videos, a socio-attentional navigation framework relying on human visual attention to exploit possible cooperation from humans in the scene, and GNN-DeepRL based method for a safe, non-discomforting and potentially cooperative robot navigation. Humans' gaze direction in addition to their observable motion is considered to achieve the objective because cooperation can be only assumed if the human is aware of the robot.

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

## 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 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)

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### 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



## PROFESSIONAL SERVICES AND VOLUNTEERING

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2020	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



## SKILLS

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