# SHYAMSUNDAR PRABHAKAR INDRA

*Interests: Computer Vision, Robotics, Autonomous Vehicles, Machine Learning, Speech Recognition, Software Engineering, Vision Language Models, NLP*

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## EDUCATION

**University of Maryland, College Park** — *MD, USA*

Master of Engineering in Robotics | **GPA : 4.00/4.00** — *Aug 2022 - Grad. May 2024*

- **Graduate Teaching Assistant**, ENME272 - Computer Aided Design, Spring 2023 | **Student Athlete**, Collegiate Badminton Team
- **Key Courses:** 3D Vision, Adv. Computer Vision, Perception in Robots, Foundations of Deep Learning, Cognitive Robotics, C++ Robot Programming

**BITS Pilani, Pilani campus** — *Rajasthan, India*

Bachelor of Engineering (Hons.) in Mechanical Engineering | **GPA : 8.20/10.00** — *Aug 2016 - May 2020*

- Bachelor's Thesis on **Pedestrian Path Prediction** for Autonomous Vehicles with Dr. BK Rout at the Centre for Robotics & Intelligent Systems | link
- **Student athlete**, Collegiate Track and Field team | **President**, PTM - Tamil Cultural Association | **Team member**, Pixxel - Nanosatellite building team
- **Key Courses:** Machine Learning, Object Oriented Programming using JAVA, Intro. to Programming using C, Intro. to Robotics

## KEY SKILLS

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|---|---|
| **Programming** | **Advanced:** Python (PyTorch, PyTorch3D, TensorFlow, Keras, Scikit, Open3D, OpenCV) \| **Beginner:** C/C++, C#, Java, Matlab. |
| **CV Applications** | Generative Modeling, 3D Reconstruction, 2D to 3D modelling, Depth Estimation, Image Segmentation, Object Detection. |
| **Dev Utilities** | ROS, Git/GitHub, Unity, Gazebo, Blender, Docker, SolidWorks, RViz, Carla, Colab, Java Server Pages, HTML, Google Colab, AWS |

## EXPERIENCE

**Renesas Electronics America Inc. (Reality AI before acquisition)** — *Columbia, MD, USA*

Artificial Intelligence Engineer Intern — *May 2023 - Present*

**Summary : Software engineering and TinyML development for 1D vibration & acoustic data.**

- Contributed to end-to-end **software engineering** on **Machine Learning and CNN pipelines** for the company's automated AI deployment software.
- Researched and implemented **pyTorch model size optimization** through weight matrix decomposition, achieving a **52% reduction** on average.
- Implemented **rigorous testing procedures** to validate the robustness and reliability of the software, including **unit tests and integration tests**.
- Developed a **SVM-based anti-spoofing model** which rejects spoof inputs within voice authentication systems with an **accuracy of 96%.** | website
- Specialized experience in **advanced audio/spectral processing** techniques, such as **Spectral Centroid, Mel Spectrogram & Cepstral Analysis**.

**Vision & Learning Lab - University of Maryland, College Park** — *College Park, MD, USA*

Graduate Student Researcher | Guide : Dr. Jia-Bin Huang — *Jan 2022 - Aug 2022*

**Summary : Model setup for 3D animations generative AI project using 3D GANs and GAN inversion.**

**Robert Bosch Centre for Cyber Physical Systems - IISc Bangalore** — *Karnataka, India*

Robotics Research Intern | Guide : Dr. Shishir Kolathaya — *Jan 2022 - Aug 2022*

**Summary : 3D obstacle detection and lower level control package development for autonomous vehicle.**

- Designed a **LIDAR based 3D object detection model** to enhance the autonomy of a **level-3 Autonomous Vehicle** sponsored by WIPRO.
- Developed a **low-level python control package** working with the perception stack using **Control Barrier Functions (CBFs)** for obstacle avoidance.
- Verified the controller and the 3D object detection model in **Carla** - an autonomous driving simulator. | video

**International Institute of Information Technology, Bangalore** — *Karnataka, India*

Computer Vision Research Intern | Guide: Dr. G.N. Srinivasa Prasanna — *Jan 2021 - Aug 2021*

**Summary : Perception stack and prototype development for autonomous farm robot.**

- Developed a **YOLO-based object detection model** for **plant leaf counting**, enhancing crop health monitoring for a **farm robot**. | website
- Led the development of deep learning models to **detect and track fast-moving objects**, such as **coins in a carrom game**.
- Designed and 3D-printed essential parts for the farm robot, contributing to **prototype development**.
- Mentored a team of five interns in modeling an **autonomous robotic assembly line**.

## KEY PROJECTS

- **Multi-Mesher**: A Diffusion Driven single 2D image to 3D Mesh Reconstruction model using Zero123 and PointNet architecture (Python) | website
- **Neural Radiance Fields (NeRFs)**: Implicit 3D representation and novel view synthesis using NeRFs and Volume Rendering (Python) | github
- **Point Cloud Classification & Segmentation**: PointNet based architecture for classification and segmentation of point clouds (Python) | github
- **Hostage Rescue Game**: A Virtual Reality game based on Unity Engine simulating a Hostage Rescue mission (C#, Unity) | website
- **TerpBot**: Custom RaspberryPi based Mobile Robot (website) with Path Planning (website) & Leader-Follower capabilities (website) | (Python, C++)
- **Masked Autoencoder Inpainting**: A Transformer-based Autoencoder for Collaborative Perception by Image Inpainting (Python) | paper
- **American Sign Language Detection**: CNN and LSTM based American Sign Language (ASL) Detector for Letters from video feeds (Python) | website

## ACHIEVEMENTS

2016 **All India Rank 1073**, JEE Mains, out of 1.2 million candidates

2016 **Top 0.04 percentile**, JEE Advanced, entrance exams to the prestigious Indian Institutes of Technology

## PUBLICATIONS

Control Barrier Functions in UGVs for Kinematic Obstacle Avoidance: A Collision Cone Approach
T. Phani, G.G. Bhavya, T. Manan, S. Neelaksh, P.I. Shyamsundar, M.G. Shyam Sundar, S. Suresh, K. Vaibhav, K. Shishir
*Indian Control Conference*. 2023

Analysis of Vibration based Windmill Coupled Micromachined Energy Harvester
R. Pavan, P.I. Shyamsundar, K.P. Venkatesh
*Journal of Vibroengineering*. 2019