

# SHYAMSUNDAR PRABHAKAR INDRA

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Domain Skills: Computer Vision (CV) • Machine Learning (ML) • Deep Learning (DL) • Robotic Software • Motion Planning • Virtual Reality

## EDUCATION

### UNIVERSITY OF MARYLAND

M.ENG. IN ROBOTICS

Aug 2022-Jun 2024 | College Park, MD

GPA: 4.00 / 4.00

Roles: TA - [ENME272](#) Spring 2023

### BITS PILANI

B.E. IN MECHANICAL ENGINEERING

Aug 2016-Jul 2020 | Rajasthan, India

GPA: 8.20 / 10.00

## KEY COURSEWORK

### GRADUATE (\* Ongoing)

3D Vision\*

Robot Programming using C++\*

Human Robot Interaction\*

Advances in Extended Reality (XR)

Perception in Robots

Path Planning in Robots

Adv. Geometric Computer Vision

Control of Robotics Systems

Intro. to Robot Modelling

### UNDERGRADUATE

Machine Learning

Object Oriented Programming

Intro. to Robotics

## ACHIEVEMENTS

- **All India Rank 1073** in JEE Mains 2016 - 1.2 million candidates appeared for the exam.
- Placed in the **top 0.04 percentile** in JEE

Advanced 2016 (Entrance exam to the prestigious IIT institutions).

## SKILLS

### Programming

Python • MATLAB • Java • C • C#

### ML & CV Libraries

PyTorch • TensorFlow • Keras • Scikit • NumPy • OpenCV • PIL • Darknet • Pandas

### CV Applications

Generative Models • Object Detection & Tracking • Depth Estimation

### Development Tools

ROS • Unity • Gazebo • Simulink • RViz • Carla • Colab • JSP • CSS

## EXTRACURRICULARS

- **Badminton Player, UMD College Park** - Men's doubles player in the competitive team of the university (Present).
- **Track & Field Athlete, BITS Pilani** - Medal winner in various 100m, 200m, 4x100m and long Jump collegiate events (2016 - 2020).
- **President - PTM, BITS Pilani** - Tamil cultural association of the university (2017-2018).

## EXPERIENCE

### Renesas North America Ltd. | ARTIFICIAL INTELLIGENCE ENGINEER INTERN

May 2023 – Present | Columbia, MD

- Developed a SVM based lightweight ML anti-spoofing model, that can reject spoof inputs in voice authentication systems. ([Scikit](#)) | [VIDEO](#)
- Working on embedded deployment of the model on a Renesas Edge device. (C)
- Contributing to the company's automated AI deployment software. (Python, MATLAB)

### UMD Vision & Learning Lab | GRADUATE STUDENT RESEARCHER

Feb 2023 – Present | Guide: Dr. Jia-Bin Huang | College Park, MD

- Working on CLIP based generation of animations along with their 3D mesh using GAN Inversion and 3D-GAN.

### Robert Bosch Centre - IISc Bangalore | ROBOTICS RESEARCH INTERN - REMOTE

Jan 2022 – Aug 2022 | Guide: Dr. Shishir Kolathaya | Bangalore, India

- Implemented a **LIDAR based 3D object detection model** for a level-3 Autonomous Vehicle sponsored by WIPRO. ([PyTorch](#))
- Developed a **low-level control package** communicating with the **perception stack** using **Control Barrier Functions (CBFs)** for obstacle avoidance. ([Python](#))
- Verified the controller in an autonomous driving simulator. ([Carla](#)) | [VIDEOS](#)

### IIT Bangalore | COMPUTER VISION RESEARCH INTERN - REMOTE

Jan 2022 – Aug 2022 | Guide: Dr. G.N. Srinivasa Prasanna | Bangalore, India

- Utilized a **YOLO** architecture from **Darknet** framework to predict plant leaf count and monitor crop health. ([Transfer Learning](#))
- Tracked fast moving carrom coins using a **Deep Neural Network (DNN)** model combined with **classical image processing**. ([DL](#), [Image Processing](#))
- Mentored five new interns to model an **autonomous robotic assembly line**.

### Centre for Robotics & Intelligent Systems - BITS Pilani | UNDERGRAD THESIS

Jan 2020 – Jul 2020 | Guide: Dr. B.K.Rout | Pilani, India

- Successfully defended **thesis** on **DL applications in CV** for **level-3 autonomous vehicles**.
- Implemented and trained a **Bi-Directional LSTM Network** on temporal tracking data to predict the path of pedestrians **2 seconds** into the future. ([TensorFlow](#), [Keras](#))

## KEY PROJECTS

### TERP BOT WITH PATH PLANNING AND DYNAMIC OBSTACLE AVOIDANCE | [LINK](#) | [VIDEO](#)

Created a **unicycle** model based autonomous mobile robot called TerpBot from scratch. It perceives with just one monocular camera using a MiDaS based **monocular depth estimation** model, and has **wheel odometry** for localization. It can navigate complex environments using **RRT\* global planner**, and evade dynamic obstacles using a **Potential Field based local planner**.

### IMAGE COMPLETION USING MASKED AUTOENCODERS FOR PERSPECTIVE SHIFTING | [LINK](#)

Utilized a **multimodal mask autoencoder**, which takes RGB image and depth data of a scene to reconstruct the RGB scene from a different perspective, by completing the occluded patches.

### BI-DIRECTIONAL LSTM BASED PEDESTRIAN PATH PREDICTION | [LINK](#)

Created an end-to-end pipeline utilizing Object Detection & Tracking data as input to a **Bi-Directional LSTM network** to predict the path of pedestrians 2 seconds into the future

### KEYPOINT FEATURE PYRAMID NETWORK FOR 3D OBJECT DETECTION | [LINK](#)

Developed off **SFA3D**, the model was trained using **KITTI3D LIDAR** data, and transfer learning was performed using **Carla LIDAR** data to predict 3D position & orientation of obstacles.

### YOLO BASED LEAF DETECTION NETWORK | [LINK](#)

Used **Darknet framework** to create a **YOLO based CNN** with a ResNet50 backbone to predict the number of leaves in a plant image, and thereby monitor plant health in an agricultural robot.

## PUBLICATIONS

- [1] "Control barrier functions in ugvs for kinematic obstacle avoidance: A collision cone approach," *arXiv preprint*, 2022.
- [2] "Analysis of vibration based windmill coupled micromachined energy harvester," *JVE Journals*, 2019.