S DHARUN KUMAR
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EDUCATION

Amrita Vishwa Vidyapeetham, Coimbatore *Sept 2020 – July 2024*

Bachelor of Technology in *Electronics and Communication Engineering*, **CGPA: 8.0/10 (till 6th Sem)**

Relevant Coursework: Industrial Robotics, Control Systems, Microprocessors and Micro-Controllers, Pattern Recognition, Deep Learning for Computer Vision, FPGA-based system design.

EXPERIENCE

Robotics lab, Amrita School of Engineering, Coimbatore

Research in Mobile Robot path planning *July 2023 - Present*

- The focus is on proposing a new hybrid algorithm for dynamic obstacle dynamic target problems utilizing RRT* for global planning in combination with RL and other obstacle avoidance algorithms.
- Using MATLAB 2023 for simulation purposes and ROS noetic for real time hardware testing.
- Supervisor: Dr. T. Mohanraj, Assistant Professor, Dept of Mechanical Engineering, Amrita school of engineering, Coimbatore

Amrita school of computing, Coimbatore

Research in IOT based paddy disease detection *Dec 2022 - Present*

- The focus is on proposing custom model architecture suitable for paddy disease detection.
- Collaboration with professors of Agri university Coimbatore is done for dataset creation. Hopefully publishable within few months.
- Created a computer vision system based on IOT using Raspberry Pi 4 for local processing and fishy lens as camera module.
- Images are sent to server for preprocessing and classification and GSM module used for notifying farmers via SMS.
- *Supervisor*: Dr. T. Senthil Kumar, Assistant Professor, Dept of Computer science, Amrita school of computing, Coimbatore

Bharat FIH, Chennai *Sept 2022 – Sept 2022*

Internship

- Designed 4 jigs for smart phones using Autodesk Fusion 360 and 3D printed.
- Programmed AMR robot for navigation through PCB manufacturing unit using ROS and C++, which was adapted for PCB manufacturing unit for transferring PCBs within the unit.
- *Supervisor*: **Mr. Gomathi Selvam** Project lead at Bharat FIH.

ACADEMIC PROJECTS

Design and Development of a Weeding Robot

(Industry project, Robotics club, Amrita School of Engineering, Coimbatore) *Oct 2023 - Present*

- Aims to create an automated weed removal system for sustainable agriculture. Leading team of 15 active members.
- Desired parameters: Runtime – 3 hours(min), weeding speed – 0.7 m/s to 0.8 m/s, weeding method - cutting.

Machine Learning-Enhanced Sensor Based Smart Hand-Wearable employing Finger-Spelling for Speech Impaired People

(B. Tech Dissertation project) *Jun 2023 - Present*

- Aims to provide communication assistant for speech impaired people.
- Utilizes flex sensor, customized app with features of text to speech conversion and Arduino uno for processing.
- Sensor based dataset collection is to be done and hopefully published and later ML and DL algorithms will be embedded to increase device accuracy.

Image processing system in FPGA for edge detection *Oct 2023 - Nov 2023*

- Created image processing system using VIVADO utilizing AXI interfaces, IPs and block diagram tool.
- Implemented Sobel, Prewitt and Canny edge detection in Nexys A7 Artix-7 FGPA using Vitis.

Intelligent water management system *July 2023 - Aug 2023*

- Aims for optimized water usage in home garden.
- Tools and techniques used: Arduino mega for edge computing, MQTT protocol, MIT App Inventor for app-based controlling, MATLAB and Simulink for control system simulation, temperature and humidity sensor, soil moisture sensor, solenoid valve.
- Control theory used: Overshoot below 2% is achieved, state space and MPC is used.

Design and prototyping of 6 DOF robotic arm for material handling *April 2023 - May 2023*

- Designed and developed a prototype of 6 DOF robotic arm which automatically classifies metal, glass and plastic using capacitive and inductive proximity sensor, controlled by Arduino mega.
- PLA used for 3D printing components and it automatically picks the material and places in respective bins.
- Design parameters: Payload – 3 Kg, accuracy – 100%, mini servo motors and two finger gripper is used.

Wireless ECG Signal Transmission
(Open Lab project) *Mar 2023 - Jun 2023*

- Aims to provide remote service for ECG signal reducing the need for frequent in-person medical appointments.
- Developed prototype for wireless transmission of live ECG signal to Blynk cloud platform.
- Designed amplifier and filter stages utilizing TL084 OPAMPs, achieved a filter bandwidth of 0.05 Hz to 103 Hz. Implemented in PCB and got CMRR of 96 dB and gain of 400.

Multi robot coordination and collaboration (SIMULATION) *Jan 2023 – April 2023*

- Designed and implemented a multi-robot system using ROS1 kinetic and C++, focusing on communication and collaboration.
- Developed consensus algorithms (Distributed A*) and employed auction-based task allocation strategies. Gmapping SLAM done. Utilized simulatedTurtleBot Pi 3 burger for this project, Gazebo used for simulation.

COMPETITIONS

Smart India Hackathon (SIH 2022) *2022*

- Topic: 3D Model Drone Design using Generative Design
- Won internal Hackathon.

e-Yantra (online) *2021*

- Topic: ROS-based Agri Robot
- Simulated the URDF with the desired operation in the desired path.
- Tools/Techniques used: OpenCV, ROS Noetic

SKILLS

Languages: Python, C++, MATLAB, Simulink, LabView, Verilog, VHDL, Embedded C
Software tools and Platforms: ANSYS-HFSS, Xilinx, Vitis, VIVADO, Autodesk fusion 360, LTSPICE, NI LabView, GNU Radio
Development Boards: Arduino, ESP32, Basys3, ZYNC Zed Board, Raspberry Pi 4 B, PIC16F1455 microcontroller
Frameworks: Robot Operating System (ROS), TensorFlow, PYTORCH

ACHIEVEMENTS

- DST Inspire scholarship recipient and INSPIRE internship program (2018)
  - INSPIRE Award: Rs 5000 recipient under SEATS program, promoting Science
  - Engagement among 10-15- year -olds and represented Vivek Vidyalaya.
  - INSPIRE Internship: Engaged with global science leaders, exploring innovative scientific concepts for a week.
- Guinness book of world records - Participated in AI-for-India 1.0 – Most users to take an online computer programming lesson in 24 hours (2022)
- Led the team representing Orison Academy school, Coimbatore in Tirupur SAHODAYA Kho-Kho and emerged as winner (Sept 2018)

CERTIFICATIONS AND UPSKILLING

- **A. D. A. M. S (Advanced Data Acquisition and Mapping Solutions)**- 5 - day residential training (July 2023) on GNSS, LIDAR, DRONE for data acquisition and mapping by LnT EduTech at CTEA Mysuru campus, India and 3 credit valued online mode GIS course with duration of 4 months.
- **Industrial Robotics – Expert Level** by A. G. I. I. T at AGIIT Factory, Coimbatore (July 2023 – December 2023)
- **Machine learning engineering for operations** – Deep Learning. AI (Coursera)
- **Robotics specialization** – University of Pennsylvania (Coursera)

VOLUNTEERING AND LEADERSHIP EXPERIENCE

- Live-in-Labs ® *Feb 2023- Jun 2023*
  - Applied Human-Centered Design and QGIS tools in Uttarakhand's Dungi village for sustainable solutions.
  - Conducted in-depth surveys and C20 meetings with villagers, addressing issues - animal intrusion and water purification.
  - Presented innovative water-saving and purification method to Amrita University, funded by MA Math, an UN-recognized NGO
- Pasumai Desam, NGO *Jan 2022- Present*
  - My role - coordinator of volunteers
  - Organized three blood donation camps in Coimbatore.
  - Conducted tree planting camp on world environment day at Coimbatore
- Robotics club Project Management head, Amrita School of Engineering – Completed 2 projects, 4 ongoing – 1 company project.
- Tech Fair department Head, ANOKHA 2023, a national level Techfest – Organized the expo of leading technical projects from various departments from Amrita university and cutting - edge research projects.
- Entrepreneur cell head, Amrita Centre for Entrepreneurship – Spearheaded ‘Pitch it to win it’ event in ANOKHA 2023.