Dhruv Patel

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Education

Sardar Vallabhbhai National Institute of Technology(SVNIT) Aug. 2016 – Jul 2020
Bachelor's of Technology, Electronics and Communication; CGPA: 8.39/10 *Surat, India*

Experience

Project Associate - Robotics Research Centre, IIIT Hyderabad July 2021 - Present
Object detection, Reinforcement learning, Vision, UAVs, Structure from Motion *Hyderabad, India*

- **Object Detection in Adverse weather conditions** *Status: Currently Working*
  → Working with Prof. Madhava Krishna and Dr. Sourav Garg on improving object detection approaches for adverse weather conditions like Fog & Low-lighting.
- **DodgeDrone(ICRA 2022 Competition)** *Status: Currently Working*
  → Working on the intersection of vision and Reinforcement Learning to navigate UAVs in static/dynamic environments at high speeds, avoiding obstacles. We are trying to leverage the capabilities of a servoing framework with an RL policy to give a general obstacle avoidance policy.
  → Our formulation consists of a neural network which will predict the direction of motion, which will further be used to generate velocity commands using radial flow centered around this direction(or pixel). The entire pipeline will be optimized through an RL-based algorithm such as Proximal Policy Optimization(PPO).
- **UAV-based assessment of Civil Structures** Advisors: Prof. Madhava Krishna, Dr. R. Kiran S, Dr. Kandath
  → Developed a vision pipeline which uses UAVs to assess and extract important information from the buildings - such as Storey Heights, windows/storey count, plan shape and area of the façade, etc. [GitHub]

Associate Software Engineer - Amdocs Aug 2020 – June 2021
Java, SQL, ReactJS, Object-oriented Programming, Microservices, Jenkins, Maven, Spring *Pune, India*

- Wrote production-level software by contributing in full-stack development - developing backend APIs (Java), user-friendly frontend UI (ReactJS) and writing SQL scripts for adding/updating large chunks of data in the production database.
- In addition, helped the upcoming freshers by conducting knowledge transfer sessions of various internal Amdocs applications and followed programming practices. Manager **Ben Shasha** commended me for my consistent exceptional performance among the batch mates.

Research Intern - Swaayatt Robots April 2020 – July 2020
C++, Mathematical Optimization, Point Cloud Library(PCL), SLAM, LiDARs *Bhopal, India*

- Proposed a semantic variant of ICP (Iterative Closest Point) algorithm for incrementally building maps using semantic information from point cloud data (LiDAR) for Level-5 Autonomous Driving task. It was tested on Semantic KITTI Dataset and achieved real-time latency of approx. 4 scans/sec.
- The proposed variant outperformed vanilla ICP in terms of both accuracy and speed - improving the point cloud matching accuracy and reducing the convergence time by 97% and 50% respectively.
- Received special appreciation from Mr. Sanjeev Sharma (Director, CEO & CTO, Swaayatt Robots) for the research work done during the internship. [Swaayatt Robots Report] [Appreciation Letter]

Summer Research Intern - SVNIT May 2019 – July 2019
Python, Keras, Tensorflow, Face Recognition, Deep Learning *Surat, India*

- Advisor: Dr. K.P. Upla – The project aimed to build a Face Recognition system using Deep Learning.
- Implemented an inception network trained and validated on a custom-made facial image dataset of 25 students and worked on different modules like Face Detection, Alignment and Recognition. [Face Recognition Report].

Research Works

Dhruv Patel[1], ShankaraNarayanan H.[1], Meet Gandhi[1] & Anand Darji, "Design of an Autonomous Agriculture Robot for Real Time Weed Detection using CNN", presented at the AVES 2021 conference. [GitHub] [Paper] [credential]

[1]equal contribution

Dhruv Patel[1], Shivani Chepuri, Sarvesh Thakur, H. Kandath, Ravi Kiran S & K. Madhava Krishna, "Identifying and estimating salient parameters of a building using UAV based remote sensing", submitted at the International Conference on Unmanned Aircraft Systems(ICUAS) 2022. [GitHub]

Dhruv Patel[1], Abhinav Jain[1], Simran Bawkar, Manav Khorasiya, Kalpesh Prajapati, Kishor Upla, Kiran Raja, Raghavendra Ramachandra, Christoph Busch. (Submitted to the 7th International Conference on Computer Vision Image Processing[CVIP] 2022) "SRTGAN: Triplet Loss based Generative Adversarial Network for Real-World Super-Resolution" [GitHub] [Preprint]

Projects and Extra-Curricular

UG Project- Autonomous Agricultural Robot (TEQIP III Sponsored) Oct 2019 – June 2020

Python, ROS, Semantic segmentation, Deep Learning, Sensor fusion, Autonomous Navigation, Nvidia Jetson Nano

- Advisor: Dr. A.D. Darji - Worked in a team of 3 to build a Robot that can autonomously navigate through the fields and perform Crop Weed classification.
- Implemented 2 segmentation models: UNet and Bonnet for Crop Weed Classification task. Bonnet Model performed better class-wise prediction on CWFID & Bonn datasets and has 100x lesser parameters than UNet. It achieved 96.48% accuracy and 0.0168 units loss on CWFID whereas 99.471% mean accuracy, 98.035% mean IoU and loss of 0.0035 units on Bonn dataset. Model's Low real-time latency of avg. 2.5 fps on i7 + NVIDIA 940MX makes it possible to deploy for real-case scenarios. Our work is published at the **AVES 2021** conference.
- Were invited by **Mr. Matt Droter** (Founder, ROS Agriculture) to present our project at ROS Agriculture community meet. [GitHub Repo] [Link to community meet]

UG Seminar/Thesis - Computer Vision for Farm Robot

Image Segmentation/Classification, Computer Vision, Deep Learning, Robotics, Agriculture

- Advisor: Dr. A.D. Darji. The seminar focuses on the robotic vision system design and several classification and segmentation algorithms such as one-shot and semantic segmentation for Crop Weed classification problem [Seminar Report] [Seminar Presentation]

Drishti - Tech Club SVNIT July 2017 - June 2019

- Worked & mentored several mini projects - RFID-based Identification system, Wireless control of mobile Robot. Conducted workshops on Embedded C, Sensor Interfacing, and Computer Vision for fellow juniors.
- Represented NIT Surat at National Robotics Contest Robocon 2018 & 2019.

National Robotics Contest - Robocon Aug 2017 - June 2019

C/C++,Embedded & Control Systems, Odometry, Path Planning, RaspberryPi, Arduino,AVR, Image Processing, Team Work

- Robocon is a robotic contest organized by Asia-Pacific Broadcasting Union(ABU) [GitHub Project Page]
- **Robocon 2018** [Video:(Blue Team) YouTube Video]
  → Worked in a team of 20 and primarily contributed in developing autonomous motion using Line Following on a 3-wheel omni-drive through feedback from sensors like LSA line sensor, Gyroscope, IMU and Encoders.
  → Also developed manual control of the omni-drive using a remote playstation controller and prepared hardware circuitry using GCB (General Circuit Boards).
  → Secured 12th rank in the nationals at MIT Pune out of 120 participating universities.
- **Robocon 2019** [YouTube Video]
  → As a Senior member of a 15-person team, oversaw technical and managerial aspects in building 2 robots: 4-wheel omni-drive and 4-legged robot.
  → Primarily developed the autonomous motion of the omni-drive using Line Following while also contributing to odometry module using wheel Encoders. Developed the vision system based on colour detection for legged robot with 2 cameras interfaced and parallely threaded on Raspberry Pi 3B.
  → Secured 13th rank in the nationals at IIT Delhi in the final round clearing Design Details & Video Submission round among over 100+ participating universities.

Certifications And Awards

Deep Learning Specialization, Coursera

- Course 1: Neural Networks and Deep Learning
- Course 2: Improving Deep Neural Networks
- Course 3: Structuring Machine Learning projects
- Course 4: Convolutional Neural Networks
- Introduction to Tensorflow
- CNNs in Tensorflow

Academic & Business Writing, UC Berkeley, EdX [certificate] Score: 93%

Fundamentals of Reinforcement Learning, Uni. of Alberta, Coursera [certificate] Score: 98.98%

Deep Learning & Applications, Webinar, MeitY, Govt. of India [certificate]

Best Model, National Science Day Celebrations, Physical Research Laboratory(PRL) *Ahmedabad, India*

- Awarded Best Working Model - Stirling Engine at the PRL during 12th grade. [credential]

Technical Skills

Languages: C, C++, Java, Python, Embedded C, SQL
Tools & Frameworks: git, Spring, MATLAB, PyTorch, TensorFlow, Keras
Libraries: pandas, NumPy, Matplotlib, OpenCV