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
UAVs, Computer Vision, Deep Learning, Reinforcement Learning, Structure from Motion *Hyderabad, India*

- **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.
  → Currently, we are working on modules like identification of roof-top objects and toppling/falling hazard, crack detection and safety index formulation for civil structures. [GitHub]
- **DodgeDrone(ICRA 2022 Competition):**
  → 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.

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]

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 International Conference on Information Fusion 2022) "SRTGAN: Triplet Loss based Generative Adversarial Network for Real-World Super-Resolution" [GitHub] [Preprint]

[1]equal contribution

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, PyTorch, TensorFlow, Keras
Libraries: pandas, NumPy, Matplotlib, OpenCV