DHRUV PATEL

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EDUCATION

Georgia Institute of Technology **August 2023 - August 2025**
Master of Science, Robotics

- **Relevant Courses:** Artificial Intelligence (AI), Robotics Research and Professional Preparation, Computer Vision

Sardar Vallabhbhai National Institute of Technology (SVNIT) **July 2016 - July 2020**
Bachelor of Technology, Electronics and Communication Engineering *GPA: 8.4/10.0*

WORK EXPERIENCE

Georgia Institute of Technology **Atlanta, GA, USA**
Graduate Teaching Assistant – CS 6476 Computer Vision (graduate-level) course *August 2023 - Present*

- Designing assignments and preparing presentations for topics like Object Detection, Segmentation, Transformers, etc.

Google Summer of Code [Webpage] **Mountain View, CA, USA**
Google Summer of Code'23 Contributor *June 2023 - August 2023*

- Open-source software development for Robotics.
- Developed multi-framework support (PyTorch, TensorFlow, JAX, NumPy) for GradSLAM, an end-to-end differentiable SLAM system, using Ivy (Unify AI)'s graph compiler, enabling deployment with highly optimized frameworks like JAX.

Robotics Research Center, IIIT Hyderabad **Hyderabad, India**
Project Associate *July 2021 - July 2023*

- **Autonomous Driving Scene Understanding - ZF Friedrichshafen and QUT Robotics, Australia**
  - Proposed Gated Differentiable Image Processing (GDIP) framework for object detection in adverse weather conditions (like foggy and low-lighting). [Webpage]
  - Improved performance by 5.84 (foggy) and 16 mAPs (dark) over state-of-the-art with a ~3x speedup.
  - Researched video object detection/tracking problems in adverse weather conditions.
- **UAV-based Assessment of Civil Structures** [Website]
  - Aimed at estimating critical structural parameters using UAV-based Visual Remote Sensing through concepts like Structure-from-motion and state estimation in conjunction with classical Computer Vision and Deep Learning algorithms.
  - Constructed 3D models using Structure-from-motion, estimated ROIs (storey/window heights) with an error of 2.3% by fusing UAV's odometry information, and quantified occupancy of roof-top objects.
  - Estimated pounding effect using RANSAC-based conditional plane fitting with an accuracy of 99.04%.
  - Devised a strategy to estimate plan-shape and roof areas of buildings with an average error of 4.7 %
  - Developed an open-source software library (UVRSABI), soon to be adopted by the Govt. of India.
- **Obstacle avoidance for UAVs** [Webpage]
  - Devised a high-level control strategy for learning-based obstacle avoidance using single RGB images.
  - Optimized ResNet architecture using positive instances of obstacle-free patches from the DodgeDrone Simulation, integrated it into Habitat, and leveraged radial flow for linear velocity estimation.

Amdocs **Pune, India**
Associate Software Engineer *August 2020 - June 2021*

- Developed cross functional telecommunication software solutions for Comcast's Orion project (USA).
- Collaborated with global product owners, ensuring end-to-end feature development, integration and validation with testing team.
- Technical Stack: Java, ReactJS, SQL, Spring Boot, Maven, and Jenkins.

Swaayatt Robots **Bhopal, India**
Research Intern *April 2020 - July 2020*

- Improved Visual Odometry (VO) and SLAM pipelines for Level-5 Autonomous Vehicles.
- Devised a semantic variant of the Iterative Closest Point (ICP) algorithm outperforming vanilla ICP by 97% (matching loss) and 50% (convergence time), respectively, on the Semantic KITTI dataset.

Sardar Vallabhbhai National Institute of Technology (SVNIT) **Surat, India**
Summer Research Intern *May 2019 - July 2019*

- Implemented FaceNet, a Deep Learning-based Face Recognition system, using an NN4 variant of the inception network, and validated the system on a custom-made facial image dataset of 25 students.

SKILLS

- **Languages and Tools:** Python, C/C++, Java, JavaScript, Embedded C/C++, SQL, Git, Spring, Jenkins, Docker
- **Libraries and Frameworks:** PyTorch, TensorFlow, Keras, MATLAB, Pandas, NumPy, SciPy, Matplotlib, OpenCV, Point Cloud Library (PCL), Robot Operating System (ROS), Gazebo.

PROJECTS AND EXTRA-CURRICULAR

UG Project - Autonomous Agricultural Robot (AGRIBOT) [Webpage] *October 2019 - June 2020*

- Developed autonomy stack for a 4-wheel skid-steer drive, and simulated it in Gazebo using RGB camera, GPS, and IMU.
- Implemented a lightweight encoder-decoder architecture for crop-weed classification task, having 100x lesser parameters than SOTA like UNet.
- Achieved 96.48% accuracy on CWFID and 99.471% mean accuracy, 98.035% mean IoU on the Bonn dataset for crop-weed classification task. Runs with low latency of <2.5 fps (on Nvidia 940MX).

Asia-Pacific Robot Contest: RoboCon [Webpage] *August 2017 - June 2019*

- Developed autonomous holonomic drives using line following and odometry through feedback from line sensor, Gyroscope, IMU, and Encoders on Atmel AVR and ARM microcontroller hardware.
- Led a 15-person team in RoboCon 2019, building a 4-wheel Holonomic Drive and Quadruped Robot.

DRISHTI – Technical club, SVNIT [Website] *June 2017 - June 2019*

- Organized INSIGHT 1.0, a technical symposium with a footfall of 500-plus people.
- Mentored Embedded Systems and Robotics projects such as RFID-based Identification and Wireless control of mobile robots.

PUBLICATIONS

- S. Kalwar*, **D. Patel***, A. Aanegola, K. R. Konda, S. Garg, and K. M. Krishna, "*GDIP: Gated Differentiable Image Processing for Object Detection in Adverse Conditions*," 2023 IEEE International Conference on Robotics and Automation (ICRA), London, United Kingdom, 2023. [Webpage] [Code] [Paper]
- Srivastava K*, **Patel D***, Jha AK, Jha MK, Singh J, Sarvadevabhatla RK, Ramancharla PK, Kandath H, Krishna KM, "*UAV-Based Visual Remote Sensing for Automated Building Inspection*", European Conference on Computer Vision 2022. Cham: Springer Nature Switzerland. [Webpage] [Code] [Paper]
- **Patel D***, Jain A*, Bawkar S, Khorasiya M, Prajapati K, Upla K, Raja K, Ramachandra R, Busch C, "*SRTGAN: Triplet Loss based Generative Adversarial Network for Real-World Super-Resolution*", 7th International Conference on Computer Vision and Image Processing (CVIP) 2022. [Webpage] [Code] [Paper]
- **Patel D***, ShankaraNarayanan H.*, Gandhi M* and Darji A, "*Design of an Autonomous Agriculture Robot for Real Time Weed Detection using CNN*", presented at the AVES 2021 conference. [Code] [Paper]

AWARDS AND ACHIEVEMENTS

- **JNTE Scholarship**: Honored with the prestigious JN Tata Scholarship for abroad education, joining an elite group of only 5600 JN Tata Scholars since 1892, including esteemed Indian Presidents and scientists.
- **UAV-based Visual Remote Sensing for Automated Building Inspection (UVRSABI)**
    - Spotlight presentation at the CVCIE Workshop, ECCV 2022.
    - Inaugurated by Dr. S. Velmurugan (Chief Scientist, CRRI) to deploy in Telangana, India (Sept 2022)
    - A high-impact project (25 selected out of 300+ research projects) at IIIT-H's RnD Showcase 2023.
- **Top-contributing employee** award at Amdocs (May 2021).
- Secured **36k INR funding** from the TEQIP-III program (Govt. of India) for **AGRIBOT** and presented it at **ROS Agriculture**.
- Secured **12th** and **13th rank** in **RoboCon 2018 and 2019** respectively, among 100-plus universities.
- **Best Working Model - Stirling Engine** at the National Science Day Celebrations, Physical Research Laboratory, India.

* denotes equal contribution