DHRUV GABA

Sunnyvale, CA | dg.dhruvgaba1104@gmail.com | https://www.linkedin.com/in/dhruvnyu/ | Ph. No.: + 1 (631) 640-6421)

EXECUTIVE SUMMARY

Result-oriented professional with over 7 years of hands-on professional experience in designing, constructing, and optimizing a diverse range of robust autonomous systems, spanning software and hardware domains. Possessed deep understanding of the functionalities and internal workings of robots. Contributed to the development of autonomous vehicles, submarines, unmanned aerial vehicles (UAVs), and robotic manipulators. My technical proficiencies are centered on Sensor Fusion, Simultaneous Localization and Mapping (SLAM), Mechatronics, and Computer Vision. My career has been characterized by the relentless pursuit of excellence, tackling complex issues within the runtime software stacks of sophisticated systems, predominantly utilizing C++ and Python programming languages.

EDUCATION

New York University, New York City, USA Sep 2017 - May 2019
M.S. in Mechatronics, Robotics, and Automation Engineering | **GPA-3.54**

Guru Gobind Singh Indraprastha University, New Delhi, India Aug 2012 - Jun 2016
B. Tech in Electronics and Communication Engineering | **GPA-3.60**

TECHNICAL SKILLS

- **Programming Languages**: C, C++11, Python3 & Python2 , Quick C, OpenCV, Bash Scripting
- **Robotics Skills:** Sensor Fusion - Localization (EKF, PF, UKF), EKF-SLAM, A* & D* Path Planning, Swarm Formations
- **Simulation Tools:** CAD – SolidWorks, MATLAB, Simulink, Gazebo, PyBullet, RViZ
- **Machine Programming**: Nvidia Jetson TX1 / TX2 / Xavier, Propeller, Arduino, Raspberry Pi 3
- **Platforms**: Ubuntu/Linux, Gazebo, Calra, Unity
- **Robotics Frameworks** Robot Operating System (ROS1 & ROS2), Autoware, Nvidia Isaac

WORK EXPERIENCE

Knightscope Inc., California (Full-Time) (4.5 years) *Nov2020 - April 2025*

Senior Autonomy Engineer May 2023 - April 2025
- Designing and Development of Prototype for New Generation K7 Autonomous Robot on Autoware framework on Pixxkit chassis via ROS2.
- Designing positioning of the sensors to ensure collision avoidance and guarantee comprehensive safety by preventing the robot from colliding any living beings or objects—including small children, pets, and low-profile obstacles—that may enter its path via ROS2 packages.
- Upgraded safety of robots K5v5.3 by new prox sensor stack with a better safety bubble around the robot's footprint and production readiness in C++11.
- Developed QA (Quality Assurance) Automation Testing scripts for Knightscope's production of robots in Python & shell scripts.
- Designed a backpack mapping module for creating 3D point cloud maps for the client sites, without needing the robot physically at the site in C++.

Autonomy Engineer Aug 2022 - May 2023
- Built the K5V5.2 robot from scratch, modernized its autonomous navigation codebase, and revamped its mechatronics systems in Linux 18.04.
- Prototyped development/testing - mechatronics system solutions for project proposal - proof of concept, using agile methodologies and bash scripting.
- Developed and maintained test benches & robots for sensor integration (Motors, Lidars, IMU, etc.) with the autonomous navigation stack of ROS1.
- Enhanced Knightscope's autonomous navigation stack with improvements in localization, mapping, state machine, and charging behaviors in **C/C++**.

Robotics Software Engineer Apr 2021 – Aug 2022
- Localization Improvement Project - Improved Map editing / Cleaning techniques, and AMCL (particle filter) refinement in C++.
- Developed a live and recorded video feed system in Python 3 for the Knightscope platform, achieving sub-3-second latency from IP (RTSP) cameras.
- Engineered production-level code for the company's video feature, optimizing client experience through a low-latency video feed used ZeroMQ & RabbitMQ.

Robotics Software Intern Nov 2020 – Apr 2021
- Utilized Jetson TX1/TX2/Xavier Platforms for System Integration and Development, setup & flashing, encryption, etc. on Ubuntu Distributions
- Worked on ROS1 and Isaac Platforms (C++) for navigation systems development and customizations to create the new generation of security robot
- Diagnosed issues in comprehensive systems, covering electrical power, data networks, mechanical components, and full-stack software.

zSpace Inc., California *Aug 2019 - Nov 2021*

Jr. Computer Vision Engineer at (Part -Time) Jun 2020 – Nov 2021
- Deployed a high-fidelity deep learning model in C for hand pose estimation, capturing 21-3D points on a human hand using three fisheye cameras.
- Prototyped hand pose estimation in Python 3, leading to a multi-threaded and multi-process C/C++ production implementation.

Jr. Computer Vision Engineer at zSpace Inc., California (Full-Time) Aug 2019 – May 2020
- Engineered a 6-DoF robotic arm in C++ as a manufacturing solution to detect camera lens aberrations
- Enhanced the 3D AR/VR laptop tracking software for an improved, intuitive teaching experience with 3D object interaction.
- Executed simultaneous calibration for a tri-camera system, focusing on both intrinsic and extrinsic (pairwise & absolute) parameters.
- Conducted uncertainty analysis on calibration parameters, achieving an ultra-high accuracy with a 0.097 RMS reprojection error in C.

Duro UAS, New York City *Sep 2017 – May 2018*

R&D Robotics Engineer (Part-time) - An AUV Startup - (Part Time Internship)
- Developed mechatronics using Nvidia Jetson Tx2 and Raspberry Pi for AUV's actuators (thrusters) and sensors, leveraging serial communication in Python.
- Implemented untethered dead reckoning localization using IMU-Razor and U-Blox GPS, utilizing Extended Kalman filter in C++11.
- Developed primary and secondary localization algorithms in C++11 as ROS nodes for submarine pose correction and autonomous navigation.

Swarm Robotix, an Autonomous Container Jack Startup, Illinois *May 2018 – Aug 2018*

Perception Engineer (Full-Time Internship)

- Led a team of 12 using Agile methodology to ensure timely delivery of the ROS1 controls and navigation software package.
- Implemented EKF-SLAM on Jetson Tx2 using sensors including Razor IMU, wheel encoders, Intel Real Sense camera, and 2D LDS-01 Lidar.
- Formulated and implemented a 3rd order force-based controller for swarm formation, ensuring synchronized motion among robots.
- Developed dynamic local and global path planning algorithms, along with the kinematics for a Swerve Drive robot and its lift mechanism.

New York University under Professor. Borowick - Senior Design Course *Sep 2017 - May 2019*

Graduate Assistant at NYU, (Part -Time)

- Consulted, guided, and supported students in executing their senior design projects.
- Assisted students in developing diverse systems, including drones, submarines, racing cars, robotic hands, among others.
- Served as a Graduate Assistant for two years, advising two cohorts of students on their senior design projects with a focus on mechatronics.

REES52, Robotics start-up - Delhi, India *Jun 2016 – Jun 2017*

Chief Research Officer, (Full-Time)

- Oversaw and mentored the technical team in creating tailored automation solutions for clients.
- Designed and launched educational robotics kits using Arduino and Raspberry Pi 3+, with over 1,500 kits sold nationwide.
- Led workshops on foundational and advanced robotics, while authoring technical documentation for robotics products and manuals.

ROBOTICS PROJECTS

Smart Garbage Segregator using Computer Vision

- Developed a smart conveyor belt system for automated waste sorting into categorized bins in C.
- Differentiated objects such as cans, cups, fruits, and plastics into distinct classes using Google classifier.

Autonomous Car for Detection of Gas Leakage

- Developed a robot with autonomous navigation capabilities, featuring a 2DoF robotic arm equipped with a gas leakage detection module in C.
- Led the Autonomous Gas Detection team in the E-Yantra National Robotics Competition, securing 5th place among 3,500 teams nationwide.

Hybrid Security Quadcopter with differential drive system for navigating Multi-terrain

- Implemented features like auto take-off, landing, GPS return-to-home, geo-fencing, 3D waypoints planning, and designed failsafe mechanisms.
- Awarded "Best Project" by the Electrical Department at BVP College of Engineering in April 2016.

7 DoF - Soft Robotic Hand on a mobile platform controlled by android application

- Developed a 2D robotic arm equipped with five asymmetric flexible pneumatic actuators for precise gripping of delicate items.
- Integrated electrical solenoid and relay control systems to modulate compressed air, allowing for adaptive gripping with either 5 or 3 fingers in Python.

3D Printing of Concrete using UR10e 6-DOF Robotic Hand

- Implemented an air-pressure driven auger mechanism for concrete printing in C++.
- Engineered trajectory planning utilizing the ROS MoveIt package.

IoT – Gesture Controlled Home Automation System

- Designed a plug-and-play home automation system that attaches to switchboards without rewiring in C.
- Technologies employed included Xbee, IMU, accelerometer, relay, and home electrical systems.

Heartime – An Emergency Medicine Dispensing Ring

- Utilized technologies such as I2C-interfaced pulse oximeter, resin-based 3D printing, Bluetooth, and the Beetle Board in Quick C.
- (smallest Atmega328 SoC).

RESEARCH PUBLICATIONS

Design and Development of Innovative Self-Driving Car for Cadman Plaza Park
Authored Publication: Advances in Intelligent Systems and Computing of Springer, The 5th International Conference on Robot Intelligence Technology and Applications December 13 – 15, 2017, Daejeon, KOREA

Intelligent Smart Glass for Visually Impaired using Deep Learning Machine Vision Techniques
Authored Publication: Advances in Intelligent System and Computing (AISC) of Springer The 5th International Conference on Robot Intelligence Technology and Applications December 13 – 15, 2017, Daejeon, KOREA

Intelligent Multi-Fingered Dexterous Hand Using Virtual Reality (VR) and Robot Operating System (ROS)
Authored Publication: Advances in Intelligent System and Computing (AISC) of Springer The 5th International Conference on Robot Intelligence Technology and Applications December 13 – 15, 2017, Daejeon, KOREA

Isolated Bio-Regenerative System for Vertical Farming through Robots in Space Explorations
Authored Publication: Advances in Intelligent Systems and Computing of Springer, The 5th International Conference on Robot Intelligence Technology and Applications December 13 – 15, 2017, Daejeon, KOREA

Exploration- Probe to Jupiter Moon Europa
Authored Publication: Mars Papers, The 20th Annual International Mars Society Convention held at University of California, Irvine, September 2017

Design and Development of Innovative Pet Feeding Robot
Authored Publication: Advances in Intelligent Systems and Computing of Springer, The 5th International Conference on Robot Intelligence Technology and Applications December 13 – 15, 2017, Daejeon, KOREA

Innovative Human Mars Mission with Vertical Farming
Authored Publication: Mars Papers, The 20th Annual International Mars Society Convention held at University of California, Irvine, September 2017