

ABHINANDAN VELLANKI

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EXPERIENCE

Apple | Camera Modules Intern | Cupertino, CA May 2025 - Aug. 2025

- **Multimodal Scene Perception:** Owned the entire pipeline for on-device ambient light estimation on iPhones and delivered a robust solution that fuses the front camera image and metadata to supplement the hardware sensor with 85% accuracy and within 4ms runtime across several edge cases and environment variations.
- **Automated Quality Assurance:** Delivered a model that predicts sharpness as spatial frequency response across the image FOV and focus positions, enabling 25x faster camera module validation and defect identification.

Center for Garment Production | Robotics Engineer | Hong Kong S.A.R. Feb. 2024 - Jul. 2024

- **Vision Subsystem:** Owned the entire pipeline from selecting camera hardware and creating custom datasets to training a UNet model in PyTorch for segmenting garment pieces with 99% IOU accuracy and registering grasp points marked in CAD models onto targets within 2mm error using ICP with a combined runtime of 0.5s.
- **Dual Manipulator Integration:** Performed hand-eye calibration and collaborated with mechanical engineers to pass target end-effector poses to manipulation API, achieving 95% grasp success rate across configurations.

ePropulsion | Robotics Software Engineer | Hong Kong S.A.R. Jul. 2022 - Aug. 2023

- **Autonomy Stack :** Led the implementation of EKF to combine IMU and RTK GPS data for state estimation under 1m error and of PID control for L1 ADAS features in C++ with ROS2 with validation in Gazebo simulation.
- **Field Testing:** Deployed on 4GB ARMv8 processors in electric outboard engines, achieving 10Hz, and tuned performance in open waters, prioritizing safety and generalizability across vessels and weather conditions.

Avalon SteriTech | Robotics Software Engineer | Hong Kong S.A.R. Aug. 2021 - Jul. 2022

- **Autonomy Stack:** Integrated third-party LiDAR SLAM packages into the C++ ROS software stack of a 4WD AMR, enabling indoor mapping, localization and navigation inside aircraft, subway cars and subway stations.
- **Collaboration and Integration:** Owned the software stack and worked alongside mechanical and electrical engineers to enable disinfectant spraying, human interaction and construction site patrolling.
- **Managing Deployments:** Achieved reliable operation across two client sites for disinfection and worker safety.

EDUCATION

Carnegie Mellon University (CMU) Pittsburgh, PA
Master of Science in Robotic Systems Development Expected May 2026

- **Coursework:** Deep Reinforcement Learning, Multimodal Machine Learning, Optimal Control, Advanced Computer Vision, Robot Autonomy, Robot Mobility, Systems Engineering.

University of Hong Kong (HKU) Hong Kong S.A.R.
Bachelor of Engineering in Computer Engineering Jun. 2021

PROJECTS

Automated Long-Horizon Food Manipulation | Dr. O. Kroemer | CMU Jan. 2025 - Present

- Owned vision subsystem for ingredient segmentation and frame transformation with ROS2 integration.
- Used Franka API for manipulator control, enabling food pick and place under 2cm error with 90% success rate.
- Presently training diffusion policies for ingredient manipulation, parallelising subsystem processes to improve assembly speed and implementing collision-aware RRT local planning and minimum-jerk trajectories.

Autonomous Driving With F1-Tenth Cars | Dr. J. Dolan and Dr. Z. Manchester | CMU Feb. 2025 - Present

- Modeled nonlinear racecar dynamics and integrated Pacejka tire equations for model predictive control, achieving 0.3m cross-track error and smooth execution of trajectories on multiple F1 tracks in Carla simulation.
- Presently validating on hardware to analyse and reduce sim2real gap and maintain performance.

Training a Robot Using Federated Learning | Dr. K. Huang, HKU Jan. - Jun. 2021

- Connected a Seq2Seq conversational model to NAO6 robot peripherals for real-time human-robot interaction.
- Collected and analyzed conversation data using a BERT model to estimate sentiment of human responses.
- Implemented federated learning across three nodes to train the chatbot, enabling decentralized updates for privacy preservation and achieving 86% increase in sentiment of human responses.

SKILLS

Software: Python, C++, Java, Git, ROS/ROS2, Docker, OpenCV, Open3D, PyTorch, MATLAB

Domains: Robotics, Autonomy, Computer Vision, Deep Learning, Reinforcement Learning, Systems Engineering

Hardware: Camera Systems, CAD, Arduino, RaspberryPi, Jetson Orin, PixHawk, Serial Interfaces, Prototyping