Arnav Dhamija

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Education

- **University of Pennsylvania SEAS** — **Philadelphia, PA**
  MSE Robotics, GPA: 4.00/4 — *May 2021*
  Courses: Introduction to Robotics, Machine Learning, Computer Vision & Computational Photography, F1/10 Autonomous Racing, Learning in Robotics, Machine Perception
- **BITS Pilani, Hyderabad Campus** — **Hyderabad, India**
  BE (Hons) Computer Science Engineering, CGPA: 8.628/10 — *May 2019*
  Courses: Digital Image Processing, Computer Graphics, Machine Learning, Data Mining, Database Systems, Data Structures & Algorithms, Operating Systems, Computer Networks, Compilers, Discrete Structures, Logic in CS, Theory of Computation, Computer Architecture

Internships

mLAB: Real-Time and Embedded Systems Lab — **University of Pennsylvania**
Curriculum Learning for Drone Collision Avoidance — *May 2020 – Present*

- Created a **curriculum learning** approach for resolving colliding trajectories for a pair of drones using RLlib.
- Worked on making simulations for testing collision avoidance in a multi-drone environment using the AirSim simulator and Unreal Engine 4.

Acoustic Research Laboratory — **National University of Singapore**
DtnLink - Disruption Tolerant Protocol for Underwater Networks — *January 2019 – May 2019*

- Developed a **disruption tolerant** protocol for underwater networks using UnetStack, supervised by Prof. Mandar Chitre.
- Demonstrated that DtnLink can improve message delivery ratio by 4x in simulations.
- Created an automated test suite and several example simulations. Extensively documented results in my undergrad thesis.

Google Summer of Code: ArduPilot — **Remote**
APStreamline - Adaptive Video Streaming for ArduPilot Robots — *May 2018 – August 2018*

- Developed APStreamline, a **network adaptive** live-streaming solution for ArduPilot robots with companion computers.
- Optimized streaming performance using C++ and GStreamer libraries for **GPU** encoding on the Raspberry Pi.
- Added support for multiple cameras, video recording, and automatic quality adjustment based on packet loss.

Google Summer of Code: KDE — **Remote**
kio-stash - Virtual Folders in KIO — *May 2016 – August 2016*

- Successfully implemented a novel idea for Virtual Folder support using the **KDE Input/Output** subsystem.
- Learned automated unit testing, version control, and achieved profiency with C++11 and Qt.
- Shipped and packaged kio-stash for release in KDE's software repositories.

Projects

1:10 Scale Autonomous Racing — **Philadelphia, PA**
ESE 615 - F1/10 Autonomous Racing — *January 2020 – May 2020*

- Developed a **Model Predictive Control** based racing algorithm for a 1:10 scale car with a planar LIDAR and an NVidia Jetson TX2.
- Attempted different approaches using **RRT*** with trajectory smoothing and **Gaussian Processes** for opponent prediction using **ROS**.
- Finished 1st in class out of five teams in the virtual final race. Documented our results in the final project report.

RGB-D Tracking — **Philadelphia, PA**
ESE 650 - Learning in Robotics — *March 2020 – May 2020*

- Created a novel algorithm to track arbitrary objects using an RGB-D camera using a **particle filter** from 2D bounding box detections.
- Demonstrated the detector is able to estimate position and velocity with occluded objects on the Princeton RGB-D tracking benchmark.

Vectors — **Hyderabad, India**
Video Communication Through Opportunistic Relays and Scalable Video Coding — *January 2018 – October 2018*

- Implemented the Spray-N-Wait protocol to opportunistically transfer Scalable Video Coding encoded video in an Android app.
- Demonstrated that SVC video has 2x lower packet loss and 3x the delivery ratio of H.265 video using ad-hoc networks.
- Co-authored and published a paper in the **SoftwareX journal**, under Dr. Abhishek Thakur.

Publications

- A. Thakur, A. Dhamija and Tejeshwar Reddy G. VECTORS — VidEo Communication Through Opportunistic Relays and Scalable video coding. SoftwareX (2019), https://doi.org/10.1016/j.softx.2018.12.006.

Software Skills

- **Programming Languages:** C++, C, Java, Python, Groovy, MATLAB, Node.JS, Bash, SQL
- **Libraries:** Ray/RLlib, PyTorch, NumPy, Qt, OpenGL, GStreamer, ROS, Eigen, AirSim, Pandas, Jupyter
- **Miscellaneous:** Git, LaTeX Wireshark, CMake, Linux

Conference Presentations

- **Akademy Conference 2017** — **Almería, Spain**
  Presentation: An Introduction to the KIO Library — *July 2017*
- **QtCon Conference 2016** — **Berlin, Germany**
  Presentation: KIO-Stash - An Introduction and Use Cases — *September 2016*