

# 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
  - Developed a **curriculum learning** approach for resolving colliding trajectories for a pair of drones using [RLlib](#).
  - Created simulations for testing 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 proficiency 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.
  - Finished 2<sup>nd</sup> 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
- **Miscellaneous:** Git,  $\LaTeX$  Wireshark, CMake

## 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