# Matthew Sivaprakasam

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## Education

### M.S. | Robotics
Carnegie Mellon University
- Expected graduation: July 2024
- Overall GPA: 3.9

### B.S. | Computer Engineering
University of Pittsburgh
- April 2022
- Overall GPA: 3.76
- In-major GPA: 3.9
- Concentration: Autonomous Systems
- Minor: Biomedical Engineering

## Skills

### Programming Languages
Python • Matlab • C++
• Julia • MIPS Assembly

### Development/Frameworks
PyTorch
OpenCV
Open3D
ROS/ROS2
Tensorflow
Arduino
User-centered Design
Agile/Scrum
DaVinci Resolve

## Coursework

### CMU
Robot Learning
SLAM
Artificial Intelligence
Kinematics, Dynamics, Control
Computer Vision
Robotics Math Fundamentals
Optimal Control

### Pitt
Computer Vision
Deep Learning & Machine Learning
Cyber-Physical Systems
Learning/Control of Movement
Signals and Systems Analysis
Linear Control Systems
Quant. Systems Neuroscience

## Experience

### AirLab, Carnegie Mellon University | Master's Student
Pittsburgh, PA | June 2020 - Present
- PI: Dr. Sebastian Scherer
- Researching multi-modal self-supervised learning and online adaptation in the context of perception and planning algorithms for autonomous off-road navigation to make them robust to unknown environments
- Student lead for Scalable, Adaptive, and Resilient Autonomy (SARA) project

### MIT-PITT-RW | Perception Engineer
Pittsburgh, PA | June 2020 - Present
- Developing software for an autonomous racecar that competes in challenges internationally at speeds over 150mph
- Improving lidar and camera perception training and inference pipelines with automatic labelling methods
- Leveraging point cloud analysis techniques for tasks such as bank-angle mapping and raceline detection

### KEF Robotics | Autonomy Development Intern
Pittsburgh, PA | May 2022 - August 2022
- Developed simulation testing infrastructure and integrated interfacing with an efficient map fusion algorithm into the core autonomy stack
- Designed a reactive pilot-assist algorithm that avoids obstacles that the pilot might collide with

### M*Modal | Software Engineering Co-op
Pittsburgh, PA | May 2019 - December 2020
- Applied state-of-the-art NLP techniques towards enhancing clinical software
- Pre-trained a language model using an efficient transformer, and fine-tuned to predict diagnosis codes from large sets of clinical documents
- Developed a QA tool that generates text by incorporating various medical terms/concepts and checks that our service understands them in the right context

### Human Engineering Research Laboratories | Research Intern
Pittsburgh, PA | June 2018 - August 2020
- Processed and analyzed IMU data taken from wheelchair users to find new metrics for evaluating user performance

## Projects

### Person-tracking for Tello Drone
- Perception and high-level control system for drone to detect,track, and follow a person with onboard camera (demo visible at matthewjsiv.github.io)
- Designed subject-visibility metrics based on keypoints on your body predicted using Google's Posenet
- Metrics are used in hand-designed error function, which is fed into PID controller to calculate motion commands along each axis

## Publications/Presentations

**TartanDrive 2.0: More Modalities and Better Infrastructure to Further Self-Supervised Learning Research in Off-Road Driving Tasks**

- **Matthew Sivaprakasam**, Parv Maheshwari, Mateo Guaman Castro, Samuel Triest, Micah Nye, Steve Willits, Wenshan Wang, Sebastian Scherer. *International Conference on Robotics and Automation, 2024*

**Fast and Modular Autonomy Software for Autonomous Racing Vehicles**

- Andrew Saba, Aderotimi Adetunji, Adam Johnson, Aadi Kothari, **Matthew Sivaprakasam**, Joshua Spisak, ... Sebastian Scherer, Deva Ramanan. *Journal of Field Robotics Volume 4, 2024*

**TartanDrive 1.5: Improving Large Multmodal Robotics Dataset Collection and Distribution**

- **Matthew Sivaprakasam**, Samuel Triest, Mateo Guaman Castro, Micah Nye, Mukhtar Maulimov, Cherie Ho, Parv Maheshwari, Wenshan Wang, Sebastian Scherer. *International Conference on Robotics and Automation 2023, Workshop on Pretraining for Robotics*

**Learning Risk-Aware Costmaps via Inverse Reinforcement Learning for Off-Road Navigation**

- Samuel Triest, Mateo Guaman Castro, Parv Maheshwari, **Matthew Sivaprakasam**, Wenshan Wang, Sebastian Scherer. *International Conference on Robotics and Automation, 2023*

**TartanDrive: A Large-Scale Dataset for Learning Off-Road Dynamics Models**

- Samuel Triest, **Matthew Sivaprakasam**, Sean Wang, Wenshan Wang, Aaron Johnson, Sebastian Scherer. *International Conference on Robotics and Automation, 2022*

**Improving Off-road Planning Techniques with Learned Costs from Physical Interactions**

- **Matthew Sivaprakasam**, Samuel Triest, Wenshan Wang, Peng Yin, Sebastian Scherer. *International Conference on Robotics and Automation, 2021*

**Quantifying Electric Powered Wheelchair Users' Driving Skills Using An Inertial Measurement Unit**

- **Matthew Sivaprakasam**, Deepan Kamaraj, Jorge Candiotti, Sandra Guzman, Brad Dicianno, Rory Cooper. *Biomedical Engineering Society Annual Conference Oct. 2019*