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Vincent Pacelli

Doctoral Candidate

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Scholar Profile

I am a doctoral candidate advised by Anirudha Majumdar in the Intelligent Robot Motion (IRoM) Lab at Princeton University. Broadly, my research is focused on the role of task-relevant information in intelligent decision making for robots and other autonomous systems — e.g., how much task-relevant information is necessary for a robot to do its job well and trade-offs between performant and robust decision making under uncertainty about task-relevant variables. To answer these questions, I combine theoretical tools and algorithms from control theory, information theory, and statistical mechanics.

Education

PhD in Mechanical Engineering, *Princeton University* — Fall 2017 — Spring 2023
MSE in Robotics, *University of Pennsylvania* — Fall 2016 — Summer 2017
BSE in Electrical Engineering, *University of Pennsylvania* — Fall 2012 — Spring 2016

Employment

Assistant Instructor: Introduction to Robotics (MAE345 / MAE549) — **2019 — 2020**
Princeton University

- Helped redesign the course curriculum from scratch.
- Created roughly ten programming assignments (C and Python) introducing students to fundamental robotics algorithms.
- Designed and prototyped the course hardware project in which students create a camera-based obstacle avoidance system implemented on a quadrotor platform.
- Gave course lectures when main instructor was traveling.
- Received the **Crocco Award for Teaching Excellence** for my performance as an instructor.

Engineering Intern — **Summer 2016**
Exyn Robotics — *Philadelphia, PA*

- Created efficient implementations of SLAM algorithms (in C++) for mapping spaces via an autonomous quadcopter equipped with depth cameras.
- Integrated said algorithms into existing software infrastructure and designed physical experiments to validate the correctness of said algorithms.

Research Intern, Safety-Critical Avionics — **Summer 2015**
NASA Langley Research Center — *Langley, VA*

- Assisted in modifying quadcopter autopilot firmware (C++) for experiments conducted by branch members.
- Created efficient software module (C++) for efficient state estimation and robust mission planning for unmanned aerial vehicles.

Skills

Programming Languages / Tools — Python, C, C++, SQL, Git, LaTeX, Python scientific libraries (e.g., NumPy, PyTorch, JAX)
Analytical Modeling — Mathematical Optimization, Control Theory, Statistics / Machine Learning, Information Theory

Selected Publications

Fundamental Performance Limits for Sensor-Based Robot Control and Policy Learning 2022
A. Majumdar and V. Pacelli. In the *Proceedings of Robotics: Systems and Science*.

Robust Control Under Uncertainty via Bounded Rationality and Differential Privacy 2022
V. Pacelli and A. Majumdar. In the *Proceedings of the IEEE Intl. Conf. on Robotics and Automation*.

Invariant Policy Optimization: Towards Stronger Generalization in Reinforcement Learning 2021
A. Sonar, V. Pacelli, and A. Majumdar. In the *Proceedings of Learning for Dynamics and Control Conf*.

Learning Task-Driven Control Policies via Information Bottlenecks 2020
V. Pacelli, and A. Majumdar. In the *Proceedings of Robotics: Systems and Science*.

Task-Driven Estimation and Control via Information Bottlenecks 2019
V. Pacelli and A. Majumdar. In the *Proceedings of the IEEE Intl. Conf. on Robotics and Automation*.

Integration of Local Geometry and Metric Information in Sampling-Based Motion Planning 2018
V. Pacelli, O. Arslan, and D. E. Koditschek. In the *Proceedings of the IEEE Intl. Conf. on Robotics and Automation*.

Sensory Steering for Sampling-Based Motion Planning 2017
O. Arslan, V. Pacelli, and D. E. Koditschek. In the *Proceedings of the IEEE Intl. Conf. on Intelligent Robots and Systems*.