VINCENT PACELLI

DOCTORAL CANDIDATE

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EDUCATION

Princeton University, Princeton, NJ — 2017 — Now
Doctoral Candidate, Mechanical and Aerospace Engineering
Advisor: Anirudha Majumdar
Expecting to Graduate in May, 2023

University of Pennsylvania, Philadelphia, PA — 2016 — 2017
Master's of Science in Engineering, Robotics
Advisor: Daniel E. Koditschek

University of Pennsylvania, Philadelphia, PA — 2012 — 2016
Bachelor's of Science in Engineering, Electrical Engineering, *Cum Laude*

RELEVANT EXPERIENCE

PRINCETON UNIVERSITY — ASST. IN RESEARCH

Princeton, NJ — September 2017 — Now

The focus of my research, conducted as part of Princeton's Intelligent Robot Motion (IRoM) Lab under **Anirudha Majumdar**, is on understanding the role that **task-relevant information** plays in designing performant robots and other decision-making systems. Two particular topics I studied are the benefits of only depending on a necessary amounts of information to achieve performance — leading to **robustness to measurement error** — and characterizing the **fundamental performance limits** of a robot equipped with a specific sensor. These projects involved developing new theory and algorithms that combine methodologies from many fields including, **control theory, information theory, machine learning, and statistical mechanics**.

PRINCETON UNIVERSITY — ASST. IN INSTRUCTION

Princeton, NJ — September 2019 — January 2021

I aided in redesigning the curriculum for Princeton's Introduction to Robotics course (MAE 345 / 545). In addition to giving feedback on the course content, I designed most of the programming assignments (C and Python) which introduce students to various algorithms central to the field of robotics — including a final project in which students create a camera-based obstacle avoidance system implemented on a quadrotor hardware platform. I also filled in as lecturer when the instructor needed. I received the **Crocco Award for Teaching Excellence** for my work on the course.

PRINCETON UNIVERSITY — STUDENT INSTRUCTOR, AI4ALL

Princeton, NJ — Summer 2018

I worked as a student instructor in Princeton's AI4ALL program, which introduces high school students in underrepresented demographics to artificial intelligence and machine learning through hands-on projects. My responsibilities involved giving introductory lectures on machine learning algorithms as well as designing and advising projects for students interested in cybersecurity applications.

EXYN TECHNOLOGIES — ENGINEERING INTERN

Philadelphia, PA — Summer 2016

As an intern, I worked on efficient implementations of SLAM algorithms for mapping spaces via an autonomous quadcopter equipped with depth-sensitive cameras. I integrated said algorithms into the project's existing software infrastructure and I designed physical experiments to validate the correctness of said algorithms.

NASA LANGLEY RESEARCH CENTER — RESEARCH INTERN

Hampton, VA — Summer 2015

I assisted in modifying quadcopter autopilot firmware for experiments conducted by branch members. I also created software module for efficient state estimation and fault-tolerant mission planning for unmanned aerial vehicles.

AWARDS

- **Crocco Award for Teaching Excellence** — 2020
  Prize awarded by the faculty of the Department of Mechanical and Aerospace Engineering in recognition of outstanding performance as an Assistant in Instruction.
- **IEEE RAS Travel Grant (ICRA 2018)** — 2018
  To aid in funding expenses incurred while traveling to present at the conference.
- **Hon. Harold Berger Award** — 2016
  Given to the senior design team in the Department of Electrical and Systems Engineering whose outstanding project combines conceptual or technical innovation with entrepreneurial possibility.

PUBLICATIONS

Extension of "Robust Control Under Uncertainty via Bounded Rationality and Differential Privacy"
V. Pacelli and A. Majumdar. In preperation for submission to the Intl. J. of Robotics Research (Fall 2022).

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.*

Systems of Stacking Interlocking Blocks 2022
R. Mangharam, M. E. O'Kelly, *V. Pacelli*, M. A. Brady. *US Patent 11,213,747.*

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.*

Joint Exploration of Local Metrics and Geometry in Sampling-based Planning 2017
V. Pacelli. *MSE Thesis.*

TALKS AND PRESENTATIONS

- Robotics: Systems and Science 2022
- IEEE Intl. Conf. on Robotics and Automation 2022
- Learning for Dynamics and Control Conf. 2021
- APS March Meeting, Robophysics Track 2021
- Robotics: Systems and Science 2020
- IEEE Intl. Conf. on Robotics and Automation 2019
- Federal Aviation Association Joint University Program Quarterly Meeting 2019
- Northeast Robotics Colloquium 2019
- IEEE Intl. Conf. on Robotics and Automation 2018

STUDENT MENTORING

- Anoopkumar Sonar 2021
- Colby Chang 2021
- Divi Pachisia 2018
- Gargi Sadalgekar 2018

PEER REVIEWER

- Autonomous Robots 2022 — Now
- IEEE Conference on Decision and Control 2021 — Now
- Robotics: Systems and Science 2021 — Now
- Learning for Dynamics and Control 2021 — Now
- Workshop on the Algorithmic Foundations of Robotics 2021 — Now
- International Journal of Robotics Research 2019 — Now

REFERENCES

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