# 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**.

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### 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.

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### 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** — September 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)** — March 2018
  To aid in funding expenses incurred while traveling to present at the conference.
- **Hon. Harold Berger Award** — May 2016
  Given to the senior design team in the Department of Electrical and Systems Engineering whose outstanding senior design project combines conceptual or technical innovation with entrepreneurial possibility.

## 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.*

**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 Conference 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

## PEER REVIEWER

- Autonomous Robots 2022 — Now
- IEEE Control Systems Society Conference 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