

# VINCENT PACELLI

## DOCTORAL CANDIDATE

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## EDUCATION

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**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

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### PRINCETON UNIVERSITY

📍 Princeton, NJ

### ASST. IN RESEARCH

📅 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

📍 Princeton, NJ

### ASST. IN INSTRUCTION

📅 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

📍 Princeton, NJ

### STUDENT INSTRUCTOR, AI4ALL

📅 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.

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.

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**NASA LANGLEY RESEARCH CENTER** Hampton, VA**RESEARCH INTERN** 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.

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**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.

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**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

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- 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

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

## PEER REVIEWER

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- 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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**Anirudha Majumdar**  
Assistant Professor  
Princeton University  
MAE Department  
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**Jaime Fernández Fisac**  
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**Matthew D. Kvalheim**  
Assistant Professor  
University of Michigan  
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**Naomi E. Leonard**  
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