VINCENT PACELLI

DOCTORAL CANDIDATE

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Google Scholar

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 <u>Intelligent Robot Motion (IRoM) Lab</u> 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

I aided in redesigning the curriculum for Princeton's <u>Introduction to Robotics</u> 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 <u>Princeton's AI4ALL program</u>, 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

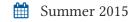
As an intern, I worked on efficient implementations of SLAM algorithms for mapping spaces via an autonomous quadcopter equipped with depth-sensitive cameras. I integrated said algorithms into the project's existing software infrastructure and I designed physical experiments to validate the correctness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

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NASA LANGLEY RESEARCH CENTER

RESEARCH INTERN

• Hampton, VA



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



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)



To aid in funding expenses incurred while traveling to present at the conference.

Hon. Harold Berger Award



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 preparation 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

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

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 V. Pacelli. *MSE Thesis.*

2017

TALKS AND PRESENTATIONS

•	Robotics:	Systems	and	Science	
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Robotics: Systems and Science

Northeast Robotics Colloquium

2022

• IEEE Intl. Conf. on Robotics and Automation

2022

• Learning for Dynamics and Control Conf.

2021

• APS March Meeting, Robophysics Track

2021

• IEEE Intl. Conf. on Robotics and Automation

2020 2019

2019

Federal Aviation Association Joint University Program Quarterly Meeting

2019

• IEEE Intl. Conf. on Robotics and Automation

2018

STUDENT MENTORING

Anoopkumar Sonar

2021

• Divi Pachisia

2018

Colby Chang

2021

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

• International Journal of Robotics Research

2019 — Now

REFERENCES

Anirudha Majumdar

Jaime Fernández Fisac

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Matthew D. Kvalheim

Naomi E. Leonard

Assistant Professor University of Michigan Mathematics Department kvalheim@umich.edu

Professor Princeton University MAE Department naomi@princeton.edu