Vincent Pacelli

Postdoctoral Fellow
Georgia Institute of Technology

1531 Belmont Ave SW
Atlanta, GA, 30310
(412) 736-4275
vpacelli@gatech.edu
https://pacel.li

Education

2017 – 2023 **Princeton University**, Princeton, NJ
Doctor of Philosophy, Mechanical and Aerospace Engineering
Advisor: Anirudha Majumdar

2016 – 2017 **University of Pennsylvania**, Philadelphia, PA
Master of Science in Engineering, Robotics
Advisor: Daniel E. Koditschek

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

Research Experience

SINCE 2023 **Georgia Institute of Technology**, *Atlanta, GA*,
Postdoctoral Fellow, *Autonomous Controls and Decision Systems Laboratory*
My research focused on deriving and analyzing new algorithms for solving stochastic optimal control problems in robotics, deep learning, and generative AI using *task-relevant* information. Some examples include learning highly efficient, task-specific optimization solvers from data with provable performance guarantees, and developing a new diffusion model with embedded task-specific information to improve generalization. I coauthored a successful grant application which was *awarded \$670k from the DARPA AI Quantified* program.

2017 – 2023 **Princeton University**, *Princeton, NJ*,
Research Assistant, *Intelligent Robot Motion Laboratory*
My research focused on designing and analyzing *task-driven* robotic control systems which utilize only *task-relevant information*. I created both model-based and model-free algorithms that synthesize such controllers by enforcing that controls only depend on a small set of latent task-relevant variables. I demonstrate both empirically and theoretically that task-driven controllers generalize better to new environments than traditional designs. My research also included deriving the *fundamental limit* of task-driven control — i.e., a novel theoretical upper bound on the achievable task performance that can be reached by a robot with a specific sensor.

2016 – 2017 **University of Pennsylvania**, *Philadelphia, PA*,
Research Assistant, *KodLab*
I worked on developing new sampling-based motion planning algorithms that used local geometric and dynamical information to efficiently navigate cluttered workspaces.

Awarded Research Grants

2025   **DARPA Artificial Intelligence Quantified**, *Coauthor*, Award: $670k
Privacy-Centric Generalization of Diffusion Models: A Stochastic Control and Information Theoretic Perspective
This project aims to develop fundamental theory characterizing the generalization capabilities of Schrödinger bridge models (SBMs), a kind of state-of-the-art diffusion model, and utilize this theory to develop high performance training algorithms with improved data privacy. Coauthored with Evangelos Theodorou.

Peer-Reviewed Conference Publications

[1] V. Pacelli, A. Ratheesh, and E. A. Theodorou, "Sampling-based control via entropy-regularized optimal transport," in *Proceedings of Robotics: System and Science*, 2026, Submitted; Under Review.

[2] J. Sul, P. Theodoropoulos, V. Pacelli, J. Choi, and T. Evangelos, "Distributionally robust schrödinger bridge," in *Proceedings of the International Conference on Machine Learning*, 2026, Submitted; Under Review.

[3] A. Ratheesh, V. Pacelli, A. D. Saravanos, and E. A. Theodorou, "Operator splitting covariance steering for safe stochastic nonlinear control," in *Proceedings of the Conference on Decision and Control*, IEEE, 2025.

[4] A. Ratheesh, V. Pacelli, and E. A. Theodorou, "Metrosky: High-fidelity photorealistic simulator for urban air mobility vehicles," in *SCITECH Forum*, AIAA, 2025.

[5] A. D. Saravanos, H. Kuperman, A. Oshin, A. T. Abdul, V. Pacelli, and E. Theodorou, "Deep distributed optimization for large-scale quadratic programming," in *Proceedings of the International Conference on Learning Representations*, 2025.

[6] P. Theodoropoulos, N. Komianos, V. Pacelli, G.-H. Liu, and E. A. Theodorou, "Feedback schrödinger bridge matching," in *Proceedings of the International Conference on Learning Representations*, 2025.

[7] A. Majumdar and V. Pacelli, "Fundamental performance limits for sensor-based robot control and policy learning," in *Proceedings of Robotics: System and Science*, 2022.

[8] V. Pacelli and A. Majumdar, "Robust control under uncertainty via bounded rationality and differential privacy," in *Proceedings of the International Conference on Robotics and Automation*, IEEE, 2022, pp. 3467–3474.

[9] A. Sonar, V. Pacelli, and A. Majumdar, "Invariant policy optimization: Towards stronger generalization in reinforcement learning," in *Proceedings of the Conference on Learning for Dynamics and Control*, PMLR, 2021, pp. 21–33.

[10] V. Pacelli and A. Majumdar, "Learning Task-Driven Control Policies via Information Bottlenecks," in *Proceedings of Robotics: System and Science*, 2020.

[11] V. Pacelli and A. Majumdar, "Task-driven estimation and control via information bottlenecks," in *Proceedings of the International Conference on Robotics and Automation*, IEEE, 2019, pp. 2061–2067.

[12] V. Pacelli, O. Arslan, and D. E. Koditschek, "Integration of local geometry and metric information in sampling-based motion planning," in *Proceedings of the International Conference on Robotics and Automation*, IEEE, 2018, pp. 3061–3068.

[13] O. Arslan, V. Pacelli, and D. E. Koditschek, "Sensory steering for sampling-based motion planning," in *Proceedings of the International Conference on Intelligent Robots and Systems*, IEEE, 2017, pp. 3708–3715.

Journal Articles

[14] A. Majumdar, Z. Mei, and V. Pacelli, "Fundamental limits for sensor-based robot control," *International Journal of Robotics Research*, vol. 42, no. 12, pp. 1051–1069, 2023.

Patents

[15] R. Mangharam, M. E. O'Kelly, V. Pacelli, and M. A. Brady, "Systems of stacking interlocking blocks," U.S. Patent 11 213 747, 2022.

Dissertations

[16] V. Pacelli, "Information-theoretic necessary and sufficient conditions for the task-driven control of robots," Ph.D. dissertation, Princeton University, 2023.

[17] V. Pacelli, "Joint exploration of local metrics and geometry in sampling-based planning," M.S. thesis, University of Pennsylvania, 2017.

Talks and Presentations

2025 IEEE Conference on Decision and Control (Upcoming)

2022 Robotics: Systems and Science
      IEEE International Conference on Robotics and Automation

2021 APS March Meeting (Robo-Physics Session)

2020 Robotics: Systems and Science

2019 IEEE International Conference on Robotics and Automation
      Federal Aviation Association Joint University Program Quarterly Meeting
      Northeast Robotics Colloquium

2018 IEEE International Conference on Robotics and Automation

Awards and Honors

2020 **Crocco Award for Teaching Excellence**
      Awarded by the faculty of the Mechanical and Aerospace Engineering Department at Princeton in recognition of outstanding performance as an Assistant in Instruction.

2018 **Princeton SEAS Travel Grant**
      Awarded by the Princeton School of Engineering and Applied Science support of the presentation of my research at the International Conference on Robotics and Automation.

2018 **IEEE RAS Travel Grant**
      Awarded by the IEEE Robotics and Automation Society in support of the presentation of my research at the International Conference on Robotics and Automation.

2016 **Hon. Harold Berger Award**, *Undergraduate Award*
Awarded to the senior design team in the Department of Electrical and Systems Engineering whose outstanding project (best of approx. 10) combines conceptual or technical innovation with entrepreneurial possibility.

Teaching Experience

Since 2023 **Georgia Institute of Technology**, *Atlanta, GA*,
Instructor of Record, *AE4803 ROB: Robotic Systems and Autonomy*
This course is a special topics course for undergraduates in aerospace engineering with senior standing (20-30 students per semester). It provides a broad introduction to a diverse set of topics in robotics, including: analytical mechanics, dynamical systems, state estimation, mapping, and reinforcement learning. I continue to expand and refine the course material to better reflect modern robotics methods every year.

2019 – 2020 **Princeton University**, *Princeton, NJ*,
Teaching Assistant, *MAE345 / MAE549: Introduction to Robotics*
This course is an introductory robotics course for both undergraduate and graduate students . I helped the instructor (Anirudha Majumdar) develop the course over two semesters by providing feedback on curriculum material, designing homework assignments, and creating lab assignments using robotics hardware.

2018 **Princeton University**, *Princeton, NJ*,
Student Instructor, *AI4ALL*
I volunteered as a student instructor for Princeton's AI4ALL program — a summer program that 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.

Academic and Professional Services

Organizing Committee

2023 "Bridging the Lab-to-Real Gap: Conversations with Academia, Government, and Industry." *Workshop at the IEEE Conference on Robotics and Automation.* https://sites.google.com/view/lab2realgap

Peer Review

2025 IEEE Robotics and Automation Letters
IEEE International Conference on Intelligent Robots
IEEE Transactions on Robotics

Since 2022 Autonomous Robots (Journal)
IEEE Conference on Decision and Control

Since 2021 Robotics: Systems and Science (Conference)
Learning for Decision and Control (Conference)
Workshop on the Algorithmic Foundations of Robotics (Conference)

Since 2019 International Journal of Robotics Research

Student Mentorship
Graduate Students

2025	Arjun Krishna (UPenn)	Research Feedback and Guidance
Since 2024	Akash Ratheesh (Georgia Tech)	Published Peer-Reviewed Paper
	Benjamin Jung (Georgia Tech)	Research Credit

Undergraduate Students

2025	Ishan R. Swali (Georgia Tech)	Academic and Research Guidance
2021	Anoopkumar Sonar (Princeton)	Published First Peer-Reviewed Paper
2018	Divi Pachisia (Princeton)	Research Credit
	Gargi Sadalgekar (Princeton),	Research Credit

References

Evangelos A. Theodorou
Associate Professor
AE Department
Georgia Institute of Technology
evangelos.theodorou@gatech.edu

Anirudha Majumdar
Associate Professor
MAE Department
Princeton University
ani.majumdar@princeton.edu

Jaime Fernández Fisac
Assistant Professor
ECE Department
Princeton University
jfisac@princeton.edu

Dinesh Jayaraman
Assistant Professor
CIS Department
University of Pennsylvania
dineshj@seas.upenn.edu