

Vasileios Vasilopoulos

Personal Website: <http://www.vassilisvasilopoulos.com>

Immigration Status: US Green Card Holder

OVERVIEW

- Full-stack Robotics and AI Engineer with 15 years of experience.
- Ph.D. from the University of Pennsylvania, with strong math background and hands-on hardware experience.
- Developer of multiple publicly available software packages in Python and C++.
- Author of multiple peer-reviewed papers, presented in international conferences and journals.
- Comfortable working in a collaborative environment and communicating in written, verbal and visual formats.
- Research Areas: Reactive Motion Planning, Machine Learning, Optimization, Dynamics and Control.

EDUCATION

- 2021 **Ph.D., University of Pennsylvania**
School of Engineering and Applied Science (SEAS)
Department of Mechanical Engineering and Applied Mechanics (MEAM)
Thesis: *Reactive Planning with Legged Robots in Unknown Environments*
Advisor: Daniel E. Koditschek
Committee: G. J. Pappas, D. E. Koditschek, N. Roy, K. Daniilidis, M. Yim
- 2018 **M.S.E., University of Pennsylvania**
School of Engineering and Applied Science (SEAS)
Department of Mechanical Engineering and Applied Mechanics (MEAM)
Concentration: Mechatronic and Robotic Systems
GPA: 3.91/4.00
- 2014 **Diploma (Dipl.-Ing.), National Technical University of Athens (NTUA)**
School of Mechanical Engineering
Concentration: Mechanical Design & Control
Thesis: *Dynamics and Control of a Monopod Robot with a Single Actuator on Compliant Terrain*
Supervisor: Evangelos G. Papadopoulos
GPA: 9.38/10.00 (*Ranked 1st out of 179 graduates*)

RESEARCH AND WORK EXPERIENCE

- 2024 – today **Ghost Robotics** – Philadelphia, PA
Principal Software Engineer, Manipulation Lead
- Developing real-time perception and manipulation planning algorithms in C++ for autonomous grasping with arm-equipped legged robots.
 - Built simulation environments with articulated robots in PyBullet to facilitate the development and validation of grasp planning algorithms.

- 2022 – 2024 **Samsung Research America (AI Center - New York)** – New York, NY
Senior Researcher - Machine Learning Research
- Developed a reactive motion planning architecture for robot arms and mobile manipulators.
 - Introduced a novel algorithm for online learning of continuous 3D Signed Distance Fields (SDF).
 - Developed an OMPL-based planning framework and a C++ trajectory optimizer for a 7DOF robot arm, within a complete dishwasher loading pipeline.
- 2021 – 2022 **Computer Science & Artificial Intelligence Lab (CSAIL)**, MIT – Cambridge, MA
Postdoctoral Associate, working with Prof. Nicholas Roy
- Developed fast reactive planning algorithms for mobile robots in rugged environments.
 - Worked on semantic terrain segmentation and classification for off-road vehicles.
- 2021 **Dept. of Electrical & Systems Engineering**, University of Pennsylvania – Philadelphia, PA
Postdoctoral Researcher, working with Prof. Daniel E. Koditschek and Prof. George J. Pappas
- Introduced a hierarchical task and motion planning architecture for mobile manipulation tasks.
 - Showed how to solve rearrangement problems captured by LTL formulas in unknown spaces.
- 2017 – 2019 **Ghost Robotics** (Part-Time) – Philadelphia, PA
Scientific Advisor (2018 – 2019)
Engineering Associate, Navigation & Perception (2017 – 2018)
- Developed software for reactive obstacle avoidance using LIDAR sensors and stereo cameras.
- 2015 – 2021 **GRASP Laboratory, Kod*lab**, University of Pennsylvania – Philadelphia, PA
Graduate Research Assistant, working with Prof. Daniel E. Koditschek
- Developed a novel reactive planning algorithm with simultaneous formal guarantees of target convergence and collision avoidance in unexplored environments.
 - Showed how to execute mobile manipulation tasks with legged robots without an attached arm.
 - Integrated reactive motion planning algorithms with high-level task planning solvers and low-level limb/behavior control.
 - Incorporated deep perceptual feedback and semantic mapping algorithms in the software stack.
 - Implemented the sensor and planning software pipeline, as well as a high-fidelity simulation environment in Gazebo, using C++, Python and ROS.
- 2013 **Interlink Automations SA** – Athens, Greece
Undergraduate Intern
- Developed GUI for Put/Pick to Light Systems using Qt Creator and C++.
- 2011 – 2015 **Control Systems Laboratory**, National Technical University of Athens – Athens, Greece
Research Assistant, working with Prof. Evangelos G. Papadopoulos (2013 – 2015)
Undergraduate Research Trainee (2011 – 2013)
- Introduced novel viscoplastic models describing the foot-terrain interaction for legged robots.
 - Showed how to control hopping height and forward speed using just one actuator per leg.

PUBLICATIONS

Peer-Reviewed Journal Publications:

- [4] **V. Vasilopoulos**, G. Pavlakos, K. Schmeckpeper, K. Daniilidis, and D. E. Koditschek, “Reactive Navigation in Partially Familiar Planar Environments Using Semantic Perceptual Feedback”, *The International Journal of Robotics Research*, vol. 41, no. 1, pp. 85-126, January 2022.

- [3] P. B. Reverdy, **V. Vasilopoulos**, and D. E. Koditschek, “Motivation dynamics for autonomous composition of navigation tasks”, *IEEE Transactions on Robotics*, vol. 37, no. 4, pp. 1239-1251, August 2021.
- [2] **V. Vasilopoulos**, G. Pavlakos, S. L. Bowman, J. D. Caporale, K. Daniilidis, G. J. Pappas, and D. E. Koditschek, “Reactive Semantic Planning in Unexplored Semantic Environments Using Deep Perceptual Feedback”, *IEEE Robotics and Automation Letters*, vol. 5, no. 3, pp. 4455-4462, July 2020.
- [1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, “Monopod Hopping on Compliant Terrains”, *Robotics and Autonomous Systems*, vol. 102, pp. 13-26, April 2018.

Full-Text Peer-Reviewed Conference Publications:

- [13] **V. Vasilopoulos**, S. Garg, J. Huh, B. Lee, and V. Isler, “HIO-SDF: Hierarchical Incremental Online Signed Distance Fields”, *IEEE International Conference on Robotics and Automation (ICRA)*, Yokohama, Japan, May 2024.
- [12] **V. Vasilopoulos**, S. Garg, P. Piacenza, J. Huh, and V. Isler, “RAMP: Hierarchical Reactive Motion Planning for Manipulation Tasks Using Implicit Signed Distance Functions”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, USA, October 2023.
- [11] **V. Vasilopoulos**, S. Castro, W. Vega-Brown, D. E. Koditschek, and N. Roy, “A Hierarchical Deliberative-Reactive System Architecture for Task and Motion Planning in Partially Known Environments”, *IEEE International Conference on Robotics and Automation (ICRA)*, Philadelphia, PA, USA, May 2022, pp. 7342-7348.
- [10] M. Tzes, **V. Vasilopoulos**, Y. Kantaros, and G. J. Pappas, “Reactive Informative Planning for Mobile Manipulation Tasks under Sensing and Environmental Uncertainty”, *IEEE International Conference on Robotics and Automation (ICRA)*, Philadelphia, PA, USA, May 2022, pp. 7320-7326.
- [9] **V. Vasilopoulos***, Y. Kantaros*, G. J. Pappas, and D. E. Koditschek, “Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments”, *IEEE International Conference on Robotics and Automation (ICRA)*, Xi’an, China, May 2021, pp. 6385-6392.
- [8] T. T. Topping, **V. Vasilopoulos**, A. De, and D. E. Koditschek, “Composition of Templates for Transitional Pedipulation Behaviors”, *The International Symposium on Robotics Research (ISRR '19)*, Hanoi, Vietnam, October 2019.
- [7] **V. Vasilopoulos**, and D. E. Koditschek, “Reactive Navigation in Partially Known Non-Convex Environments”, *13th International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Mérida, Mexico, December 2018.
- [6] **V. Vasilopoulos**, T. T. Topping, W. Vega-Brown, N. Roy, and D. E. Koditschek, “Sensor-Based Reactive Execution of Symbolic Rearrangement Plans by a Legged Mobile Manipulator”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Madrid, Spain, October 2018, pp. 3298-3305.
- [5] **V. Vasilopoulos**, W. Vega-Brown, O. Arslan, N. Roy, and D. E. Koditschek, “Sensor-Based Reactive Symbolic Planning in Partially Known Environments”, *IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, May 2018, pp. 5683-5690.
- [4] **V. Vasilopoulos**, O. Arslan, A. De, and D. E. Koditschek, “Sensor-Based Legged Robot Homing Using Range-Only Target Localization”, *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, Macau, China, December 2017, pp. 2630-2637.
- [3] **V. Vasilopoulos**, K. Machairas, and E. G. Papadopoulos, “Quadruped Pronking on Compliant Terrains Using a Reaction Wheel”, *IEEE International Conference on Robotics and Automation (ICRA)*, Stockholm, Sweden, May 2016, pp. 3590-3595.
- [2] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, “Control and Energy Considerations for a Hopping Monopod on Compliant Terrains”, *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, Washington, USA, May 2015, pp. 4570-4575.
- [1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, “Compliant Terrain Legged Locomotion Using a Viscoplastic Approach”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Chicago, Illinois, USA, September 2014, pp. 4849-4854.

Abstract-Based Peer-Reviewed Conference Publications:

- [2] T. T. Topping, **V. Vasilopoulos**, A. De, and D. E. Koditschek, “Towards bipedal behavior on a quadrupedal platform using optimal control”, *SPIE 9837, Unmanned Systems Technology XVIII*, p. 98370H, Baltimore, MD, USA, April 2016.
- [1] **V. Vasilopoulos**, I. S. Paraskevas, and E. G. Papadopoulos, “Monopod Hopping on Rough Planetary Environments”, *13th Symposium on Advanced Space Technologies in Robotics and Automation (ASTRA)*, ESA, ESTEC, Noordwijk, The Netherlands, May 2015.

Peer-Reviewed Workshop Publications:

- [1] **V. Vasilopoulos**, “Reactive Mobile Manipulation with Legged Robots”, *RSS Pioneers*, July 2020.

Technical Reports:

- [5] **V. Vasilopoulos**, S. Castro, W. Vega-Brown, D. E. Koditschek, and N. Roy, “Technical Report: A Hierarchical Deliberative-Reactive System Architecture for Task and Motion Planning in Partially Known Environments”, *Technical Report*, February 2022, arXiv:2202.01385.
- [4] **V. Vasilopoulos***, Y. Kantaros*, G. J. Pappas, and D. E. Koditschek, “Technical Report: Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments”, *Technical Report*, November 2020, arXiv:2011.00642.
- [3] **V. Vasilopoulos**, G. Pavlakos, S. L. Bowman, J. D. Caporale, K. Daniilidis, G. J. Pappas, and D. E. Koditschek, “Technical Report: Reactive Semantic Planning in Unexplored Semantic Environments Using Deep Perceptual Feedback”, *Technical Report*, February 2020, arXiv:2002.12349.
- [2] **V. Vasilopoulos**, and D. E. Koditschek, “Technical Report: Reactive Navigation in Partially Known Non-Convex Environments”, *Technical Report*, July 2018, arXiv:1807.08432.
- [1] **V. Vasilopoulos**, W. Vega-Brown, O. Arslan, N. Roy, and D. E. Koditschek, “Technical Report: Sensor-Based Reactive Symbolic Planning in Partially Known Environments”, *Technical Report*, September 2017, arXiv:1709.05474.

Theses:

- [2] **V. Vasilopoulos**, “Reactive Planning with Legged Robots in Unknown Environments”, Ph.D. Dissertation, University of Pennsylvania, Philadelphia, PA, USA, 2021.
- [1] **V. Vasilopoulos**, “Dynamics and Control of a Monopod Robot with a Single Actuator on Compliant Terrain”, Diploma Thesis, NTUA, Athens, Greece, 2014 (in Greek).

PATENTS

- [1] N. Chavan-Dafle, **V. Vasilopoulos**, S. Agrawal, J. Huh, S. Garg, P. Piacenza, I. H. Kasahara, K. S. Engin, Z. He, S. Song, V. Isler, “Synergies Between Pick and Place: Task-Aware Grasp Estimation”, US Patent App. 18/367,827.

PUBLISHED SOFTWARE

- **HIO-SDF – Hierarchical Incremental Online Signed Distance Fields**
Written in Python, using PyTorch and ROS.
URL: <https://github.com/SamsungLabs/HIO-SDF>
- **RAMP – Reactive Motion Planning Using Implicit Signed Distance Functions**
Written in Python, using PyTorch and the NVIDIA Isaac Gym simulation framework.
URL: <https://github.com/SamsungLabs/RAMP>
- **semnav – Reactive Navigation with Semantic Feedback Using ROS**
Written in C++ and Python, using ROS.
URL: <https://github.com/vvasilo/semnav>
- **semnav_matlab – Simulation of Reactive Navigation In Non-Convex Planar Environments**
Written in MATLAB.
URL: https://github.com/vvasilo/semnav_matlab

- **kodlab_gazebo – Simulation of Legged Platforms Using Gazebo**
Written in C++ and Python, using ROS and Gazebo.
URL: https://github.com/KodlabPenn/kodlab_gazebo
- **doubly_reactive_matlab – Reactive Homing Algorithm Using Range-Only Target Localization**
Written in MATLAB, using the ROS-MATLAB bridge to read the sensors and generate commands.
URL: https://github.com/KodlabPenn/doubly_reactive_matlab
- **yolov3_pytorch_ros – Real-time Object Detection with ROS, based on YOLOv3 and PyTorch**
Written in Python, using PyTorch and ROS.
URL: https://github.com/vvasilo/yolov3_pytorch_ros

HONORS AND AWARDS

2020	Pioneer, Robotics: Science and Systems <i>One of 28 senior Ph.D. students and postdocs selected for the 2020 RSS Pioneers workshop.</i>
2017	Award from the Technical Chamber of Greece <i>For excellent performance during the undergraduate studies at NTUA.</i>
2015	Thomaidion Award for Scientific Publications, NTUA <i>For the paper “Monopod Hopping on Rough Planetary Environments”.</i>
2015	Awards from the National Technical University of Athens <i>For ranking 1st out of 179 students in the 2014 graduating class.</i>
2015	Student Travel Grant from IEEE <i>For participation at the International Conference on Robotics and Automation (ICRA).</i>
2014	Chrisovergi Award <i>For ranking 1st out of 179 students in the 2014 graduating class.</i>
2014	Thomaidion Award for Scientific Publications, NTUA <i>For the paper “Compliant Terrain Legged Locomotion Using a Viscoplastic Approach”.</i>
2009 – 2014	Sarantopoulos Foundation scholarship for undergraduate studies <i>For ranking 1st at the nationwide university entrance examinations.</i>
2009 – 2012	State Scholarships Foundation annual award <i>For ranking 1st at the nationwide university entrance examinations and in the 1st, 2nd and 3rd year of undergraduate studies.</i>
2011	Tiftixi Award <i>For ranking 1st in the 2nd year of undergraduate studies.</i>
2010	Nikolaos I. Kritikos scholarship <i>For exceptional performance in Mathematics.</i>
2009	Award from the National Technical University of Athens <i>For ranking 1st at the nationwide entrance examinations for the School of Mechanical Engineering.</i>
2008	Bronze Medal in the 25th Hellenic Mathematical Olympiad <i>Participation in the qualifying stage for the National Mathematical Team guided by the Hellenic Mathematical Society (HMS).</i>

TEACHING, MENTORING AND OUTREACH

2016 – 2021	GRASP Laboratory, University of Pennsylvania <i>Mentor of Undergraduate and Masters students</i> <ul style="list-style-type: none"> • Mentored 3 undergraduate (submatriculated in graduate programs) and 2 graduate students. • Supervised 2 theses and 2 independent studies.
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- 2021 **Aerospace Engineering, University of Michigan**
Guest Lecture for AERO 740 (Visual Navigation for Autonomous Aerial Vehicles)
- Title: “Reactive Planning in Unexplored Semantic Environments”
 - Instructor: Prof. Vasileios Tzoumas
- 2018 **Mechanical Engineering and Applied Mechanics, University of Pennsylvania**
Guest Lecture for MEAM 517 (Control & Optimization with Applications in Robotics)
- Title: “Towards Bipedal Standing on a Quadrupedal Robot Using Polynomial Optimization”
 - Instructor: Prof. Michael Posa
- 2017 **EdX – “Robotics: Locomotion Engineering” (MicroMasters Program: Robotics)**
Teaching Assistant
- Developed online projects on legged locomotion (SLIP/Jerboa) using MATLAB.
 - Managed forum discussion.
- 2016 – 2017 **Mechanical Engineering and Applied Mechanics, University of Pennsylvania**
Teaching Assistant for MEAM 513: Feedback Control, MEAM 348: Mechanical Engineering Design Laboratory, and MEAM 210: Statics and Strength of Materials
- Offered recitations, held office hours, graded exams, offered solutions to homework problems.
- 2016 **“Research Experience for Teachers (RET)” (NSF program) – Philadelphia, PA**
Mentor of Middle School teachers
- Guided a middle school teacher through a research project on legged locomotion for 8 weeks.
- 2016 **FIRST LEGO League - Qualifiers – Philadelphia, PA**
Project Judge
- Judged Robotics projects from middle school students.
- 2016 **USA Science & Engineering Festival – Washington, DC**
Representing GRASP Lab

INVITED TALKS

- 2021 **University of Washington, Personal Robotics Lab**
 Title: “Reactive Task and Motion Planning in Unknown Environments”
- 2021 **Cornell University, Robotics Seminar**
 Title: “Reactive Task and Motion Planning in Unknown Environments”
- 2021 **USC, Center of Cyber-Physical Systems and the Internet of Things**
 Title: “Reactive Task and Motion Planning in Unknown Environments”
- 2021 **MIT, Computer Science & Artificial Intelligence Laboratory (CSAIL)**
 Title: “Reactive Planning with Legged Robots in Unknown Environments”
- 2021 **University of Pennsylvania, ARO MURI W911NF2010080 Group Meeting:**
“Robust Concept Learning and Lifelong Adaptation Against Adversarial Attacks”
 Title: “Reactive Planning for Mobile Manipulation Tasks in Unexplored Semantic Environments”
- 2021 **Georgia Tech, IRIM Robograde Seminar Series**
 Title: “Reactive Planning with Legged Robots in Unexplored Semantic Environments”

- 2020 **BIRS-CMO workshop “Topological Complexity and Motion Planning”**
Title: “Doubly Reactive Methods of Task Planning for Robotics”
- 2019 **University of Pennsylvania, MEAM Seminar**
Title: “Reactive Mobile Manipulation with Legged Robots in Partially Known Environments”

PRESS

- 2019 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
“Composition of Templates for Transitional Pedipulation Behaviors”, ISRR 2019
URL: <https://tinyurl.com/y4f2yk3o>
- 2018 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
“Sensor-Based Reactive Execution of Symbolic Rearrangement Plans by a Legged Mobile Manipulator”, IEEE IROS 2018
URL: <https://goo.gl/r8pPfA>
- 2017 **IEEE Spectrum - Video Friday**
For the video accompanying the paper:
“Sensor-Based Legged Robot Homing Using Range-Only Target Localization”, IEEE ROBIO 2017
URL: <https://goo.gl/TnhKtS>
- 2016 **Technical.ly**
“Why 10 District teachers spent their summer doing grad-level STEM research”
URL: <https://rb.gy/rghcu2>
- 2016 **GRASP News**
“GRASP at 3rd USA Science & Engineering Festival”
URL: <https://rb.gy/c9v2dy>

SKILLS

Programming	C/C++, Python, MATLAB, Bash,
Libraries	PyTorch, CUDA, NumPy, Eigen, C++ Boost/Boost Geometry, OMPL,
Technologies	Git, Docker, ROS 1/ROS 2, Gazebo, Bullet/PyBullet, Isaac Gym,
Design Software	Solidworks - SolidCAM, Autodesk Inventor, CadSoft EAGLE,
Other Software	L ^A T _E X, MS Office, Wolfram Mathematica,
Operating Systems	Unix-based systems (macOS/Linux), MS Windows,
Languages	English (Excellent knowledge), Greek (Native)

ACADEMIC SERVICE

- **International Workshop Organizer:**
“Geometry and Topology in Robotics: Learning, Optimization, Planning, and Control”, RSS 2021, with

Noémie Jaquier, Claire Liang, Christoforos Mavrogiannis, Leonel Rozo, Hans-Peter Schröcker, Søren Hauberg, Subhrajit Bhattacharya, Florian Pokorny, Siddhartha S. Srinivasa, and Suvrit Sra.

- **Program Committee Member:**

2022 International Joint Conference on Artificial Intelligence (IJCAI)

2021 Pioneers Workshop, Robotics: Science and Systems (RSS)

2021 International Joint Conference on Artificial Intelligence (IJCAI)

- **Journal Reviewer:**

The International Journal of Robotics Research

IEEE Transactions on Robotics (T-RO)

IEEE Robotics and Automation Letters (RA-L)

IEEE Transactions on Systems, Man, and Cybernetics: Systems

Springer Autonomous Robots

Elsevier Mechatronics

Elsevier Mechanism and Machine Theory

ACM Transactions on Autonomous and Adaptive Systems (TAAS)

ASME Journal of Dynamic Systems, Measurement and Control

IFAC Automatica

The American Mathematical Monthly

- **Conference Reviewer:**

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IFRR International Symposium on Experimental Robotics (ISER)

IEEE International Symposium on Multi-Robot and Multi-Agent Systems (MRS)

AACC American Control Conference (ACC)

- **Memberships:**

IEEE

IEEE Robotics and Automation Society (RAS)