Erion Plaku

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Citizenship: USA

updated: 11/19/2024

EMPLOYMENT

◇ **National Science Foundation**, *Alexandria, VA* 12/2023–present
Program Director
- Co-Lead: National Artificial Intelligence Research Institutes
- Robust Intelligence (RI)

Directorate for Computer and Information Science and Engineering (CISE)
Division of Information and Intelligent Systems (IIS)

◇ **George Mason University**, *Fairfax, VA* 08/2020–12/2023
Associate Professor
Department of Computer Science
College of Engineering and Computing

◇ **National Science Foundation**, *Alexandria, VA* 08/2019–08/2022
Program Director (IPA)
Directorate for Computer and Information Science and Engineering (CISE)
Division of Information and Intelligent Systems (IIS)

▷ ***Programs***
- Co-Lead: Foundational Research in Robotics (FRR)
  - ∗ *NSF Director's Award for Superior Accomplishment (Group, FRR, 05/2021)*
- Co-Lead: National Robotics Initiative (NRI)
- Robust Intelligence (RI)
- National Artificial Intelligence Research Institutes

▷ ***Inter-Agency Engagements***
- Co-Chair: Intelligent Robotics and Autonomous Systems (IRAS) Interagency Working Group, Networking & Information Technology Research & Development Program (NITRD)

◇ **Catholic University of America**, *Washington, DC* 08/2016–08/2020
Associate Professor
Department of Electrical Engineering and Computer Science
School of Engineering

◇ **Catholic University of America**, *Washington, DC* 08/2010–08/2016
Assistant Professor
Department of Electrical Engineering and Computer Science
School of Engineering

◇ **Johns Hopkins University**, *Baltimore, MD* 08/2010–07/2012
Adjunct Assistant Professor
Department of Computer Science
Whiting School of Engineering

EDUCATION

◇ **Johns Hopkins University**, *Baltimore, MD* 08/2008–08/2010
Postdoctoral Fellow
Laboratory for Computational Sensing and Robotics
Whiting School of Engineering

◇ **Rice University**, *Houston, TX* 08/2002–07/2008
Ph.D. in Computer Science
George R. Brown School of Engineering

◇ **Clarkson University**, *Potsdam, NY* 08/2000–05/2002
M.S. in Computer Science

◇ **State University of New York**, *Fredonia, NY* 08/1996–05/2000
B.S. in Computer Science (majors: (1) Computer Science (2) Mathematics)

AWARDS

◇ **NSF Director's Award for Superior Accomplishments 2021**
Foundational Research in Robotics (FRR) Group
(in my role as an NSF IPA PD)

◇ **Finalist Best Application Paper**
McMahon J and **Plaku E** (2021): *"Dynamic Multi-Goal Motion Planning with Range Constraints for Autonomous Underwater Vehicles Following Surface Vehicles."* Proceedings of the IEEE International Conference on Automation Science and Engineering, pp. 704–711

◇ **Best Robotics Paper**
Le D and **Plaku E** (2017): *"Cooperative Multi-Robot Sampling-Based Motion Planning with Dynamics."* Proceedings of the International Conference on Planning and Scheduling, pp. 513–521

◇ **Best Student Paper**
Wells A and **Plaku E** (2015): *"Adaptive Sampling-Based Motion Planning for Mobile Robots with Differential Constraints."* Springer LNCS Towards Autonomous Robotic Systems, vol. 9287, pp. 283–295

◇ **Kaman Excellence in Research Award**
School of Engineering, Catholic University of America, 2015

◇ **Faculty Research Fellowship**
Office of Naval Research, Summer 2014

◇ **Burns Fellowship**
School of Engineering, Catholic University of America, 2011

RESEARCH FOCUS

The research in our group increases the ability of robots to plan and act on their own or assist in human-machine cooperative tasks. Our long-term goal is to make the supervision of robots similar to that of humans so as to increase productivity and capabilities. Our research brings together concepts from robotics, planning, control, dynamics, AI, machine learning, and logic to enable supervisors to describe tasks in high-level languages and have such frameworks plan the actions and motions for robots to safely complete their assigned tasks.

RESEARCH AREAS

- **Robot Motion Planning and Control**
  - Enhancing the autonomy of robots operating in unstructured environments through novel motion planning and control approaches that take into account the underlying robot dynamics
  - New class of motion planners that combine discrete search with sampling-based exploration
  - Capable of taking any motion objectives into account, such as reducing the distance traveled or the energy consumption
  - Applicable to any mobile robot type, e.g., ground, aerial, or marine robots
- **Combined Task and Motion Planning**
  - Going beyond the "reach-the-goal" paradigm, and enabling the user to specify complex tasks using high-level structured languages, and automatically planning the motions to enable the robot to carry out the specified task
  - Tasks can be specified using expressive formal models, such as Regular Languages (RL), Linear Temporal Logic (LTL), or Planning-Domain Definition Language (PDDL)
  - These models combine propositions through logic, making it possible to specify coverage, sequencing, partial ordering, inspection, search-and-rescue missions, and many other tasks
  - Novel treatment that unifies planning at multiple levels of discrete and continuous abstractions by coupling AI high-level reasoning with sampling-based motion planning and control
  - *Our goal is to close the gap between AI and Robotics so that complex tasks that are currently solved efficiently only in a discrete setting will be solved efficiently in a more realistic, continuous setting that takes into account obstacles and robot dynamics*
- **Logistics Operations**
  - Emergent need to enhance the capabilities of robots deployed in factories, warehouses, and other logistics operations, where robots are often required to pick up and deliver objects from multiple locations within certain time frames
  - Pioneered a framework for logistics operations that can effectively take into account complex robot dynamics, time windows for completing tasks, and capacity constraints on pickups, deliveries, and vehicle load
- **Collaborative Robotics**
  - Planning the motions and actions to enable a team of robots to perform complex tasks, such as exploration, data collection, or inspection of buildings, bridges, and other infrastructure
  - Human-robot collaborations to more quickly adapt to changing environmental and contextual conditions

- ▷ *Our goal is to make supervision of robotic systems similar to the supervision of humans in order to increase productivity and capabilities*

◇ **AI and Machine Learning**

- ▷ Use-inspired AI and Machine Learning to enhance robotics
- ▷ Supervised learning and reinforcement learning to enable robots to solve new problems more efficiently and quickly adapt to new environments
- ▷ AI search and logical reasoning to enable robots to perform high-level tasks

◇ **Application Domains**

- ▷ ***Marine Robotics***
  Enhancing the autonomy of underwater vehicles in terms of mission and motion-planning capabilities (collaborations with the U.S. Naval Research Laboratory and Phoenix International)
- ▷ ***Aerial Robotics***
  Enhancing the autonomy of unamanned aerial vehicles for persistent surveillance of risk-sensitive areas (collaboration with the U.S. Naval Research Laboratory)
- ▷ ***Medical Robotics – Robotic-Assisted Surgeries***
  Computational methods that learn from expert demonstrations in robotic-assisted surgeries (using the daVinci surgical system) so that they can be used to assist in training novice surgeons (collaboration with Johns Hopkins University)

◇ **Robotic Manipulation through Haptic Sensing, Exploration, and Planning**

- ▷ Novel approaches to enable robots equipped with haptic sensors to perform manipulation of unknown objects based on geometric and tactile appearance information

◇ **Hybrid Systems: Automatic Discovery of Safety Violations**

- ▷ Novel approach based on combination of model checking and motion planning to automatically discover safety violations in hybrid systems. Applications in conflict-resolution protocols in air-traffic control and general transportation networks

◇ **Approximate Nearest Neighbors and Nonlinear Dimensionality Reduction**

- ▷ Efficient approximations of the nearest-neighbors graph to significantly reduce the major bottleneck in nonlinear dimensionality reduction while maintaining accuracy
- ▷ Methods reliably extract from molecular simulation data the main nonlinear modes of motion while reducing the time to analyze the data from months to hours

◇ **Large-Scale High-Performance Distributed Computing**

- ▷ Distributed computation of large nearest-neighbors graphs and distributed motion-planning methods providing a platform to solve high-dimensional problems with hundreds of dimensions for articulated or multi-robot systems

◇ **Research and Educational Software**

- ▷ Developed OOPSMP as an extensive toolkit for teaching and robotics research. OOPSMP has been adopted by numerous universities worldwide

GRANTS

◇ (2019) NSF CCF1900085 (Division of Computing and Communication Foundations): *"FET: Medium: Collaborative Research: Automated Analysis and Exploration of High-dimensional and Multimodal Molecular Energy Landscapes"*

PIs: Shehu A, **Plaku E**, Wanli Q
Funding awarded to Plaku E: **$219,992.00**, overall: $799,348 (08/01/2019–07/31/2023)

◇ (2015) NSF IIS1548406 (Division of Information & Intelligent Systems): *"A Synergistic Framework for Motion and Task Planning in Mixed Continuous and Discrete Spaces"*
PI: **Plaku E**, Funding awarded: **$99,924.00** (09/01/2015–08/31/2018)

◇ (2014) NSF IIS1449505 (Division of Information & Intelligent Systems): *"Toward Supervised Autonomy for Robotic Systems"*
PI: **Plaku E**, Funding awarded: **$149,995.00** (09/01/2014–08/31/2017)

◇ (2014) NSF ACI1440581 (Division of Advanced Cyberinfrastructure): *"A plug-and-play software platform of robotics-inspired algorithms for modeling biomolecular structures and motions"*
PIs: Shehu A, **Plaku E**, Roitberg A
Funding awarded to Plaku E: **$215,476.00**, overall: $499,999 (02/01/2015–01/31/2019)

◇ (2015) U.S. Naval Research Laboratory: *"Adaptive Mission and Motion Planning to Enhance the Autonomy of Underwater Vehicles"*
PI: **Plaku E**, Funding awarded: **$55,298.00** (05/30/2015–05/29/2016)

◇ **Internal Grants**
- ▷ CUA School of Engineering Grants (PI: **Plaku E**)
  - ○ (2014): "Motion Planning for Unmanned Aerial Vehicles" $14,000
  - ○ (2012): "Robotic Manipulation with the KUKA youBot" $40,000
  - ○ (2011): "Motion Planning and Exploration with iCreate Robots" $13,000

PUBLICATIONS

	total nr. citations	**h-index**	**i10-index**
overall	2960	26	52
since 2019	1266	20	35

PUBLICATIONS 2024

96 Bui H, **Plaku E**, and Stein G (2024): *"Multi-Robot Guided Sampling-Based Motion Planning With Dynamics in Partially Mapped Environments."* IEEE Access, vol. 12, pp. 56448–56460

95 Khanal A, Bui H, **Plaku E**, and Stein G (2024): *"Learning-informed Long-Horizon Navigation under Uncertainty for Vehicles with Dynamics."* IEEE/RSJ International Conference on Intelligent Robots and Systems, in press

94 Aghzal M, **Plaku E**, and Yao Z (2024): *"Look Further Ahead: Testing the Limits of GPT-4 in Path Planning."* IEEE International Conference on Science and Engineering, pp. 1020–1027

93 Das D, Le Y, **Plaku E**, and Xiao X (2024): *"Motion Memory: Leveraging Past Experiences to Accelerate Future Motion Planning."* IEEE International Conference on Robotics and Automation, pp. 16467–16474

92 Aghzal M, **Plaku E**, and Yao Z (2024): *"Can Large Language Models be Good Path Planners? A Benchmark and Investigation on Spatial-temporal Reasoning."* International Conference on Learning Representation, Workshop on Large Language Models for Agents

PUBLICATIONS 2023

91 McMahon J and **Plaku E** (2023): *"Autonomous Data Collection with Dynamic Goals and Communication Constraints for Marine Vehicles."* IEEE Transactions on Automated Science and Engineering, vol. 20, no. 3, pp. 1607–1620

90 McMahon J, Parker R, Baldoni P, Anstee S, and **Plaku E** (2023): *"Simultaneous Survey and Inspection with Autonomous Underwater Vehicles."* IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 1–7

89 Le Y and **Plaku E** (2023): *"Leveraging Single-Goal Predictions to Improve the Efficiency of Multi-Goal Motion Planning with Dynamics."* IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 850–857

88 Khanal A, Bui H, Stein G, and **Plaku E** (2023): *"Guided Sampling-Based Motion Planning with Dynamics in Unknown Environments."* IEEE International Conference on Automation Science and Engineering, pp. 1–8

87 Plaku E, Cela A, and **Plaku E** (2023): *"Motion Planning with Safety Zones."* International Conference of Informatics in Control, Automation and Robotics, vol. 1, pp. 405–412

PUBLICATIONS 2022

86 Baldoni P, McMahon J and **Plaku E** (2022): *"Leveraging Neural Networks to Guide Path Planning: Improving Dataset Generation and Planning Efficiency."* IEEE International Conference on Automation Science and Engineering, pp. 667–674

85 Bui H, Le Y, and **Plaku E** (2022): *"Improving the Efficiency of Sampling-based Motion Planners via Runtime Predictions for Motion-Planning Problems with Dynamics."* Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 4486–4491

PUBLICATIONS 2021

84 Zhang Y, Huang H, **Plaku E** and Lap-Fai Y (2021): *"Joint Computational Design of Workspaces and Workplans."* ACM Transactions on Graphics, vol. 48, no. 6, pp. 1–16

83 Can Secim, B, Kvelashvili T, Kilic O, and **Plaku E** (2021): *"Antenna-Based Aerial Inspection of Nonflat Terrains using Microwave Remote Sensing."* IEEE International Conference on Automation Science and Engineering, pp. 934–941

82 McMahon J and **Plaku E** (2021): *"Dynamic Multi-Goal Motion Planning with Range Constraints for Autonomous Underwater Vehicles Following Surface Vehicles."* IEEE International Conference on Automation Science and Engineering, pp. 704–7011
(Finalist Best Application Paper)

81 McMahon J and **Plaku E** (2021): *"Autonomous Data Collection With Timed Communication Constraints for Unmanned Underwater Vehicles."* IEEE Robotics and Automation Letters, vol. 6, no. 2, pp. 1832–1839 (also in IEEE International Conference on Robotics and Automation)

80 Le D and **Plaku E** (2021): *"Multi-Robot Motion Planning with Unlabeled Goals for Mobile Robots with Differential Constraints."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 7950–7956

PUBLICATIONS 2020

79 Warsame Y, Edelkamp S, and **Plaku E** (2020): *"Energy-Aware Multi-Goal Motion Planning Guided by Monte Carlo Search."* IEEE International Conference on Automated Science and Engineering, pp. 335-342, doi: 10.1109/CASE48305.2020.9217008

PUBLICATIONS 2019

78 Molloy K, **Plaku E**, and Shehu A (2019): *"ROMEO: A Plug-and-play Software Platform of Robotics-inspired Algorithms for Modeling Biomolecular Structures and Motions."* arXiv 1905.08331

77 Edelkamp S, Warsame Y, and **Plaku E** (2019): *"Monte-Carlo Search for Prize-Collecting Robot Motion Planning with Time Windows, Capacities, Pickups, and Deliveries."* Springer LNCS Advances in Artificial Intelligence, vol. 11793, pp. 154–167

76 Le D and **Plaku E** (2019): *"Multi-Robot Motion Planning with Dynamics via Coordinated Sampling-Based Expansion Guided by Multi-Agent Search."* IEEE Robotics and Automation Letters, vol. 4, pp. 1868–1875

PUBLICATIONS 2018

75 Le D and **Plaku E** (2018): *"Cooperative, Dynamics-Based, and Abstraction-Guided Multi-Robot Motion Planning."* Journal of Artificial Intelligence Research, vol. 63, pp. 361–390

74 Morris D, Maximova T, **Plaku E**, and Shehu A (2018): *"Attenuating Dependence on Structural Data in Computing Protein Energy Landscapes."* BMC Bioinformatics, vol. 20 (Suppl11):280

73 Plaku E, **Plaku E**, and Simari P (2018): *"Clearance-driven Motion Planning for Mobile Robots with Differential Constraints."* Robotica, vol. 36, pp. 971–993

72 Edelkamp S, Lahijanian M, Magazzeni D, and **Plaku E** (2018): *"Integrating Temporal Reasoning and Sampling-Based Motion Planning for Multi-Goal Problems With Dynamics and Time Windows."* IEEE Robotics and Automation Letters, vol. 3, pp. 3473–3480

71 Qiao W, Akhterg N, Fangu X, Maximova T, **Plaku E**, and Shehu A (2018): *"From Mutations to Mechanisms and Dysfunction via Computation and Mining of Protein Energy Landscapes."* BMC Genomics, vol. 19, pp. 671–683

70 Le D and **Plaku E** (2018): *"Multi-Robot Motion Planning with Dynamics Guided by Multi-Agent Search."* Proceedings of the International Joint Conferences on Artificial Intelligence, pp. 5314–5318

PUBLICATIONS 2017

69 Maximova T, Zhang Z, Carr D, **Plaku E**, and Shehu A (2017): *"Sample-based Models of Protein Energy Landscapes and Slow Structural Rearrangements."* Journal of Computational Biology, vol. 25, pp. 33–50

68 Edelkamp S, Pomarlan M, and **Plaku E** (2017): *"Multi-Region Inspection by Combining Clustered Traveling Salesman Tours with Sampling-Based Motion Planning."* IEEE Robotics and Automation Letters, vol. 2, pp. 428–435

67 Plaku E, **Plaku E**, and Simari P (2017): *"Direct Path Superfacets: An Intermediate Representation for Motion Planning."* IEEE Robotics and Automation Letters, vol. 2, pp. 350–357

66 McMahon J and **Plaku E** (2017): *"Robot Motion Planning with Task Specifications via Regular Languages."* Robotica, vol. 35, pp. 26–49

65 Edelkamp S, Can Secim, B, and **Plaku E** (2017): *"Surface Inspection via Hitting Sets and Multi-Goal Motion Planning."* Springer LNCS Towards Autonomous Robotic Systems, vol. 10454, pp. 134–149

64 Qiao W, Maximova T, Fang X, **Plaku E**, and Shehu A (2017): *"Reconstructing and Mining Protein Energy Landscapes to Understand Disease."* IEEE International Conference on Bioinformatics and Biomedicine, pp. 22–27

63 Le D and **Plaku E** (2017): *"Cooperative Multi-Robot Sampling-Based Motion Planning with Dynamics."* International Conference on Planning and Scheduling, pp. 513–521 **(Best Robotics Paper)**

62 Morris D, Maximova T, **Plaku E**, and Shehu A (2017): *"Out of One, Many: Exploiting Intrinsic Motions to Explore Protein Structure Spaces."* IEEE International Conference on Computational Advances in Bio and Medical Sciences, pp. 1–1

61 Qiao W, Maximova T, **Plaku E**, and Shehu A (2017): *"Statistical Analysis of Computed Energy Landscapes to Understand Dysfunction in Pathogenic Protein Variants."* ACM International Conference on Bionformatics, Computational Biology, and Health Informatics, pp. 679–684

60 Kvelashvili T, Kilic O, Can Secim B, and **Plaku E** (2017): *"UAV Swarm-Based Antenna System."* USNC-URSI National Radio Science, in press

PUBLICATIONS 2016

59 Shehu A and **Plaku E** (2016): *"A Survey of Computational Treatments of Biomolecules by Robotics-inspired Methods Modeling Equilibrium Structure and Dynamics"* Journal of Artificial Intelligence Research, vol. 57, pp. 509–572

58 McMahon J and **Plaku E** (2016): *"Autonomous Data Collection with Limited Time for Underwater Vehicles."* IEEE Robotics and Automation Letters, vol. 2, pp. 112–119

57 Maximova T, **Plaku E**, and Shehu A (2016): *"Structure-guided Protein Transition Modeling with a Probabilistic Roadmap Algorithm."* IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 13, pp. 1–14

56 **Plaku E**, Rashidian S, and Edelkamp S (2016): *"Multi-Group Motion Planning in Virtual Environments."* Computer Animation and Virtual Worlds, vol. 29(6), e1688,, doi: 10.1002/cav.1688

55 **Plaku E** and Le D (2016): *"Interactive Search for Action and Motion Planning with Dynamics."* Journal of Experimental and Theoretical Artificial Intelligence, vol. 28, pp. 849–869

54 McMahon J and **Plaku E** (2016): *"Mission and Motion Planning for Autonomous Underwater Vehicles Operating in Spatially and Temporally Complex Environments."* IEEE Journal of Oceanic Engineering, vol. 41, pp. 893–912

53 Maximova T, Carr D, **Plaku E**, and Shehu A (2016): *"Sample-based Models of Protein Structural Transitions."* ACM Conference on Bioinformatics and Computational Biology, pp. 128–137

52 Maximova T, **Plaku E**, and Shehu A (2016): *"The Sampling-based Algorithm for Modeling Protein Conformational SwitchingMethod for Extended Sampling and Transition Paths Prediction with Probabilistic Roadmap Algorithm."* Structural Bioinformatics and Computational Biophysics, Intelligent Systems for Molecular Biology, pp. 66 (**Outstanding Research Presentation**)

PUBLICATIONS 2015

51 **Plaku E** and Karaman S (2015): *"Motion Planning with Temporal-Logic Specifications: Progress and Challenges."* AI Communications, vol. 29, pp. 151–162

50 McMahon J, Dzikowicz B, Houston B, and **Plaku E** (2015): *"A Hybrid Planning Framework For Autonomous Underwater Vehicles."* NRL Review, pp. 114–116

49 Wallar A, **Plaku E**, and Sofge D (2015): *"Reactive Motion Planning for Unmanned Aerial Surveillance of Risk-Sensitive Areas."* IEEE Transactions on Automated Science and Engineering, vol. 12, pp. 969–980

48 **Plaku E** (2015): *"Region-Guided and Sampling-Based Tree Search for Motion Planning with Dynamics."* IEEE Transactions on Robotics, vol. 31, pp. 723–735

47 Wells A and **Plaku E** (2015): *"Adaptive Sampling-Based Motion Planning for Mobile Robots with Differential Constraints."* Springer LNCS Towards Autonomous Robotic Systems, vol. 9287, pp. 283–295 (**Best Student Paper**)

46 Maximova T, **Plaku E**, and Shehu A (2015): *"Computing Transition Paths in Multiple-Basin Proteins with a Probabilistic Roadmap Algorithm."* Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine, pp. 35–42

45 McMahon J and **Plaku E** (2015): *"Autonomous Underwater Vehicle Mine Countermeasures via the Physical Traveling Salesman Problem."* MTS/IEEE Oceans, isbn 978-0-9339-5743-5

44 Edelkamp S, **Plaku E**, Greulich C, and Pomarlan M (2015): *"Solving the Inspection Problem via Colored Traveling Salesman Tours."* Workshop on Task Planning for Intelligent Robots in Service and Manufacturing, IEEE International Conference on Robotics and Automation, pp. 26–31

PUBLICATIONS 2014

43 **Plaku E** and McMahon J (2014): *"Motion Planning and Decision Making for Underwater Vehicles Operating in Constrained Environments in the Littoral."* Springer LNCS Towards Autonomous Robotic Systems, vol. 8069, pp. 328–339

42 Wallar A and **Plaku E** (2014): *"Path Planning for Swarms by Combining Probabilistic Roadmaps and Potential Fields."* Springer LNCS Towards Autonomous Robotic Systems, vol. 8069, pp. 417–428

41 McMahon J and **Plaku E** (2014): *"Sampling-Based Tree Search with Discrete Abstractions for Motion Planning with Dynamics and Temporal Logic."* Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 3726–3733

40 Le D and **Plaku E** (2014): *"Guiding Sampling-Based Tree Search for Motion Planning with Dynamics via Probabilistic Roadmap Abstractions."* Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 212–217

39 Rashidian S, **Plaku E**, and Edelkamp S (2014): *"Motion Planning with Rigid-Body Dynamics for Generalized Traveling Salesman Tours."* Proceedings of the ACM SIGGRAPH Motion in Games, pp. 87–96

38 Edelkamp S and **Plaku E** (2014): *"Multi-Goal Motion Planning with Physics-Based Game Engines."* Proceedings of the IEEE Conference on Computational Intelligence and Games, pp. 115–122

37 Wallar A and **Plaku E** (2014): *"Path Planning for Swarms in Dynamic Environments by Combining Probabilistic Roadmaps and Potential Fields."* Proceedings of the IEEE Symposium on Swarm Intelligence, pp. 290–297

36 Wallar A, **Plaku E**, and Sofge D (2014): *"A Planner for Autonomous Risk-Sensitive Coverage*

(PARCov) by a Team of Unmanned Aerial Vehicles." Proceedings of the IEEE Symposium on Swarm Intelligence, pp. 283–289

35 McMahon J and **Plaku E** (2014): *"Combined Task and Motion Planning for AUVs."* Workshop on AI and Robotics, IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 17–18

PUBLICATIONS 2013

34 **Plaku E**, Kavraki LE, and Vardi MY (2013): *"Falsification of LTL Safety Properties in Hybrid Systems."* Springer International Journal on Software Tools for Technology Transfer, vol. 15, pp. 305–320

33 **Plaku E** (2013): *"Robot Motion Planning with Dynamics as Hybrid Search."* Proceedings of the AAAI Conference on Artificial Intelligence, pp. 1415–1421

32 McMahon J and **Plaku E** (2013): *"Combined Mission and Motion Planning to Enhance Autonomy of Underwater Vehicles Operating in the Littoral Zone."* Workshop on Combining Task and Motion Planning, IEEE International Conference on Robotics and Automation, pp. 17–22

31 McMahon J and Plaku E (2013): *"Motion Planning with Linear Temporal Logic for Underwater Vehicles Operating in Constrained Environments."* Workshop on Planning in Continuous Domains, International Conference on Automated Planning and Scheduling, pp. 3

30 **Plaku E** (2013): *"From Navigation to Robotic-Assisted Surgery: Combined Planning in Discrete and Continuous Spaces."* Workshop on Combining Robot Motion Planning and AI Planning for Practical Applications, Robotics: Science and Systems, pp. 5–6

PUBLICATIONS 2012

29 **Plaku E** (2012): *"Planning in Discrete and Continuous Spaces: From LTL Tasks to Robot Motions."* Springer LNCS Towards Autonomous Robotic Systems, vol. 7429, pp. 331–342.

28 **Plaku E** (2012): *"Guiding Sampling-Based Motion Planning by Forward and Backward Discrete Search."* Springer LNCS Intelligent Robots and Applications, vol. 7508, pp. 289–300

27 **Plaku E** (2012): *"Motion Planning with Discrete Abstractions and Physics-Based Game Engines."* Springer LNCS Motion in Games, vol. 7660, pp. 290–301

26 **Plaku E** (2012): *"Path Planning with Probabilistic Roadmaps and Linear Temporal Logic."* Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 2269–2275

25 **Plaku E** (2012): *"Motion Planning with Differential Constraints as Guided Search over Continuous and Discrete Spaces."* Proceedings of the International Symposium on Combinatorial Search, pp. 171–172

24 **Plaku E** (2012): *"Planning Robot Motions to Satisfy Linear Temporal Logic, Geometric, and Differential Constraints."* Workshop on Combining Task and Motion Planning for Real-World Applications, International Conference on Automated Planning and Scheduling, pp. 21–28

PUBLICATIONS 2011

23 Pezzementi Z, **Plaku E**, Reyda C, and Hager GD (2011): *"Tactile Object Recognition From Appearance Information."* IEEE Transactions on Robotics, vol. 27, pp. 473–487

22 Liu WP, Lucas BC, Guerin K, and **Plaku E** (2011): *"Sensor and Sampling-Based Motion Planning for Minimally Invasive Robotic Exploration of Osteolytic Lesions."* IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 1346–1352

21 **Plaku E** (2011): *"Sampling-Based Motion Planning with High-Level Discrete Specifications."* Workshop on Progress and Open Problems in Motion Planning, IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 29–30

PUBLICATIONS 2010

20 **Plaku E**, Kavraki LE, and Vardi MY (2010): *"Motion Planning with Dynamics by a Synergistic Combination of Layers of Planning."* IEEE Transactions on Robotics, vol. 26, pp. 469–482

19 Reiley C, **Plaku E**, and Hager GD (2010): *"Motion Generation of Robotic Surgical Tasks: Learning from Expert Demonstrations."* Proceedings of the International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 967–970

18 **Plaku E** and Hager GD (2010): *"Sampling-Based Motion and Symbolic Action Planning with Geometric and Differential Constraints."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 5002–5008

PUBLICATIONS 2009

17 **Plaku E**, Kavraki LE, and Vardi MY (2009): *"Hybrid Systems: From Verification to Falsification by Combining Motion Planning and Discrete Search."* Springer Formal Methods in System Design, vol. 34, pp. 157–182

16 **Plaku E**, Kavraki LE, and Vardi MY (2009): *"Falsification of LTL Safety Properties in Hybrid Systems."* Proceedings of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems, pp. 368–382

PUBLICATIONS 2008

15 **Plaku E** and Kavraki LE (2008): *"Quantitative Analysis of Nearest-Neighbors Search in High-Dimensional Sampling-Based Motion Planning."* Springer Tracts in Advanced Robotics, vol. 47, pp. 3–18

14 **Plaku E**, Kavraki LE, and Vardi MY (2008): *"Impact of Workspace Decompositions on Discrete Search Leading Continuous Exploration (DSLX) Motion Planning."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 3751–3756

PUBLICATIONS 2007

13 **Plaku E**, Stamati H, Clementi C, and Kavraki LE (2007): *"Fast and Reliable Analysis of Molecular Motion Using Proximity Relations and Dimensionality Reduction."* Proteins: Structure, Function, and Bioinformatics, vol. 67, pp. 897–907

12 **Plaku E** and Kavraki LE (2006): *"Distributed Computation of the knn Graph for Large High-Dimensional Point Sets."* Journal of Parallel and Distributed Computing, vol. 67, pp. 346–359

11 **Plaku E**, Kavraki LE, and Vardi MY (2007): *"Hybrid Systems: From Verification to Falsification."* International Conference on Computer Aided Verification, pp. 468–481

10 **Plaku E**, Kavraki LE, and Vardi MY (2007): *"Discrete Search Leading Continuous Exploration for Kinodynamic Motion Planning."* Proceedings of the Robotics: Science and Systems, pp. 326–333

9 **Plaku E** and Kavraki LE (2007): *"Nonlinear Dimensionality Reduction Using Approximate Nearest Neighbors."* Proceedings of the SIAM International Conference on Data Mining, pp. 180–191

8 **Plaku E**, Kavraki LE, and Vardi MY (2007): *"A Motion Planner for a Hybrid Robotic System with Kinodynamic Constraints."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 692–697

7 **Plaku E**, Bekris KE, and Kavraki LE (2007): *"OOPS for Motion Planning: An Online Open-source Programming System."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 3711–3716

PUBLICATIONS 2005

6 **Plaku E**, Bekris KE, Chen BY, Ladd AM, and Kavraki LE (2005): *"Sampling-Based Roadmap of Trees for Parallel Motion Planning."* IEEE Transactions on Robotics, vol. 21, pp. 587–608

5 Akinc M, Bekris KE, Chen BY, Ladd AM, **Plaku E**, and Kavraki LE (2005):. *"Probabilistic Roadmaps of Trees for Parallel Computation of Multiple Query Roadmaps."* Springer Tracts in Advanced Robotics, vol. 15, pp. 80–89

4 **Plaku E** and Kavraki LE (2005): *"Distributed Sampling-Based Roadmap of Trees for Large-Scale Motion Planning."* Proceedings of the IEEE International Conference on Robotics and Automation, pp. 3879–3884

PUBLICATIONS 2003

3 Bekris KE, Chen BY, Ladd AM, **Plaku E**, and Kavraki LE (2003): *"Multiple Query Motion Planning using Single Query Primitives."* IEEE/RSJ International Conference on Intelligent Robots and Systems, pp. 656–661

PUBLICATIONS 2001

2 **Plaku E** and Shparlinski IE (2001): *"On Polynomial Representations of Boolean Functions Related to some Number Theoretic Problems."* International Conference on the Foundations of Software Technology and Theoretical Computer Science, pp. 305–316

PUBLICATIONS 1999

1 Arnavut Z and **Plaku E** (1999): *"Lossless Compression of ECG Signals."* IEEE International Conference of the Engineering in Medicine and Biology Society, pp. 274

INVITED TALKS

◇ Autonomy Summit, University of Maryland, 11/2024

◇ Summit for AI Institutes Leadership (SAIL), Pittsburgh, PA, 10/2024

◇ HBCU Making and Innovation Showcase, Washington, D.C., 09/2024

◇ Robotics and Controls Systems (RCS) Seminar, UNC Charlotte, 08/2023

◇ NITRD Intelligent Robotics and Autonomous Systems (IRAS) Interagency Working Group, 04/2023

◇ NSF Panel, National Workshop on Human-like Robots, 07/2022

◇ NSF Panel, Workshop on Algorithmic Foundation of Robotics, 06/2022

◇ 16th Japan-U.S. Joint Working Level Committee Meeting on Science and Technology, 06/2021

◇ Workshop on No-Touch Care for Worker Safety During Pandemic Response, IEEE International Conference on Robotics and Automation, 06/2021

- U.S. - Israel Innovation Forum, 04/2021
- Computer Science Department, George Mason University, 02/2020
- Robust Intelligence and National Robotics Initiative, NSF 02/2019
- Panel on AI Perspectives, Smith Group, Washington, DC, 11/2018
- School of Informatics, Tirana University, Albania 6/2018
- Computer Science Department, George Mason University, 10/2017
- National Robotics Engineering Center, CMU, 07/2017
- Robotics Seminar, MIT, 12/2016
- Workshop on Planning for Hybrid Systems (keynote talk), AAAI Conference on Artificial Intelligence, 02/2016
- Virginia Tech – Northern Virginia Center, Department of Computer Science, 12/2014
- Naval Research Laboratory, Washington, DC, 07/2014
- Workshop on Model Checking and Automated Planning, International Conference on Automated Planning and Scheduling, Portsmouth, NH, 06/2013
- University of Florida, Department of Mechanical Engineering, 01/2013
- Workshop on Planning in Continuous Domains, International Conference on Automated Planning and Scheduling, Rome, Italy, 06/2013
- Naval Research Laboratory, Washington, DC, 06/2012
- Virginia Tech – Northern Virginia Center, Department of Computer Science, 03/2012
- Johns Hopkins University, Laboratory for Computational Sensing and Robotics, 11/2011
- Stanford University, Department of Computer Science, 03/2010
- George Mason University, Department of Computer Science, 11/2009
- Robotics: Science and Systems, Workshop on Bridging the gap between high-level discrete representations and low-level continuous behaviors, Seattle, WA, 06/2009.
- Johns Hopkins University, Department of Computer Science, 10/2008
- Carnegie Mellon University, Department of Computer Science, 03/2008
- Willow Garage, Mountain View, CA, 05/2008
- Worcester Polytechnic Institute, Department of Computer Science, 02/2008
- Intel Research, Hillsboro, OR, 01/2007
- State University of New York at Fredonia, 11/2006
- Rutgers State University of New Jersey, 07/2005
- Texas A&M University, Department of Computer Science, 05/2005

PROFESSIONAL DEVELOPMENT AND SERVICE

- **Associate Editor**

- ▷ IEEE/RSJ Intl Conf on Intelligent Robots and Systems (2011–2019)

◇ **Steering Committee**

- ▷ IEEE RAS Technical Committee on Algorithms for Planning and Control of Robot Motion (2008 – present)

◇ **Dagstuhl Seminar Series**

- ▷ Co-organizer of a one-week seminar on "Automated Planning and Model Checking" as part of the highly-ranked Dagstuhl seminar series, November 2014

◇ **Workshops Organized**

- ▷ "How to Engage in AI Research as an Undergraduate?" CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference, Washington, DC, 2022 (role: co-organizer)
- ▷ "Combining Task and Motion Planning." IEEE International Conference on Robotics and Automation, Karlsruhe, Germany, 2013 (role: main organizer)
- ▷ "Combined Robot Motion Planning and AI Planning for Practical Applications." Robotics: Science and Systems, Berlin, Germany, 2013 (role: main organizer)
- ▷ "Motion planning with the OOPSMP toolkit: A hands-on tutorial on using state-of-the-art motion planning algorithms." IEEE/RSJ International Conference on Intelligent Robots and Systems, Nice, France, 2008 (role: co-organizer)

◇ **Senior Program Committee**

- ▷ AAAI Conference on Artificial Intelligence (2021)
- ▷ Joint International Conference on Artificial Intelligence (2020)
- ▷ Pacific Rim International Conference on Artificial Intelligence (2020)

◇ **Program Committee**

- ▷ IEEE International Conference on Robotics and Automation
- ▷ IEEE International Conference on Intelligent Robots and Systems
- ▷ AAAI Conference on Artificial Intelligence
- ▷ Robotics: Science and Systems
- ▷ International Joint Conference on Artificial Intelligence
- ▷ European Conference on Artificial Intelligence
- ▷ International Conference on Automated Planning and Scheduling
- ▷ Hybrid Systems: Computation and Control
- ▷ IEEE International Conference on Biomedical Robotics and Biomechatronics
- ▷ Cognitive Robotics

◇ **NSF Panelist** 2010–2019

◇ **Journal Reviewer**

- ▷ Science Translational Medicine
- ▷ PLoS One
- ▷ IEEE Transactions on Robotics

- ▷ International Journal of Robotics Research
- ▷ Robotica
- ▷ Autonomous Robots
- ▷ Automatica
- ▷ IEEE Transactions on Automation Science and Engineering
- ▷ IEEE Transactions on Knowledge and Data Engineering
- ▷ IEEE Transactions on Biomedical Engineering
- ▷ IEEE Robotics and Automation Letters
- ▷ Artificial Intelligence Journal
- ▷ Artificial Intelligence in Medicine
- ▷ Journal of Experimental and Theoretical Artificial Intelligence
- ▷ AI Communications
- ▷ Journal of Franklin Institute

TEACHING AND EDUCATIONAL ACTIVITIES

◇ **Catholic University of America (CUA)**

- ▷ Design of Data Science program (M.S. and minor) 2018–2019
- ▷ Key player in developing CS/EE Robotics concentration 2014
- ▷ CS curriculum revisions 2012, 2017
- ▷ CUA Committee on Core Curriculum Revisions 2018–2019
  - ○ Convergence education driven by compelling themes
  - ○ Covered in a number of courses from different disciplines

◇ **Curriculum Development**

- ▷ CSC530/DA501: Data Analytics (CUA)
- ▷ CSC/EE 576: Introduction to Robotics (CUA)
- ▷ CS 336: Algorithms for Sensor-Based Robotics (JHU)

◇ **Courses Redesigned**

- ▷ CS 580: Artificial Intelligence (GMU)
- ▷ CSC 542: Artificial Intelligence (CUA)
- ▷ CSC 212: Theory of Computing (CUA)
- ▷ CSC 223: Object-Oriented Programming (CUA)
- ▷ CSC 113: Introduction to Programming (CUA)

◇ **Courses Taught**

- ▷ GMU CS 583: Algorithms Fall 2023
- ▷ GMU CS 484: Data Mining Spring 2023
- ▷ GMU CS 580: Artificial Intelligence Fall 2022
- ▷ CUA CSC/EE 576: Introduction to Robotics Fall 2011, Spring 2014, Spring 2016

- ▷ CUA CSC 542: Artificial Intelligence — Spring 2011, 2013, 2015, 2017, 2018, 2019
- ▷ CUA CSC484/584/DA515: Introduction to Machine Learning — Summer 2019
- ▷ CUA CSC530/DA501: Data Analytics — Fall 2018
- ▷ CUA CSC 223: Object-Oriented Programming — Fall 2014–2016
- ▷ CUA CSC 212: Theory of Computing — Spring 2011–2019
- ▷ CUA CSC 113: Introduction to Computer Programming — Fall 2010–2016, 2018
- ▷ JHU CS 336: Algorithms for Sensor-Based Robotics — Spring 2010

◇ **Committees**

- ▷ GMU CS Graduate Studies Committe (Fall 2023)
- ▷ GMU MS Admissions Committee (Spring 2023)
- ▷ GMU Robotics Strategies and Development (2022–2023)
- ▷ CUA AI & Ethics Group, Chair (2017–2019)
- ▷ CUA University Undergraduate Board (2015–2019)
- ▷ CUA School of Engineering Committee on University Strategic Planning (2016–2019)
- ▷ CUA School of Engineering Committee on Appointment and Promotion (2018–2019)
- ▷ CUA Chair of Computer Science Undergraduate Curriculum Committee (2013)
- ▷ CUA EECS Computer Science Curriculum Revision Committee (Fall 2010, Spring 2011)
- ▷ CUA EECS Computer Science Odyssey Day and Open House (2011–2017)

◇ **Outreach Activities**

- ▷ **Robotics for Elementary School Students** — Fall 2018
  Providing robotics presentations and demonstrations for K-6 students and helping elementary school teachers launch robotics project-based learning modules, where the kids learn about designing and creating their own model robots
- ▷ **Math for Elementary School Students** — Spring 2019
  Ran MathClub at Canterbury Woods Elementary School, where I taught about 70 students in grades K-6 every week during Spring 2019, emphasizing logical reasoning and problem solving
- ▷ **DC FIRST Robotics** — 2012–2019
  Trained high-school students and conducted robotics exhibits at the main competition events.
- ▷ **High School Robotics Training Program** — Summer 2011–present
- ▷ **Engineering New Frontiers** — Summer 2011–2012
  Organized the robotics events, presentations, and competitions as part of the summer camp for high-school students
- ▷ **Robotics Competitions** — 2011–2019
  Organizing robotics events such as robot soccer, robot wars, and drone competitions to broaden student participation and attract more students to STEM.

STUDENT MENTORING

◇ **Ph.D. Advisor**

- ▷ Hoang Dung Bui (Ph.D. Student, GMU) Spring 2020 – Fall 2023
- ▷ Yuanjie Lu (Ph.D. Student, GMU) Spring 2021 – Fall 2023
- ▷ Philip Baldoni (Ph.D. Student, GMU) Spring 2021 – Fall 2023
- ▷ James McMahon (Ph.D., CUA) Spring 2012–Spring 2016
- ▷ Duong Le (Ph.D., CUA) Fall 2013–Fall 2018
- ▷ Baris Secim (Ph.D. Student, CUA) Fall 2015 – 2018

◇ **M.S. Advisor**

- ▷ Sara Rashidian (M.S. Student, CUA) Fall 2013–Summer 2014

◇ **Undergraduate Research Advisor**

- ▷ Andrew Wells (Undergraduate, CUA) 2014–2016
- ▷ Alex Wallar (Undergraduate, St. Andrews University, UK) 2012–2015
- ▷ Tien Pham (Undergraduate, CUA) 2018–2019

◇ **Senior-Design Research Advisor**

- ▷ Michael Morgan, Joseph Santschi, James Conroy, James Lucas, Khrysitian-Alexander Tran (2018–2019): "Exploration of Unknown Environments using a Team of Aerial and Ground Robots"
- ▷ Taner Tuncer and Abdulaziz Alhuthali (2018–2019): "Making Music with AI"
- ▷ Tsotne Kvelashvili, John Paul McPherson, Dulanjana Jayawardane (2016–2017): "UAV Swarm-based Antenna System" (**1st place**)
- ▷ Andrew Wells, Timothy Danchik, Peter Kuebler, Phillip Samra (2015–2016): "Target Tracking by a Team of Unmmaned Aerial Vehicles"
- ▷ Matthew Dillon and Jorge Coronado (2014–2015): "Self-Balancing Skateboard"
- ▷ Matthew Melly and Lance Van Arsdale (2014–2015): "Mixed Real and Virtual Environments"
- ▷ Iyeol Beniam, Hilary Bruynell, and Elena Fafaul (2013–2014): "Robot Wars" (**1st place**)
- ▷ Patrick Gilfoil and Po Ming Chen (2013–2014): "3D Gaming with Physics Engines"
- ▷ Duong Le, Tuan Nguyen, Thanh Nguyen (2012–2013): "Kuka YouBot – At Your Service" (**1st place**)
- ▷ Hung Tran (2012–2013): "Using Kinect to Recognize Body-Language Gestures"
- ▷ Joseph Lattisaw (2011–2012): "Exploration of Unknown Environments by a Team of Robots"
- ▷ Minh Le (2011–2012): "Multi-Goal Motion Planning"
- ▷ Phuong Pham (2011–2012): "Motion Planning with Moving Obstacles"
- ▷ Kevin Lynn and Mohammed Abotaleb (2010–2011): "Axes Robotic Arm Designed to Pick Up Items Based on a Specific Color"

◇ **High-School Students Research Advisor**

- ▷ Shrey Gupta (Thomas Jefferson High School for Science and Technology, McLean, VA) Summer 2021
- ▷ Anwitha Kollipara (Thomas Jefferson High School for Science and Technology, McLean, VA) Summer 2021

- ▷ Taj Abdin (Thomas Jefferson High School for Science and Technology, McLean, VA) Summer 2021
- ▷ Ronit Reddy (South County High School, Lorton, VA) Summer 2021
- ▷ David Garner (Eleanor Roosevelt High School, Greenbelt, MD) Fall 2015–2016
- ▷ Sophia Barbieri (John F. Kennedy High School, Silver Spring, MD) Spring 2015
- ▷ Alex Wallar (George Mason High School, Falls Church, VA) Summer 2012
- ▷ Vladimir Utchin (George Mason High School, Falls Church, VA) Summer 2012
- ▷ Devin Luce (Montgomery Blair High School, Silver Spring, MD) Summer 2012
- ▷ Tong Hyun (Chantilly High School, Chantilly, VA) Summer 2011