Erion Plaku

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SUMMARY

Research: Dr. Plaku is a leading expert in AI, specializing in planning, high-level reasoning, autonomous systems, and AI-driven decision-making. With a prolific academic career spanning a decade, he has made significant contributions in AI and robotics, effectively bridging the gap between advanced AI and their real-world uses in robotics and autonomous systems. His work integrates advanced techniques in autonomous decision making, motion planning, and intelligent automation, along with cutting-edge developments in generative AI, large language models (LLMs), and foundational AI models. As a professor at George Mason University and the Catholic University of America, he conducted impactful research and mentored students in AI and robotics, contributing to significant advancements in AI-powered autonomy. Dr. Plaku has developed and released several open source software tools that advance AI, robotics, and autonomous systems, fostering collaboration, and broadening the impact of advanced technologies among researchers, students, educators, industry professionals, and practitioners.

Dr. Plaku is actively engaged in advancing AI and robotics research, seeking to expand the capabilities of autonomous systems and intelligent decision making. His deep technical expertise, strategic vision, and experience managing high-impact AI programs allow him to make impactful contributions to AI innovation and the ongoing development of intelligent systems at scale.

Program Management: As a program director at NSF, Dr. Plaku led the National AI Research Institutes program, a cornerstone federal investment in AI, managing a $540 million portfolio that supports 27 institutes nationwide. This flagship initiative, supported by multiple federal agencies and industry partners, drives long-term, high-impact AI research while fostering collaboration between academia, industry, and government to accelerate innovation and real-world applications. In addition, Dr. Plaku was a program director for the CISE/IIS/Robust Intelligence program, which focuses on developing AI systems that are resilient and adaptable to real-world challenges. Dr. Plaku was also instrumental in advancing robotics research at NSF, co-leading the Foundational Research in Robotics (FRR) program, the agency's flagship initiative in robotics. He also co-chaired the Interagency Working Group on Intelligent Robotics and Autonomous Systems (IRAS), coordinating federal R&D efforts across multiple agencies to accelerate progress in robotics and autonomous systems. In addition, Dr. Plaku played a key role in the advancement of international collaborations, engaging with organizations such as Japan's Science and Technology Agency and the UK's Engineering and Physical Sciences Research Council.

Through his work at NSF, Dr. Plaku led high-impact research initiatives, fostered collaboration between disciplines, agencies, and international partners, and advanced AI innovations with broad scientific, technological and social impact.

EMPLOYMENT

- **National Science Foundation**, *Alexandria, VA* 12/2023–02/2025
  Program Director (Federal)
  - Co-Lead: National Artificial Intelligence Research Institutes
  - Robust Intelligence (RI)

  Division of Information and Intelligent Systems (IIS)
  Directorate for Computer and Information Science and Engineering (CISE)
- **George Mason University**, *Fairfax, VA* 08/2020–12/2023
  Associate Professor, Department of Computer Science
- **National Science Foundation**, *Alexandria, VA* 08/2019–08/2022
  Program Director (IPA)
  Division of Information and Intelligent Systems (IIS)
  Directorate for Computer and Information Science and Engineering (CISE)
  - ***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

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

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

EDUCATION

◇ **Johns Hopkins University**, *Baltimore, MD* 08/2008–08/2010
Postdoctoral Fellow
Laboratory for Computational Sensing and Robotics, Department of Computer Science

◇ **Rice University**, *Houston, TX* 08/2002–07/2008
Ph.D. in Computer Science

◇ **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)

PROGRAM MANAGEMENT AND LEADERSHIP

◇ **National Artificial Intelligence Research Institutes Program (Co-Lead)** 12/2023–02/2025

▷ Co-led the National AI Research Institutes program, a multi-sector effort led by NSF in partnership with several federal agencies and industry, consisting of 27 AI Institutes and representing a $540 million investment and a cornerstone Federal Government commitment to fostering long-term, foundational and use-inspired research in AI while advancing the key objectives of the National Artificial Intelligence Research and Development Strategic Plan.

▷ Multi-sector effort led by NSF in partnership with several
- federal agencies
  - U.S. Department of Agriculture, National Institute of Food and Agriculture
  - U.S. Department of Defense, Office of the Under Secretary of Defense for Research and Engineering
  - U.S. Department of Education, Institute of Education Sciences
  - U.S. Department of Homeland Security, Science & Technology Directorate
  - U.S. Department of Commerce's National Institute of Standards and Technology
- industry: Amazon, Google, IBM, Intel, Accenture, Capital One, and
- non-profit organizations: Simons Foundation

◇ **Robust Intelligence (Program Director)** 08/2019–08/2022, 12/2023–02/2025

▷ Program director in NSF/CISE/IIS Robust Intelligence, which supports computational research in AI, machine learning, computer vision, human-language technologies, computational neuroscience, generative AI, large language models, foundational models, and other cutting-edge areas of AI research.

◇ **Artificial Intelligence R&D Interagency Working Group (member)**
Networking & Information Technology Research & Development Program 12/2023–02/2025

▷ Represented NSF in the Artificial Intelligence R&D Interagency Working Group, coordinating federal AI R&D efforts and supporting initiatives set by the NSTC Select Committee on AI and the Subcommittee on Machine Learning and Artificial Intelligence to enhance U.S. leadership and competitiveness in AI R&D and its transformative applications.

◇ **Intelligent Robotics and Autonomous Systems Interagency Working Group (Co-Chair)**
Networking & Information Technology Research & Development Program 07/2021–08/2022

▷ Co-chaired the Intelligent Robotics and Autonomous Systems Interagency Working Group, coordinating R&D efforts across 28 federal agencies to accelerate the development and deployment of resilient, ethical, and efficient robots and autonomous systems to enhance human productivity, safety, and quality of life across diverse environments such as workplaces, hospitals, communities, and homes.

◇ **Foundational Research in Robotics (Co-Lead)** 07/2021–08/2022

▷ Co-led the Foundational Research in Robotics program, NSF's flagship robotics initiative, a collaborative effort between the CISE and ENG Directorates, supporting groundbreaking research on robotic systems that integrate advanced computational capabilities with complex physical functions to drive the future of robotics and autonomous systems.

◇ **National Robotics Initiative (Co-Lead)** 08/2019–05/2022

▷ Co-led the National Robotics Initiative, a partnership between NSF and several federal agencies, resulting in an investment of over $250 million to support more than 300 groundbreaking research projects aimed at driving innovation in robotics to enhance human safety, productivity, and independence.

◇ ***International Engagements***

▷ Led NSF/CISE efforts in fostering collaborations with the
- Japan Science and Technology (JST) Agency and
- UK Engineering and Physical Sciences Research Council (EPSRC)

▷ Coordinated NSF/CISE/IIS and NSF/FRR efforts for the NSF-India Collaboration

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 AND TECHNICAL CONTRIBUTIONS

◇ **AI & Machine Learning for Decision-Making**

▷ **Planning, Search, and Reasoning:** Enhanced AI-driven decision-making through heuristic search, constraint-based reasoning, and automated planning. Developed innovative methods for efficient search space exploration and robust AI reasoning, enabling scalable solutions for autonomous systems and complex, large-scale AI planning.

▷ **High-Dimensional and Constrained Search:** Developed specialized techniques for efficient search and optimization in high-dimensional, constrained spaces, focusing on search-space pruning, adaptive heuristics, and constraint-aware planning for AI-driven optimization and scientific computing.

- ▷ **Integrating Large Language Models (LLMs):** Developed methods for integrating LLMs with AI planning, search, and decision-making frameworks to enhance efficiency and adaptability. Introduced novel approaches for leveraging LLMs in heuristic generation, spatial-temporal reasoning, and plan synthesis, improving solution quality and scalability. Designed hybrid AI architectures combining classical planning with neural models for more robust, flexible decision-making in complex scenarios.
- ▷ **Continuous Learning:** Leveraging past experiences, reinforcement learning, and predictive models to enhance planning efficiency. Developed novel approaches that incorporate runtime predictions, memory-driven planning, and neural representations to improve planning quality and efficiency.
- ▷ **Formal Methods and Assurance:** Developed novel safety verification approaches for hybrid systems, with applications in air traffic control and autonomous transportation, delivering formal guarantees for reliable and trustworthy deployment.
- ▷ **Routing and Resource Allocation:** Developed efficient frameworks for optimizing routing of mobile agents and resource allocation under constraints.
- ▷ **Probabilistic Reasoning Under Uncertainty:** Tackled challenges in probabilistic reasoning, uncertainty modeling, and decision-making in partially observable environments by developing stochastic and risk-aware planning and robust control policies for autonomous agents in real-world conditions.
- ▷ **Nonlinear Dimensionality Reduction:** Developed efficient nearest-neighbor search and nonlinear dimensionality reduction for large-scale data analysis, improving speed and accuracy.
- ▷ **Distributed Computing:** Developed high-performance distributed computing for large-scale AI problems, including planning, search and high-dimensional optimization.

◇ **Autonomous Systems & Robotics**

- ▷ **Motion Planning and Control:** Developed advanced planning and control algorithms to enhance autonomy in unstructured, unknown environments while accounting for complex dynamics. Created a new class of planners integrating discrete search with sampling-based methods, significantly reducing planning time, travel distance, and energy use. Demonstrated broad applicability across ground, aerial, and marine robots, enabling adaptable, scalable autonomy for diverse industry applications.
- ▷ **Combined Task and Motion Planning:** Developed methods for specifying high-level tasks using structured languages, enabling autonomous systems to automatically generate motion plans. Introduced formal models such as Regular Languages (RL), Linear Temporal Logic (LTL), and PDDL to define complex tasks, including coverage, sequencing, inspection, and search-and-rescue missions. Unified discrete AI reasoning with continuous motion planning and control, creating a scalable framework for efficient, reliable task execution in dynamic environments with obstacles.
- ▷ **Collaborative Robotics:** Developed motion planning and coordination strategies for multi-robot teams to efficiently handle exploration, data collection, and infrastructure inspection. Introduced scalable methods for task allocation, decentralized control, and communication-efficient planning, enabling seamless robotic supervision to enhance productivity and operational efficiency.
- ▷ **Logistics Operations:** Developed novel logistics optimization frameworks driven by the growing need for advanced automation in factories, warehouses, and supply chains, incorporating robot, vehicle, and mobile agent dynamics, task time windows, and capacity constraints on pickups, deliveries, and vehicle loads for more efficient and scalable operations.
- ▷ **Robotic Manipulation through Haptic Sensing, Exploration, and Planning:** Novel approaches that combine machine learning and planning to enable robots equipped with haptic sensors to perform manipulation of unknown objects based on geometric and tactile appearance information.

◇ **Industry Applications & Cross-Domain Impact**

- ▷ **Navy, Defense, Aerospace**: AI-powered autonomy for underwater, surface, ground, and aerial vehicles with a focus on mission-critical reliability (collaboration with the U.S. Naval Research Laboratory).
- ▷ **Healthcare & Medical AI**: AI-driven robotic-assisted surgery techniques leveraging expert demonstrations for enhanced training and automation (collaboration with Johns Hopkins University), ensuring safety and regulatory compliance.
- ▷ **Manufacturing & Supply Chain**: AI-enhanced robotics for warehouse automation, predictive mainte-

nance, and logistics optimization.

◇ **Open-Source Software**

▷ Developed OOPSMP, a robotics toolkit for research and education, and ROMEO, a plug-and-play platform for biomolecular modeling, both used by numerous researchers, students, and practitioners. Released several AI and machine learning methods for decision-making, autonomous systems, and robotics, with open-source code accompanying many published papers.

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)

PUBLICATIONS

	total nr. citations	**h-index**	**i10-index**
overall	3024	27	53
since 2020	1129	18	34

PUBLICATIONS 2025

97 Lu Y, Das D, **Plaku E**, and Xiao X (2025): *"Multi-Goal Motion Memory."* IEEE International Conference on Robotics and Automation, in press

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, pp. 3069–3075

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."* 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."* 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."* 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."* 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."* 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."* 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."* ACM SIGGRAPH Motion in Games, pp. 87–96

38 Edelkamp S and **Plaku E** (2014): *"Multi-Goal Motion Planning with Physics-Based Game Engines."* 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."* 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."* 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."* 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."* 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."* 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."* 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."* 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."* 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."* 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."* Robotics: Science and Systems, pp. 326–333

9 **Plaku E** and Kavraki LE (2007): *"Nonlinear Dimensionality Reduction Using Approximate Nearest Neighbors."* 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."* 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."* 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."* 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

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)

◇ **Educational 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.
- ▷ **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.

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