George P. Kontoudis

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RESEARCH INTERESTS

My research interests lie in the intersection of robotics, control theory, and machine learning. I am particularly interested in how learning algorithms and control theory can enable multi-agent systems to efficiently collaborate with minimal information exchange for robotic navigation and exploration tasks.

RESEARCH EXPERIENCE

Postdoctoral Research Associate (MRC Fellow), University of Maryland
Motion and Teaming Lab (PI: Michael Otte) *Jan 2022–present*

Graduate Research Assistant, Virginia Tech
Center for Marine Autonomy & Robotics (PI: Daniel J. Stilwell) *Aug 2018–Dec 2021*
Computational Multiphysics Systems Laboratory (PI: Tomonari Furukawa) *Aug 2016–Jul 2018*

Undergraduate Research Assistant, National Technical University of Athens
Control Systems Laboratory (PI: Kostas J. Kyriakopoulos) *Apr 2014–Mar 2016*

Founder & Research Associate, OpenBionics *Sep 2014–present*

EDUCATION

PhD in Electrical Engineering, Virginia Tech *2018–2021*
Advisor: Daniel J. Stilwell
Dissertation Title: "Communication-Aware, Scalable Gaussian Processes for Decentralized Exploration"
GPA: 3.94/4.00

MSc in Mechanical Engineering, Virginia Tech *2016–2018*
Advisors: Tomonari Furukawa & Kyriakos G. Vamvoudakis
Thesis Title: "Adaptive, Anthropomorphic Robot Hands for Grasping and In-Hand Manipulation"
GPA: 4.00/4.00

Diploma in Mechanical Engineering, National Technical University of Athens *2012–2016*
Advisor: Kostas J. Kyriakopoulos
Thesis Title: "Design and Development of an Underactuated, Anthropomorphic Robot Hand"

BSc in Mechanical Engineering, University of West Attica *2005–2010*

TEACHING EXPERIENCE

Graduate Teaching Assistant, Virginia Tech
Department of Mechanical Engineering *Fall 2016, Spring 2017*

AWARDS & HONORS

5 × IEEE Student Travel Support (IROS, ACC, CDC) *2015, 2019–2021*
2 × Virginia Tech GSA Travel Fund Award (Humanoids, ICORR) *2019, 2020*
NSF Student Travel Grant (WuWNet) *2019*
NTUA Thomaideion Award *2016*
Hackaday Prize, 2nd place among 900 projects *2015*
Robotdalen Innovation Award, 1st place *2015*

INDUSTRY EXPERIENCE

Mechanical Engineer, Sychem S.A. *Oct 2010–Aug 2015*
Aircraft Maintenance Engineer Trainee, Olympic Aviation *May 2008–Jan 2010*

PUBLICATIONS

Referred Journal Publications [J4]

[J1] **George P. Kontoudis**, Stephen Krauss, Daniel J. Stilwell, "Model-Based Learning of Underwater Acoustic Communication Performance for Marine Robots," *Robotics and Autonomous Systems* , 2021.

[J2] Geng Gao, Mojtaba Shahmohammadi, Lucas Gerez, **George P. Kontoudis**, Minas Liarokapis, "On Differential Mechanisms for Underactuated, Lightweight, Adaptive Prosthetic Hands," *Frontiers in Neurorobotics*, 2021.

[J3] **George P. Kontoudis**, Kyriakos G. Vamvoudakis, "Kinodynamic Motion Planning with Continuous-Time Q-Learning: An Online, Model-Free, and Safe Navigation Framework," *IEEE Transactions on Neural Networks and Learning Systems* , 2019.

[J4] **George P. Kontoudis**, Minas Liarokapis, Kyriakos G. Vamvoudakis, Tomonari Furukawa, "An Adaptive Actuation Mechanism for Anthropomorphic Robot Hands," *Frontiers in Robotics and AI*, 2019.

Chapters in Edited Volumes

[V1] **George P. Kontoudis**, Kyriakos G. Vamvoudakis, Zirui Xu, "RRT-QX: Real-Time Kinodynamic Motion Planning in Dynamic Environments with Continuous-Time Reinforcement Learning," in *Brain and Cognitive Intelligence: Control in Robotics*, B. Wei (Ed.), Taylor & Francis Group, CRC Press, 2022. *(to appear)*

Referred Conference Publications [C12]

[C1] Josh Netter, **George P. Kontoudis**, Kyriakos G. Vamvoudakis, "Bounded Rational RRT-QX: Multi-Agent Motion Planning in Dynamic Human-Like Environments Using Cognitive Hierarchy and Q-Learning," *IEEE Conference on Decision and Control (**CDC**)*, Austin, USA, 2021.

[C2] **George P. Kontoudis**, Daniel J. Stilwell, "Decentralized Nested Gaussian Processes for Multi-Robot Systems," *IEEE International Conference on Robotics and Automation (**ICRA**)*, Xi'an, China, 2021.

[C3] Minas Liarokapis, **George P. Kontoudis**, "Teaching Robotic and Biomechatronic Concepts with a Gripper Design Project and a Grasping and Manipulation Competition," *IEEE International Conference on Robotics and Automation (**ICRA**)*, Xi'an, China, 2021.

[C4] **George P. Kontoudis**, Daniel J. Stilwell, "Prediction of Acoustic Communication Performance in Marine Robots Using Model-Based Kriging," *American Control Conference (**ACC**)*, New Orleans, USA, 2021.

[C5] Gal Gorjup, **George P. Kontoudis**, Anany Dwivedi, Geng Gao, Saori Matsunaga, Toshisada Mariyama, Bruce MacDonald, and Minas Liarokapis "Combining Programming by Demonstration with Path Optimization and Local Replanning to Facilitate the Execution of Assembly Tasks ," *IEEE International Conference on Systems, Man and Cybernetics (**SMC**)*, Toronto, Canada, 2020.

[C6] **George P. Kontoudis**, Zirui Xu, Kyriakos G. Vamvoudakis, "Online, Model-Free Motion Planning in Dynamic Environments: An Intermittent, Finite Horizon Approach with Continuous-Time Q-Learning," *American Control Conference (**ACC**)*, Denver, USA, 2020.

[C7] **George P. Kontoudis**, Daniel J. Stilwell, "A Comparison of Kriging and Cokriging for Estimation of Underwater Acoustic Communication Performance," *ACM International Conference on Underwater Networks and Systems (**WuWNet**)*, Atlanta, USA, 2019.

[C8] **George P. Kontoudis**, Minas Liarokapis, Kyriakos G. Vamvoudakis, "An Adaptive, Humanlike Robot Hand with Selective Interdigitation: Towards Robust Grasping and Dexterous, In-Hand Manipulation," *IEEE-RAS International Conference on Humanoid Robots (**Humanoids**)*, Toronto, Canada, 2019.

[C9] **George P. Kontoudis**, Minas Liarokapis, Kyriakos G. Vamvoudakis, "A Compliant, Underactuated Finger for Anthropomorphic Hands," *IEEE/RAS-EMBS Inter. Conference on Rehabilitation Robotics (**ICORR**)*, Toronto, Canada, 2019.

[C10] **George P. Kontoudis**, Kyriakos G. Vamvoudakis, "Robust Kinodynamic Motion Planning using Model-Free Game-Theoretic Learning," *American Control Conference (**ACC**)*, Philadelphia, USA, 2019.

[C11] Kyriakos D. Tsoukalas, **George P. Kontoudis**, Kyriakos G. Vamvoudakis, "Active-Bayesian Learning for Cooperation Connectivity in Dynamic Cyber-Physical-Human Systems," *IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning (**ADPRL**)*, Honolulu, USA, 2017.

[C12] **George P. Kontoudis**, Minas Liarokapis, Agisilaos G. Zisimatos, Christoforos I. Mavrogiannis, Kostas J. Kyriakopoulos, "Open-Source, Anthropomorphic, Underactuated Robot Hands with a Selectively Lockable Differential Mecha-

nism: Towards Affordable Prostheses," *IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, Hamburg, Germany, 2015.

Theses [T3]

[T1] **George P. Kontoudis**, "Communication-Aware, Scalable Gaussian Processes for Decentralized Exploration," *Doctoral Dissertation, Virginia Tech*, USA, December 2021.

[T2] **George P. Kontoudis**, "Adaptive, Anthropomorphic Robot Hands for Grasping and In-Hand Manipulation," *Master Thesis, Virginia Tech*, USA, December 2018.

[T3] **George P. Kontoudis**, "Design and Development of an Underactuated, Anthropomorphic Robot Hand," *Diploma Thesis, National Technical University of Athens*, March 2016. *(in Greek)*

Technical Reports [R2]

[R1] **George P. Kontoudis**, Minas Liarokapis, Agisilaos G. Zisimatos, Christoforos I. Mavrogiannis, Kostas J. Kyriakopoulos, "How to Create Affordable, Anthropomorphic, Light-Weight Prosthetic Hands," *Control Systems Lab, National Technical University of Athens,* Athens, Greece, October 2015.

[R2] Agisilaos G. Zisimatos, Minas Liarokapis, Christoforos I. Mavrogiannis, **George P. Kontoudis**, Kostas J. Kyriakopoulos, "How to Create Affordable, Modular, Light-Weight, Underactuated, Compliant Robot Hand," *Control Systems Lab, National Technical University of Athens,* Athens, Greece, January 2015.

TALKS & PRESENTATIONS

- "Communication-Aware, Scalable Gaussian Processes for Decentralized Exploration" *Bradley Department of Electrical and Computer Engineering, Virginia Tech*, Blacksburg, USA, December 2021. **[PhD Defense]**
- "Decentralized Nested Gaussian Processes for Multi-Robot Systems," *IEEE International Conference on Robotics and Automation (**ICRA**)*, Xi'an, China, 2021. **[Virtual Presentation]**
- "Online, Model-Free Motion Planning in Dynamic Environments: An Intermittent, Finite Horizon Approach with Continuous-Time Q-Learning," *American Control Conference (**ACC**)*, Denver, USA, 2020. **[Rapid-Interactive Presentation]**
- "A Comparison of Kriging and Cokriging for Estimation of Underwater Acoustic Communication Performance," *ACM International Conference on Underwater Networks and Systems (**WuWNet**)*, Atlanta, USA, 2019. **[Oral Presentation]**
- "An Adaptive, Humanlike Robot Hand with Selective Interdigitation: Towards Robust Grasping and Dexterous, In-Hand Manipulation," *Workshop on New Challenges in Humanoid Grasping and Manipulation in IEEE-RAS International Conference on Humanoid Robots (**Humanoids**)*, Toronto, Canada, 2019. **[Oral Presentation - Invited Talk]**
- "An Adaptive, Humanlike Robot Hand with Selective Interdigitation: Towards Robust Grasping and Dexterous, In-Hand Manipulation," *IEEE-RAS International Conference on Humanoid Robots (**Humanoids**)*, Toronto, Canada, 2019. **[Poster Presentation]**
- "Robust Kinodynamic Motion Planning using Model-Free Game-Theoretic Learning," *American Control Conference (**ACC**)*, Philadelphia, USA, 2019. **[Oral Presentation]**
- "A Compliant, Underactuated Finger for Anthropomorphic Hands," *IEEE/RAS-EMBS International Conference on Rehabilitation Robotics (**ICORR**)*, Toronto, Canada, 2019. **[Poster Presentation]**
- "Adaptive, Anthropomorphic Robot Hands for Grasping and In-Hand Manipulation," *Department of Mechanical Engineering, Virginia Tech*, Blacksburg, USA, December 2018. **[Master's Defense]**
- "Evaluation Strategies of Adaptive, Anthropomorphic Robot Hands for Dexterous In-Hand Manipulation: Early Results," *National Institute of Standards and Technology (**NIST**)*, USA, 2018. **[Invited Talk]**
- "Open-Source, Anthropomorphic, Underactuated Robot Hands with a Selectively Lockable Differential Mechanism: Towards Affordable Prostheses," *IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, Hamburg, Germany, 2015. **[Oral Presentation]**

SERVICE ACTIVITIES

Conference Organizing Committees

- Online Platform Chair, Conference on Robot Learning (CoRL) *2022*

Reviewer, Journals

- IEEE Transactions on Neural Networks and Learning Systems *2019–2021*
- IEEE Transactions on Robotics *2020*
- IEEE Transactions on Automation Science and Engineering *2020, 2021*
- IEEE Transactions on Cybernetics *2020*
- IEEE Transactions on Systems, Man and Cybernetics: Systems *2021*
- IEEE Computational Intelligence Magazine *2020*
- IEEE Control Systems Letters *2019, 2020*
- IEEE Robotics and Automation Letters *2019*
- Frontiers in Artificial Intelligence *2021*
- Journal of Optimization Theory and Applications *2021*
- International Journal of Advanced Robotic Systems *2015, 2016*

Reviewer, Conferences

- American Control Conference (ACC) *2018–2021*
- IEEE International Conference on Robotics and Automation (ICRA) *2018–2022*
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) *2018–2020*
- IEEE Conference on Decision and Control (CDC) *2019, 2020*
- IEEE International Conference on Automation Science and Engineering (CASE) *2019*
- IEEE-RAS International Conference on Humanoid Robots (Humanoids) *2019*
- IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob) *2018, 2020, 2021*
- European Control Conference (ECC) *2022*
- Mediterranean Conference on Control and Automation (MED) *2018*

Memberships

- IEEE, Student Member *2015–present*
- ASME, Student Member *2016–present*
- SIAM, Student Member *2019–present*

MENTORING

PhD Students

- Joshua Netter, Georgia Institute of Technology *2020–present*
  Advisor: Kyriakos G. Vamvoudakis

Master's Students

- Zirui Xu, Georgia Institute of Technology *2018–2020*
  Advisor: Kyriakos G. Vamvoudakis
  Currently: PhD student, University of Michigan

RELEVANT GRADUATE COURSEWORK (VIRGINIA TECH)

Control	AOE5244: Optimization Techniques, AOE5984-SS: Cyber-Physical Systems & Distributed Control, AOE5774: Nonlinear Systems Theory, AOE6544: Linear Control Theory, ME6574: Adaptive Control Systems
Robotics	ECE5984-SS: Advanced Robot Motion Planning, ME5984-SS: Advanced Experimental Robotics, ME5524: Bayesian Robotics, ECE5984-SS: Autonomous Coordination, ME5984-SS: Motion Planning Analysis
Dynamics	AOE5204: Vehicle Dynamics & Control
Mathematics	MATH5414: Model Reduction of Dynamical Systems, MATH3324: Advanced Calculus
Others	STAT5544: Spatial Statistics, AOE5984: Scientific Machine Learning & Uncertainty Quantification ECE5644: Game Theory for Communication Networks