

Seth Karten

Curriculum Vitae

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Education

- 2023–2027 **PhD, Computer Science**, *Princeton University*, Princeton, NJ.
(expected) - Advisor: Chi Jin.
- 2021–2023 **Master of Science, Robotics (Research)**, *Carnegie Mellon University (CMU)*, Pittsburgh, PA.
- GPA: 4.24/4.00
- Committee: Katia Sycara, Fei Fang, and Benjamin Freed.
Thesis: *Emergent Communication and Decision-Making in Multi-Agent Teams*
- 2017–2020 **Bachelor of Science, Computer Science**, *Rutgers University, The State University of New Jersey*, New Brunswick, NJ.
- GPA: 3.89/4.00; Honors Computer Science; Summa Cum Laude; Minor: Mathematics
- Advisor: Kostas Bekris.
Research: *Learning Motion Primitives for Continual Kinodynamic Motion Planning*

Research Interests

I am interested in a myriad of topics related to artificial intelligence, machine learning, reinforcement learning, and game theory. More specifically, I am interested in decentralized multi-agent teams and open-ended reinforcement learning.

Research Experience

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|--------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 2023–Present | PhD Candidate,
- Advisor: Chi Jin | Princeton University.
Department of Computer Science. |
| 2021–2023 | Masters Student (24 Months),
- Advisor: Katia Sycara | Carnegie Mellon University.
Robotics Institute. |
| 03/2021 | Applied Scientist (6 Months),
- Mentor: Kostas Bekris; Supervisor: Michael Wolf | Amazon.
Robotics AI. |
| 2018–2021 | Undergraduate Student (30 months),
- Advisor: Kostas Bekris | Rutgers University.
Department of Computer Science. |
| 05/2020 | Visiting Researcher (4 Months),
- Advisor: Katia Sycara | Carnegie Mellon University.
Robotics Institute. |
| 2017–2018 | Undergraduate Student (13 months),
- Advisor: Dario Pompili | Rutgers University.
Department of Electrical and Computer Engineering. |
| 06/2016 | Visiting Researcher (3 months),
- Advisor: Ioannis Kymissis | Columbia University.
Department of Electrical Engineering. |

Honors and Awards

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| 2023 | National Science Foundation Graduate Research Fellowship (5 years), | <i>NSF.</i> |
| 2023 | Francis Robbins Upton Fellow (5 years), | <i>Princeton.</i> |
| 2021 | CMU Robotics Institute Research Assistantship (2 years), | <i>CMU.</i> |
| 2019 | C. Greg Hagerty Artificial Intelligence Award (1 recipient in Department of Computer Science), | <i>Rutgers.</i> |
| 2019 | Scarlet Scholarship, | <i>Rutgers.</i> |

- 2018 Engineering Continuing Student Academic Excellence Scholarship, Rutgers.
 2018 Aresty Fellow (4.5% acceptance), Rutgers.
 2017 Honors Academy Scholar, Rutgers.
 2017 James Dickson Carr Scholarship, Rutgers.
 2016 Liberty Science Center Partners in Science Fellow (9% acceptance), Columbia University.

Publications

Journal

- 2023 **Seth Karten**, Mycal Tucker, Huao Li, Siva Kailas, Michael Lewis, and Katia Sycara. Interpretable learned emergent communication for human-agent teams. *IEEE Transactions on Cognitive and Developmental Systems*, pages 1–1, 2023.

Conference

- 2023 **Seth Karten**, Mycal Tucker, Siva Kailas, and Katia Sycara. Towards true lossless sparse communication in multi-agent systems. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pages 7191–7197. IEEE, 2023.
- 2023 **Seth Karten**, Siva Kailas, and Katia Sycara. Emergent compositional concept communication through mutual information in multi-agent teams: Extended abstract. In *In Proc. of the 22nd International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2023)*, 2023.
- 2021 Aravind Sivaramakrishnan, Edgar Granados, **Seth Karten**, Troy McMahon, and Kostas E Bekris. Improving kinodynamic planners for vehicular navigation with learned goal-reaching controllers. In *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 9038–9043. IEEE, 2021.
- 2018 Mehdi Rahmati, **Seth Karten**, and Dario Pompili. Slam-based underwater adaptive sampling using autonomous vehicles. In *OCEANS 2018 MTS/IEEE Charleston*, pages 1–7. IEEE, 2018.

Workshop

- 2022 **Seth Karten**, Mycal Tucker, Huao Li, Siva Kailas, Michael Lewis, and Katia Sycara. Interpretable learned emergent communication for human-agent teams. *Workshop on Human Theory of Machines and Machine Theory of Mind for Human-Agent Teams at International Conference on Intelligent Robots and Systems (IROS)*, 2022.
- 2022 **Seth Karten**, Mycal Tucker, Siva Kailas, and Katia Sycara. Towards true lossless sparse communication in multi-agent systems. *Workshop on Deep Reinforcement Learning at Conference on Neural Information Processing Systems (NeurIPS)*, 2022.
- 2022 **Seth Karten** and Katia Sycara. Intent-grounded compositional communication through mutual information in multi-agent teams. *Workshop on Decision Making in Multi-Agent Systems at International Conference on Intelligent Robots and Systems (IROS)*, 2022.
- 2021 **Seth Karten**, Aravind Sivaramakrishnan, Edgar Granados, Troy McMahon, and Kostas E Bekris. Data-efficient learning of high-quality controls for kinodynamic planning used in vehicular navigation. In *Workshop on Machine Learning for Motion Planning at IEEE International Conference on Robotics and Automation (ICRA)*, 2021.

Media Coverage

- 03/2019 Undergraduates are Getting Published: Underwater Adaptive Sampling, Rutgers Press.
 05/2016 Mercury Astronomical Observations, The Suburban, NJ.

Teaching and Mentoring Experience

- 2023 Introduction to Reinforcement Learning, CMU RISS.

Undergraduate Student Mentorship

- 2022,2023 CMU NSF REU RISS, Mentor.
- 2022 CMU AI Mentorship Program, Mentor.

Curriculum Development

- 2018 ENG 294: Honors Design and Development I, Rutgers.
- 2018 ENG 396: Honors Design and Development II, Rutgers.

Elementary School Outreach

- 2017 Elementary School Science (45 students), Voorhees Elementary School.

Academic Service

Journal, Conference, and Workshop Reviewer (of Individual Papers)

- 2023 Neural Information Processing Systems (NeurIPS).
- 2022,2023 IEEE Transactions on Robotics (T-RO).
- 2022 The International Symposium on Robotics Research (ISRR).
- 2019 IEEE Robotics and Automation Letters (RA-L).
- 2019 Robotics: Science and Systems (RSS).
- 2019 Workshop on Algorithmic Foundations of Robotics (WAFR).

Conference Volunteering

- 2019 The 2nd IEEE International Symposium on Multi-robot and Multi-agent Systems.

Committees

- 2022, 2023 Teaching Innovation Award Committee, CMU.
- 2022, 2023 NSF REU: Robotics Institute Summer Scholars (RISS), CMU.
- 2022 Junior Science and Humanities Symposium, Rutgers.
- 2018 Governor's School of Engineering and Technology, Rutgers.

Student Government

- 2022, 2023 Graduate Student Assembly External Affairs Committee Member, CMU.
- 2022, 2023 Graduate Student Assembly Robotics Institute Representative, CMU.

Talks and Presentations

Presentations at Conferences

- 05/2023 **Emergent Compositional Concept Communication through Mutual Information in Multi-Agent Teams**, 22nd International Conference on Autonomous Agents and Multiagent Systems (AAMAS).
- 05/2023 **Towards true lossless sparse communication in multi-agent systems**, International Conference on Robotics and Automation (ICRA).
- 12/2022 **Towards true lossless sparse communication in multi-agent systems**, Workshop on Deep Reinforcement Learning at Conference on Neural Information Processing Systems (NeurIPS).
- 10/2022 **Intent-Grounded Compositional Communication through Mutual Information in Multi-Agent Teams**, Workshop on Decision Making in Multi-Agent Systems at International Conference on Intelligent Robots and Systems (IROS).
- 10/2022 **Interpretable Learned Emergent Communication for Human-Agent Teams**, Workshop on Human Theory of Machines and Machine Theory of Mind for Human-Agent Teams at International Conference on Intelligent Robots and Systems (IROS).

05/2021 **Data-Efficient Learning of High-Quality Controls for Kinodynamic Planning used in Vehicular Navigation**, Machine Learning for Motion Planning Workshop at International Conference on Robotics and Automation (ICRA).

Invited Talks

12/2021, Human-agent Teaming for Multi-agent Challenges, RISS CMU.
12/2022

10/2018 How to Excel in Undergraduate Research, Rutgers.

04/2018 Honors Design and Development Program Unveiling, Rutgers.

Undergraduate Research Symposiums

08/2020 A Machine Theory of Mind Approach to Agent Intervention , Robotics Institute Summer Scholars Symposium, CMU.

08/2018 Using Parallel Processing to Create Real-Time Insect Flight Simulations, Aresty Summer Science Research Symposium, Rutgers.

08/2016 Sensing Light: Determining Exact Red, Green, and Blue Values, Liberty Science Center Research Symposium, Columbia University.

Affiliations

IEEE. Robotics and Automation Society (RAS).

Relevant Coursework

Graduate

Machine Learning; Advanced Machine Learning for Game Theory; Embodied Learning; Reinforcement Learning; Natural Language Processing; Multi-Robot Coordination; Computer Vision; Robot Manipulation.

Undergraduate

Computational Robotics; Artificial Intelligence; Design and Analysis of Algorithms; Real Analysis; Operating Systems; Numerical Analysis; Computer Graphics; Brain-Inspired Computing; Theory of Probability.

Summer Schools

2023 CIFAR Deep Learning + Reinforcement Learning Summer School.