Stephanie Milani

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Research Interests

Reinforcement learning, interpretability and explainability, AI evaluation and measurement, AI transparency, human-AI interaction, sequential decision-making.

Education

2019–Present	**Carnegie Mellon University**.
	Ph.D. Candidate in Machine Learning.
	Advisor: Fei Fang.
	Committee: Fei Fang, Hong Shen, Geoffrey J. Gordon, Katja Hofmann, & Oriol Vinyals.
2021	**Carnegie Mellon University**.
	M.S. in Machine Learning Research.
2019	**University of Maryland, Baltimore County**.
	B.S. in Computer Science, B.A. in Psychology. *Cum Laude.* Honors College Certificate. Presidential Scholar.
	Advisors: Marie desJardins and Cynthia Matuszek.

Research Experience

2019–Present	**Carnegie Mellon University**, *Machine Learning Department.*
	Graduate Researcher advised by Fei Fang.
2022	**Microsoft Research, Montreal**, *Reinforcement Learning Group.*
	Ph.D. Research Intern advised by Geoffrey J. Gordon.
2021	**Microsoft Research, Cambridge**, *Deep Reinforcement Learning for Games Group.*
	Ph.D. Research Intern advised by Katja Hofmann and Harm van Seijen.
2019	**Carnegie Mellon University**, *Robotics Institute.*
	Post-Bacc Research Intern advised by David Held.
2018–2019	**Carnegie Mellon University**, *Robotics Institute.*
	Undergraduate Research Intern advised by Katia Sycara, *Robotics Institute Summer Scholars Program.* Supported by NSF REU.
	University of Maryland, Baltimore County, *Computer Science and Electrical Engineering.*
	Undergraduate Research Assistant advised by Cynthia Matuszek. *URA Scholar.*
2016–2019	**University of Maryland, Baltimore County**, *Computer Science and Electrical Engineering.*
	Undergraduate Research Assistant advised by Marie desJardins.
2017	**Carnegie Mellon University**, *Robotics Institute.*
	Undergraduate Research Intern advised by Christoph Mertz, *Robotics Institute Summer Scholars Program.*
2014–2016	**University of Maryland, School of Medicine**, *Neurobiology Department.*
	Undergraduate Research Assistant advised by Jennifer Wenzel.

Publications

* denotes equal contribution.

Book Chapters

[1] **S. Milani**, Z. Zhang, N. Topin, Z. R. Shi, C. Kamhoua, E. E. Papalexakis, F. Fang. Interpretable Multi-Agent Reinforcement Learning with Decision-Tree Policies. *Explainable Agency in Artificial Intelligence, CRC Press / Taylor & Francis*, 2024.

Refereed Publications

[1] M. Phan, K. Brantley, **S. Milani**, S. Mehri, G. Swamy, G. Gordon. When is Transfer Learning Possible? *International*

Conference on Machine Learning (ICML), 2024. *27.5% acceptance*.

[2] A. Venugopal, **S. Milani**, F. Fang, B. S. Ravindran. MABL: Bi-Level Latent-Variable World Model for Sample-Efficient Multi-Agent Reinforcement Learning. *International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, 2024. *25% acceptance*.

[3] **S. Milani**, N. Topin, M. Veloso, F. Fang. Explainable Reinforcement Learning: A Survey and Comparative Review. *ACM CSUR Special Issue on Trustworthy AI*, 2024.

[4] **S. Milani**, A. Kanervisto, K. Ramanauskas, S. Schulhoff, B. Houghton, R. Shah. The MineRL BASALT Evaluation and Demonstrations Dataset for Training and Benchmarking Agents that Solve Fuzzy Tasks. *Neural Information Processing Systems (NeurIPS) Benchmarks & Datasets Track*, 2023. **Oral Presentation**, *1% acceptance.*

[5] **S. Milani**, A. Juliani, I. Momennejad, R. Georgescu, J. Rzpecki, A. Shaw, G. Costello, F. Fang, S. Devlin, K. Hofmann. Navigates Like Me: Understanding How People Evaluate Human-Like AI in Video Games. *ACM Conference on Human Factors in Computing Systems (CHI)*, 2023. *27.7% acceptance*.
Previous versions in NeurIPS Workshop on Human-Centered AI, 2021; CHI Late Breaking Work, 2022.

[6] M. Carroll, O. Paradise, J. Lin, R. Georgescu, M. Sun, D. Bignell, **S. Milani**, K. Hofmann, M. Hausknecht, A. Dragan, S. Devlin. Uni[MASK]: Unified Inference in Sequential Decision Problems. *Neural Information Processing Systems (NeurIPS)*, 2022. **Oral Presentation**, *1.9% acceptance.*
Previous version in ICLR Workshop on Generalizable Policy Learning in the Physical World, 2022.

[7] Y. Du, Z. Song, **S. Milani**, C. Gonzalez, F. Fang. Learning to Play Adaptive Cyber Deception Game. *The 13th Workshop on Optimization and Learning in Multiagent Systems at the International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2022.

[8] **S. Milani***, Z. Zhang*, N. Topin, Z. R. Shi, C. Kamhoua, E. Papalexakis, F. Fang. MAVIPER: Learning Decision Tree Policies for Interpretable Multi-Agent Reinforcement Learning. *European Conference on Machine Learning (ECML)*, 2022. *26% acceptance*.
Previous version in AAAI Explainable Agency in AI Workshop, 2022, **Invited for book chapter**.

[9] N. Topin, **S. Milani**, F. Fang, M. Veloso. Iterative Bounding MDPs: Learning Interpretable Policies via Non-Interpretable Methods. *AAAI Conference on Artificial Intelligence*, 2021. *21% acceptance*.

[10] **S. Milani***, Z. Fan*, S. Gulati, T. Nguyen, F. Fang, A. Yadav. Intelligent Tutoring Strategies for Students with Autism Spectrum Disorder: A Reinforcement Learning Approach. *AAAI Conference on Artificial Intelligence (AAAI) Workshop on AI for Education*, 2020.
Also accepted for lightning talk at the CMU Symposium on AI and Social Good, 2020.

[11] **S. Milani**, W. Shen, K. S. Chan, S. Venkatesan, N. O. Leslie, C. Kamhoua, F. Fang. Harnessing the Power of Deception in Attack Graph Games. *Conference on Decision and Game Theory for Security (GameSec)*, 2020.

[12] J. Winder, **S. Milani**, M. Landen, E. Oh, S. Parr, S. Squire, M. desJardins, C. Matuszek. Planning with Abstract Learned Models While Learning Transferable Subtasks. *AAAI Conference on Artificial Intelligence*, 2020. *20.6% acceptance*.
Previous versions in ICAPS IntEx Workshop, 2017; RLDM, 2017; and Do Good Robotics Symposium, 2019.

[13] B. Houghton, **S. Milani**, N. Topin, W. H. Guss, K. Hofmann, D. Perez-Liebana, M. Veloso, R. Salakhutdinov. Guaranteeing Reproducibility in Deep Learning Competitions. *Neural Information Processing Systems (NeurIPS) Challenges in Machine Learning (CiML) Workshop*, 2019.

[14] **S. Milani**, N. Topin, K. Sycara. Penalty-Modified Markov Decision Processes: Efficient Incorporation of Norms into Sequential Decision Making Problems. *Multidisciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2019.

[15] H. Li, **S. Milani**, V. Krishnamoorthy, M. Lewis, K. Sycara. Perceptions of Domestic Robots' Normative Behavior Across Cultures. *AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES)*, 2019.

Refereed Competition Papers and Proceedings

[1] **S. Milani**, A. Kanervisto*, K. Ramanauskas*, S. Schulhoff, B. Houghton, S. Mohanty, B. Galbraith, K. Chen, Y. Song, T. Zhou, B. Yu, H. Liu, K. Guan, Y. Hu, T. Lv, F. Malato, F. Leopold, A. Raut, V. Hautamäki, A. Melnik,

S. Ishida, J. F. Henriques, R. Klassert, W. Laurito, E. Novoseller, V. G. Goecks, N. Waytowich, D. Watkins, J. Miller, R. Shah. Towards Solving Fuzzy Tasks with Human Feedback: A Retrospective of the MineRL BASALT 2022 Competition. To appear in *PMLR: NeurIPS 2022 Competition and Demonstration Track*, 2024.

[2] A. Kanervisto, **S. Milani**, K. Ramanauskas, B. V. Galbraith, S. H. Wang, B. Houghton, S. Mohanty, R. Shah. The MineRL BASALT Competition on Learning from Human Feedback. *Conference on Neural Information Processing Systems (NeurIPS) Competition Track*, 2022.

[3] R. Shah, S. H. Wang, C. Wild, **S. Milani**, A. Kanervisto, V. G. Goecks, N. Waytowich, D. Watkins-Valls, B. Prakash, E. Mills, D. Garg, A. F. Fries, A. Souly, J. S. Chan, D. del Castillo, T. Lieberum. Retrospective on the 2021 BASALT Competition on Learning from Human Feedback. *PMLR: NeurIPS 2021 Competition and Demonstration Track*, 2022.

[4] A. Kanervisto*, **S. Milani***, K. Ramanauskas, N. Topin, Z. Lin, J. Li, J. Shi, D. Ye, Q. Fu, W. Yang, W. Hong, Z. Huang, H. Chen, G. Zeng, Y. Lin, V. Micheli, E. Alonso, F. Fleuret, A. Nikulin, Y. Belousov, O. Svidchenko, A. Shpilman. MineRL Diamond 2021 Competition: Overview, Results, and Lessons Learned. *PMLR: NeurIPS 2021 Competition and Demonstration Track*, 2022.

[5] W. H. Guss, A. Dirik*, B. V. Galbraith*, B. Houghton*, A. Kanervisto*, N. S. Kuno*, **S. Milani***, S. Mohanty*, K. Ramanauskas*, R. Salakhutdinov*, R. Shah*, N. Topin*, S. H. Wang*, C. Wild*. The MineRL Diamond Competition on Sample Efficient Reinforcement Learning. *Conference on Neural Information Processing Systems (NeurIPS) Competition Track*, 2021.

[6] R. Shah, C. Wild, S. H. Wang, N. Alex, B. Houghton, W. H. Guss, **S. Milani**, N. Topin, P. Abbeel, S. Russell, A. Dragan. The MineRL BASALT Competition on Learning from Human Feedback. *Conference on Neural Information Processing Systems (NeurIPS) Competition Track*, 2021.

[7] W. H. Guss, **S. Milani**, N. Topin, B. Houghton, S. Mohanty, A. Melnik, A. Harter, B. Buschmaas, B. Jaster, C. Berganski, D. Heitkamp, M. Henning, H. Ritter, C. Wu, X. Hao, Y. Lu, H. Mao, Y. Mao, C. Wang, M. Opanowicz, A. Kanervisto, Y. Schraner, C. Scheller, X. Zhou, L. Liu, D. Nishio, T. Tsuneda, K. Ramanauskas, G. Juceviciute. Towards robust and domain agnostic reinforcement learning competitions: MineRL 2020. *PMLR: NeurIPS 2020 Competition and Demonstration Track*, 2021.

[8] W. H. Guss, S. Devlin*, B. Houghton*, N. S. Kuno*, **S. Milani***, S. Mohanty*, R. Salakhutdinov*, J. Schulman*, N. Topin*, O. Vinyals*. NeurIPS 2020 Competition: The MineRL Competition on Sample Efficient Reinforcement Learning using Human Priors. *Conference on Neural Information Processing Systems (NeurIPS) Competition Track*, 2020.

[9] **S. Milani**, N. Topin, B. Houghton, W. H. Guss, S. P. Mohanty, O. Vinyals, N. S. Kuno. A Retrospective Analysis of the 2019 MineRL Competition on Sample-Efficient Reinforcement Learning Using Human Priors. *PMLR: NeurIPS 2019 Competition and Demonstration Track*, 2020.

[10] W. H. Guss, C. Codel*, K. Hofmann*, B. Houghton*, N. S. Kuno*, **S. Milani***, S. Mohanty*, D. Perez-Liebana*, R. Salakhutdinov*, N. Topin*, M. Veloso*, and P. Wang*. The MineRL Competition on Sample Efficient Reinforcement Learning using Human Priors. *Conference on Neural Information Processing Systems (NeurIPS) Competition Track*, 2019.

Technical Reports

[1] **S. Milani**. Penalty-Modified Abstract Markov Decision Processes. *Technical Report for Undergraduate Research Award, UMBC*, 2019.

[2] **S. Milani**. Creating a Scalable Framework for Model-Free Reinforcement Learning in Norm-Rich Environments. *Robotics Institute Summer Scholars Working Papers Journal*, 2018.

[3] **S. Milani** and C. Mertz. Generating Hard Positive Examples via Adversary for Occluded Traffic Sign Detection. *Robotics Institute Summer Scholars Working Papers Journal*, 2017.

Honors and Awards . . . .

Research

2024 **Future Leader in Responsible Data Science & AI**, UMichigan Institute for Data Science.
Selected as 1 of around 40 outstanding data science and AI researchers.

2023	**NeurIPS Scholar Award**
	Graduate Student Travel Grant, Carnegie Mellon University.
	$750 USD to attend CHI 2023.
2022	**ECML PhD Registration Grant**, 17% acceptance.
	AAAI Student Scholarship
2019	**RLDM Travel Award**.
	ICML Travel Award.
	NeurIPS Travel Award.
	Top Reviewer Award, ICML.
	Awarded to top 33% of all reviewers.
2018–2019	**Undergraduate Research Award**, University of Maryland, Baltimore County.
	Selective $1500 USD scholarship to support original undergraduate research with a faculty mentor. 1 of 55 total awarded.
2018	**Inclusion@RSS Scholar**
	Oracle Scholar, OurCS Workshop.
	1 of 102 chosen nationally to attend OurCS research workshop. Of those, one of a select group of participants designated as Oracle Scholar.
	Researcher of the Week, University of Maryland, Baltimore County.
2017	**Researcher of the Week**, University of Maryland, Baltimore County.
	Women in Transportation Fellow, Traffic 21.
	1 of 1 awarded to support RISS internship.

Academic and Service

2021	**Funding Proposal for MineRL BASALT**, AIJ.
	*Awarded to R. Shah, C. Wild, S. H. Wang, N. Alex, B. Houghton, W. H. Guss, **S. Milani**, N. Topin, P. Abbeel, S. Russell, A. Dragan.*
2020	**Inclusivity Compute and Conference Grants for MineRL Competition at NeurIPS**, AIJ.
	*Awarded €7,500 to **S. Milani**, N Topin.*
2019	**Inclusivity Travel Grants for MineRL Competition and Workshop at NeurIPS**, AIJ.
	*Awarded €3,000 to **S. Milani**, N. Topin.*
	Community Service Award, University of Maryland, Baltimore County Honors College.
	1 of 4 awarded at UMBC for strong academic performance and outstanding community service.
	Grace Hopper Student Scholar, Grace Hopper Conference.
	Funded by Palo Alto Networks to attend Grace Hopper Conference. 1 of 657 awarded nationally.
2018–2019	**Rewriting the Code Fellow**
	Newman Civic Fellow, Campus Compact.
	1 of 268 awarded nationally for leadership and dedication to increasing access to computer science. Nominated by the President of UMBC, Dr. Freeman Hrabowski.
2017–2019	**NAE Grand Challenge Scholar**, University of Maryland, Baltimore County.
	1 of 7 students selected in yearly cohort to focus on finding solutions to address important societal problems.
2017–2018	**France-Merrick Scholar**, UMBC.
	1 of 7 awarded. For commitment to leadership and service in computer science and artificial intelligence.

Professional and Community Service

Organizing

2023	**WiML Un-Workshop**, *Logistics Chair*, ICML.
	WiML Un-Workshop, *Co-Organizer of Evening Social*, ICML.
	With A. Bunnell.

2022	**MineRL BASALT Competition on Fine-Tuning from Human Feedback**, *Workshop Co-Organizer and Panel Moderator*, NeurIPS.
	Panelists: Kianté Brantley, Sam Devlin, Fei Fang, Oriol Vinyals.
2021–2022	**MineRL BASALT Competition on Learning from Human Feedback**, *Competition Organizer*, NeurIPS.
	2022: With A. Kanervisto, K. Ramanauskas, B. V. Galbraith, S. H. Wang, S. Schulhoff, B. Houghton, S. P. Mohanty, R. Shah.
	2021: With R. Shah, C. Wild, S. H. Wang, N. Alex, B. Houghton, W. H. Guss, S. P. Mohanty, A. Kanervisto, N. Topin, P. Abbeel, S. Russell, A. Dragan.
2019–2021	**MineRL Competition on Sample-Efficient Reinforcement Learning**, Competition Organizer.
2021	**Minecraft as a Research Platform for RL**, *Workshop Organizer*, MSR Research Summit.
	With E. Zuniga.
2017–2018	**Meet Your Professor Speaker Series**, *Seminar Organizer*. UMBC.

Reviewing

	AAMAS Workshop on Reinforcement Learning in Games, *2024*.
	ICML, *2024, 2023, 2022, 2021, 2020*.
	NeurIPS, *2023*.
	AAAI PC Member of Student Program, *2023*.
	GameSec, *2022*.
	AAMAS Workshop on Autonomous Agents for Social Good, *2022*.
	Cooperative AI Foundation Proposal, *2021*.
	NeurIPS Competition Track, *2021*.
	ICLR, *2020*.
	AAAI, *2020*.
	Game Theory and Machine Learning for Cyber Security (Book Chapter Reviewer), *2020*.
	AAAI Workshop on Diversity in Artificial Intelligence, *2020*.
	ICML Workshop on AI for Social Good, *2019*.
	ICLR Workshop on AI for Social Good, *2019*.
	RISS Working Papers Journal, *2018, 2017*.

Academic and Departmental Service

2023–2024	**Carnegie Mellon University Machine Learning PhD Admissions Committee**.
2022–2023	**Carnegie Mellon University Machine Learning PhD Admissions Committee**.
2021–2022	**Carnegie Mellon University Machine Learning PhD Admissions Committee**.
2020–2021	**Carnegie Mellon University Machine Learning Master's Admissions Committee**.
2020	**Carnegie Mellon University RISS Admissions Committee**.
2018	**RISS Working Papers Journal**, Assistant Managing Editor. CMU.
2017	**RISS Working Papers Journal**, Assistant Managing Editor. CMU.

Outreach

2023, 2020	**CMU Graduate Application Support Program (GASP)**, Mentor.
	Supported student now PhD student at the University of Cambridge.
2019–2021	**CMU AI Mentorship Program**, Mentor.
2019	**Steel City Showdown FIRST Robotics Competition**, Referee and Volunteer.
	Rewriting the Code Alumni Office Hours, Mentor.
	Dedicated 30 min/week to provide career and academic advice to female undergrads.
2016-2019	**UMBC Computer Science Education**, Vice President (2016-2017), President (2017-2018), Treasurer (2018-2019).
2017	**Creative Coders**, Co-founder. Co-founded program to introduce middle-school students to CS.

QuHacks Hackathon at UMBC, Organizer.
Organized day-long hackathon for appx. 100 high-school and middle-school students.

North County High School Computer Science Classes, Co-presenter.
Presented on various CS topics to high school students.

2017, 2016 **Hour of Code at UMBC**, Organizer and Volunteer.
Organized and volunteered during two-day-long Hour of Code events on CS and AI.

▬▬▬ Invited Talks and Events. . . . .

Does not include contributed conference or workshop talks.

2024 **Guest Lecture**, 17-537/17-737 AI Methods for Social Good at Carnegie Mellon University.
Explainable AI for Social Good.

2023 **Invited Speaker**, Miao Embodied AI Lab at the University of Connecticut.
Human-Interpretable Reinforcement Learning.

Invited Speaker, Berkeley Multi-Agent Learning Seminar.
Human-Interpretable Multi-Agent Reinforcement Learning.

Invited Speaker, AMD.
Navigates Like Me: Understanding How People Evaluate Human-Like AI in Video Games.

Invited Speaker, University of Maryland Multi-Agent Reinforcement Learning Seminar.
Human-Interpretable Multi-Agent Reinforcement Learning.

Selected Hot Desk Demo, CHI Interactivity.
Navigates Like Me: Understanding How People Evaluate Human-Like AI in Video Games.

2022 **Invited Speaker**, Women in AI Ignite at NeurIPS.
Human-Centered Multi-Agent Systems: Learning from and for People.

Invited Panelist, Machine Learning Graduate Student Panel, Carnegie Mellon University Robotics Institute Summer Scholars Program.

2021 **Invited Speaker**, Microsoft Research AI and Gaming Research Summit.
The MineRL 2020 Competition on Sample Efficient Reinforcement Learning using Human Priors.

Invited Panelist, Microsoft Research AI and Gaming Research Summit.

Invited Panelist, Graduate School Application Support, Carnegie Mellon University Robotics Institute Summer Scholars Program.

2020 **Invited Participant**, SOCML.
Doing 'cognitive neuroscience' on models - will it help us understand generalization?.

Invited Participant, SOCML.
Deep Reinforcement Learning.

Invited Speaker, The Campus Laboratory School at Carlow University Career Day.
Sustainability through Computer Science.

2019 **Invited Panelist**, RISS Orientation, Carnegie Mellon University Robotics Institute Summer Scholars Program.

2018 **Invited Participant**, CCC AI Roadmap Workshop: Integrated Intelligence. Sole undergraduate student. *Resulted in A 20-Year Community Roadmap for AI Research in the US.*

▬▬▬ Teaching Experience and Preparation . . . .

2024–Present **Eberly Future Faculty Program, CMU**, *Participant.*

2024–Present **Machine Learning with Large Datasets (10-405/10-605), CMU**, *Co-Head Teaching Assistant.*
Instructors: Geoff Gordon and Ameet Talwalkar.

2021 **Historical Advances in Machine Learning (10-777), CMU**, *Teaching Assistant.*
Instructor: Aaditya Ramdas.

2017–2018 **Creative Coders**, Curriculum Developer.

Developed curriculum for middle-school students to learn CS concepts.

2016–2017 **Computer Science Matters in Maryland**, Curriculum Developer.

━━━━ Affiliations . . . .

SIGCHI, Rewriting the Code Alumni, AAAI, ACM.

━━━━ Selected Media Coverage . . . .

○ "How to design artificial intelligence that acts nice — and only nice," by Kathryn Hulick. Science News Explores. 2024.

○ "Security games reveal how networks can fool cyber attackers." U.S. Army DEVCOM Army Research Laboratory Public Affairs. 2020.

○ "MineRL sample-efficient reinforcement learning challenge—back for a second year—benefits organizers, as well as larger research community," by Noboru Sean Kuno. Microsoft Research Blog. 2020.

○ "AI takes on popular Minecraft game in machine-learning contest," by Jeremy Hsu. Nature Journal. 2019.

○ "Project Malmo competition returns with student organizers and a new mission: To democratize reinforcement learning," by Noboru Sean Kuno. Microsoft Research Blog. 2019.

○ "Traffic21's Women in Transportation Awardee Joining CMU's Machine Learning Ph.D. Program." Mobility21. 2019.

○ "Stephanie Milani named Newman Civic Fellow for expanding access to CS education," by Catalina Sofia Dansberger Duque. UMBC News. 2018.

○ "The Hour of Code Arrives at UMBC," by Declan Keefe. The Retriever. 2017.