Mohsen Ghaffari, Ph.D.

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Mohsen Ghaffari is a postdoctoral researcher in Computer Science at SQUARE group, IT-University of Copenhagen, Denmark. He received a PhD degree in Computer Science from ITU. His research focuses on using formal methods to improve the reliability, safety, and explainability of Reinforcement Learning. He also explores decision-making under uncertainty and the applications of Multi-Agent Reinforcement Learning in real-world problems, particularly in smart grids and route planning. Mohsen has published his research in top-tier conferences, such as *ICFP, FASE, SEAMS,* as well as leading journals such as *ESWA, CIE, ITEES, and UW*.

EDUCATION

2021 – 2024   **Ph.D. Computer Science, IT-University, Copenhagen, Denmark**
THESIS: *Testing and Symbolic Analysis For Reinforcement Learning*
ADVISORS: Andrzej Wąsowski, Mahsa Varshosaz

2015 – 2018   **M.Sc. Computer Science, IASBS, Zanjan, Iran**
THESIS: *Multi-Agent Reinforcement Learning of Load Shifting in the Smart Grid*
ADVISOR: Mohsen Afsharchi

2010 – 2014   **B.Sc. Computer Science, Tabriz University, Iran**

EMPLOYMENT HISTORY

2024 – CURR   **PostDoc.** ITU, Copenhagen, Denmark

2021 – 2024   **Ph.D.** ITU, Copenhagen, Denmark

2015 – 2016   **Lecturer.** ICDL and GEPS, Sadra Institute, Ardabil, Iran

SKILLS

LANGUAGES		TECHNICAL SKILLS			RESEARCH INTERESTS
AZERI	Native	JAVA	SPF	DReal	Reinforcement Learning
PERSIAN	Native	PYTHON	PyExZ3	Z3	Multi-Agent Systems
ENGLISH	Fluent	C	KLEE	CORAL	Game Theory
FRENCH	Basic	C++			Smart Grid
SPANISH	Basic	PROLOG			Formal Methods
DANISH	Basic	SCALA			

TEACHING EXPERIENCE

Aug 2022 – Jan 2024	Teacher Assistant for Advance Programming, MSc Course, ITU
Aug 2022 – Jan 2023	Teacher Assistant for Advance Programming, MSc Course, ITU
Mar 2017 – Jul 2017	Teacher Assistant for Multi-agent Systems, MSc Course, IASBS
Aug 2016 – Dec 2016	Teacher Assistant for Advance Artificial Intelligence, MSc Course, IASBS
Dec 2015 – Mar 2016	Teacher Assistant for Artificial Intelligence 2, BSc Course, IASBS
Sep 2012 – Dec 2020	Private Tutor for Computer Science Courses

SUPERVISION

MSc   **Amirhossein Sedaghatnia**, Multi-agent Deep Reinforcement Learning for Pickup and Delivery, IASBS, 2025

Cong Chen, Efficient Discrete Reinforcement Learning, ITU, 2024

Sepideh Bagheri: Multi-agent Reinforcement Learning for Police Patrolling, IASBS, 2022

BSc   **Julia Justyna Maziarz, Mathis Valentin Gravil, Sneha Shrestha**, Multi-agent Reinforcement Learning for Controlling Traffic Lights, ITU, 2024

Danyal Yorulmaz, Tobias Gad Spoorendonk, Multi-agent Reinforcement Learning for Search and Rescue Operation, ITU, 2024

MISCELLANEOUS EXPERIENCE

Awards and Achievements

2025	Distinguished Paper in ETAPS
2018	Second-Class Honor in Master Grade, IASBS, Iran
2017	Third Place in the Electric Power Ideas Competition, Iran
2015	Ranked 151st Among 10,000+ Candidates in Iran's Master's Entrance Exam for Computer Science
2010	Top 5% of 350,000+ Candidates in Iran's Bachelor's Entrance Exam

INSTRUCTIVE ACTIVITIES

2025	Organiser of the Reading Group for Information Theory, Inference, and Learning Algorithms
2024	Reviewer for International Conference on Automated Planning and Scheduling
	Participant in the Research Explorer Ruhr
	Reviewer for International Joint Conferences on Artificial Intelligence
2023	Participant in the Workshop on Verifiable and Robust AI Sønderborg, Denmark
	Participant in the REMARO Summer School Oslo
	Organiser of the Foundations of Probabilistic Programming course
2022	Participant in the Summer School on Privacy-Preserving Machine Learning
	Participant in the Summer School on SMT Solving and Automated Verification
2021 – Curr	Organiser of the SQUARE Seminars
2021 – 2023	Active Peer Reviewer for Applied Soft Computing Journal
	Active Peer Reviewer for Expert Systems With Applications Journal
	Active Peer Reviewer for Information Science Journal
2021	Participant in the EASE REMARO fall school
2015 – 2018	Member of the MAS-Lab, IASBS, Iran
	Member of the RoboCG-Lab, IASBS, Iran
2016	Participant in the Micro-grid and Smart Grid Power seminar, Energy Association, Iran
	Participant in the Winter School on Computational Geometry, Amirkabir, Iran
2013 – 2014	Member of Computer Science Scientific Society, Tabriz University, Iran
2012 – 2014	Chief Editor of ICS Magazine, Tabriz University, Iran
2007 & 2008	Participant in the Mathematical Olympiad, Ardabil, Iran

2007   Participant in the Astronomy Olympiad, Ardabil, Iran

RESEARCH PUBLICATIONS

Journal Articles

[1]   S. Bagheri, M. **Ghaffari**, and M. Davoodi, "Graph Transformation for Multi-agent Reinforcement Learning based Patrolling," *Under Review*, 2025.

[2]   E. H. Kim, M. **Ghaffari**, A. H. Høeg-Petersen, M. Goorden, T. D. Nielsen, K. G. Larsen, and A. Wsowski, "Minimizing Combined Sewer Overflows with Online Model-Predictive Reinforcement Learning," *Urban Water Journal (under review)*, 2024.

[3]   M. Davoodi and M. **Ghaffari**, "Learning-based systems for assessing hazard places of contagious diseases and diagnosing patient possibility," *Expert Systems with Applications*, vol. 213, p. 119 043, 2023. DOI: `10.1016/j.eswa.2022.119043`.

[4]   M. Davoodi and M. **Ghaffari**, "Shortest path problem on uncertain networks: An efficient two phases approach," *Computers & Industrial Engineering*, vol. 157, p. 107 302, 2021. DOI: `10.1016/j.cie.2021.107302`.

[5]   M. **Ghaffari** and M. Afsharchi, "Learning to shift load under uncertain production in the smart grid," *International Transactions on Electrical Energy Systems*, vol. 31, no. 2, e12748, 2021. DOI: `10.1002/2050-7038.12748`.

Peer Reviewed Conference Proceedings

[1]   M. **Ghaffari**, C. Chen, M. Varshosaz, E. B. Johnsen, and A. Wsowski, "Symbolic State Seeding Improves Coverage of Reinforcement Learning," in *20th International Conference on Software Engineering for Adaptive and Self-Managing Systems (SEAMS)*, 2025.

[2]   M. **Ghaffari**, M. Varshosaz, E. B. Johnsen, and A. Wsowski, "Symbolic State Partitioning for Reinforcement Learning," in *28th International Conference on Fundamental Approaches to Software Engineering (FASE)*, 2025. DOI: `https://doi.org/10.1007/978-3-031-90900-9_7`, **ETAPS 2025 Distingushed Paper**.

[3]   D. Yorulmaz, T. Gad Spoorendonk, M. **Ghaffari**, M. Varshosaz, and A. Wsowski, "Multi-Agent Reinforcement Learning for Search-and-Rescue with Cooperative Rotation Maneuver," in *Under Review*, 2024.

[4]   M. **Ghaffari**, M. Varshosaz, E. B. Johnsen, and A. Wsowski, "Using Symbolic Execution to Discretize State Spaces for Reinforcement Learning," in *Proceedings of the 34th Nordic Workshop on Programming Theory (NWPT)*, 2023.

[5]   M. Varshosaz, M. **Ghaffari**, E. B. Johnsen, and A. Wsowski, "Formal Specification and Testing for Reinforcement Learning," in *Proceedings of the ACM on Programming Languages*, vol. 7, ACM New York, NY, USA, 2023, pp. 125–158. DOI: `10.5281/zenodo.8083298`.

[6]   M. Varshosaz, M. **Ghaffari**, E. B. Johnsen, and A. Wsowski, "Towards Formal Specification of Reinforcement Learning," in *the 7th Workshop on Learning in Verification (LiVe)*, 2023.

TALKS

Future	Symbolic State Partitioning for Reinforcement Learning, Danish Digitalization, Data Science and AI, Nyborg, Denmark
2025	Fix-Point Partitioning of Reinforcement Learning State Space, SQUARE retreat, Sandbjerg, Denmark
	Symbolic State Partitioning for Reinforcement Learning, FASE 2025, Hamilton, Canada
	Symbolic State Seeding Improves Coverage Of Reinforcement Learning, SEAMS 2025, Ottawa, Canada
	Symbolic State Partitioning for Reinforcement Learning, ITU, Copenhagen, Denmark
	Symbolic State Seeding Improves Coverage Of Reinforcement Learning, ITU, Copenhagen, Denmark
	Testing and Symbolic Analysis For Reinforcement Learning, ITU, Copenhagen, Denmark
2024	Probabilistic Programming in Action: A Binomial Model for Predicting the Success Rate of Reinforcement Learning Algorithms, ITU, Copenhagen, Denmark
	Make a Safe Decision by Analysing the Environment, SQUARE retreat, Sandbjerg, Denmark
	Symbolic Reinforcement Learning, Ruhr University, Bochum, Germany
2023	Formal Specification and Testing for Reinforcement Learning, ITU, Copenhagen, Denmark
	Using Symbolic Execution to Discretize State Spaces for Reinforcement Learning, NWPT, Sweden
	Symbolic Reinforcement Learning, SQUARE retreat, Swinoujscie, Poland
2022	Symbolic Reinforcement Learning, ITU, Copenhagen, Denmark
	Formal Specification and Testing for Reinforcement Learning, DIREC, Copenhagen, Denmark
2021	Learning to Shift Load Under Uncertain Production in the Smart Grid, AAU, Aalborg, Denmark
2016	Arrangements and Duality (Super sampling in Ray Tracing), IASBS, Iran
	String Matching, IASBS, Iran
	Approximate Nash Equilibria in Anonymous Games, IASBS, Iran
	A Game Theoretic Approach to Energy Trading in the Smart Grid, IASBS, Iran
	Consensus-Based Decentralized Auctions for Robust Task Allocation, IASBS, Iran
	Load Shifting in the Smart Grid To Participate or Not, IASBS, Iran
	Normal Forms in Logic, IASBS, Iran
	Algebraic Techniques in Randomized Algorithms, IASBS, Iran
2015	Introduction to Cellular Automata, IASBS, Iran
2013	Introduction to Artificial Intelligence, Tabriz University, Iran
2012	Lecturer of Java Programming in Computer Science Conference, Tabriz University, Iran

REFERENCES

Andrzej Wąsowski (Ph.D. Supervisor)	IT-University of Copenhagen, wasowski@itu.dk
Mahsa Varshosaz (Ph.D. Supervisor)	IT-University of Copenhagen, mahv@itu.dk
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