

Mohsen Ghaffari, Ph.D.

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Mohsen Ghaffari holds a PhD in Computer Science from the IT University of Copenhagen, where he currently continues as a postdoctoral researcher. His research focuses on using formal methods—particularly symbolic execution—to improve the reliability, safety, and explainability of Reinforcement Learning, with a growing interest in integrating symbolic reasoning with learning-based approaches. He also investigates decision-making under uncertainty and applications of Multi-Agent Reinforcement Learning in real-world problems, especially in smart grids and planning. His application-oriented work emphasizes system modeling to improve generalization and adaptivity in learning systems. Mohsen has published in top-tier venues such as *ICFP*, *FASE*, *SEAMS*, and leading journals including *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	PYTHON	SPF	DReal	UPPAAL	Reinforcement Learning
PERSIAN	Native	JAVA	PyExZ3	Z3	PySWMM	Multi-Agent Systems
ENGLISH	Fluent	C/C++	KLEE	CORAL	SUMO	Game Theory
FRENCH	Basic	PROLOG	GDart			Smart Grid
SPANISH	Basic	SCALA	JFuzz			Formal Methods
DANISH	Basic	MATLAB				

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 Gravi**, **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

INSTRUCTIVE ACTIVITIES (CONTINUED)




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. Wąsowski, “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. 119043, 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. 107302, 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. Wąsowski, “Symbolic State Seeding Improves Coverage of Reinforcement Learning,” in *2025 IEEE/ACM 20th Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS)*, IEEE Computer Society, 2025, pp. 1–12.  DOI: 10.1109/SEAMS66627.2025.00009.
- [2] M. **Ghaffari**, M. Varshosaz, E. B. Johnsen, and A. Wąsowski, “Symbolic State Partitioning for Reinforcement Learning,” in *28th International Conference on Fundamental Approaches to Software Engineering (FASE)*, 2025.  DOI: 10.1007/978-3-031-90900-9_7, **ETAPS 2025 Distinguished Paper**.
- [3] D. Yorulmaz, T. Gad Spoorendonk, M. **Ghaffari**, M. Varshosaz, and A. Wąsowski, “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. Wąsowski, “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. Wąsowski, “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. Wąsowski, “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
Symbolic State Seeding Improves Coverage of Reinforcement Learning, 18th European Workshop on Reinforcement Learning (EWRL 2025), Tübingen, Germany
- 2025 Adversarial Behavior Exclusion for Safe Reinforcement Learning, ITU, Denmark
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

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|---------------------------------------------|-------------------------------------------------------|
| Andrzej Wąsowski (Ph.D. Supervisor) | IT-University of Copenhagen, wasowski@itu.dk |
| Mahsa Varshosaz (Ph.D. Supervisor) | IT-University of Copenhagen, mahv@itu.dk |
| Mansoor Davoodi Monfared (Co-author) | Ruhr-University of Bochum, m.davoodi-monfared@hzdr.de |