Marko RUMAN

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Curious PhD. student with deep knowledge in decision theory and advanced mathematics with a personal interest in state-of-the-art reinforcement learning and knowledge transfer.

EDUCATION

PRESENT JUN 2018	***Ph.D.* - Mathematical Engineering** State Doctoral Exam with honors Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Prague, Czech Republic
JUN 2018 SEP 2016	***MSc.* - Mathematical Engineering** GPA: 3.97 Magna cum laude Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Prague, Czech Republic
AUG 2016 SEP 2013	***BSc.* - Mathematical Engineering** GPA: 3.55 Magna cum laude Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Prague, Czech Republic

WORK EXPERIENCE

PRESENT JUL 2015	***Research Assistant* - Institute of Information Theory and Automation, Czech Academy of Sciences** • Co-authored 7 papers on reinforcement learning, learning of dynamic stochastic environments and modelling human decision making as Markov decision processes • Presented own research at conferences **NIPS**, **ICANN** and **ICCAIRO** • Developed a Python library implementing the researched universally approximating model of dynamic environments called Mixture Ratios • Recently developed a novel method for knowledge transfer in deep reinforcement learning • Participated as a team member of two international and four Czech research projects • Served as a member of the Organizing Committee of COST 2019 GAMENET Conference **Research interests** • Knowledge transfer in deep reinforcement learning • Bayesian learning of dynamic stochastic environments • Markov decision processes
JAN 2020 APR 2018	***Co-Founder* - Optimifica** • Developed a custom ML model for predicting customers' interest in specific products used by retail companies • Achieved 40% success rate when recommending 5 products for a new basket for retail companies with low-frequency customer base (2-3 visits per year on average) • Increased margin of retail companies by 5% by utilizing micro-targeted product recommendations produced by the custom ML model
APR 2018 OCT 2004	***ML and web development* - Freelancer** • Coded my first website when I was 12, worked on many machine learning and web development projects since then

TECHNICAL SKILLS

Python, PyTorch, MATLAB, C++, SQL, PHP, JavaScript, Svelte, Photoshop

AWARDS AND SCHOLARSHIPS

2014-2018	Scholarship for exceptional undergraduate students received through years 2014-2018
MAR 2022	Scholarship for passing the doctoral state exam with honors

OTHER ACTIVITIES

2019-2020	Teaching basics of C++ programming at Czech Technical University

Research Projects

2022-2026	*Dynamic distributed decision making: role of uncertainty* | EU-COST Action CA21169 Team member
2018-2021	*Distributed rational decision making: cooperation aspects* | LTC18075 Team member
2018-2020	*Optimal Distributional Design for External Stochastic Knowledge Processing* | GA18-15970S Team member
2017-2021	*Distributed rational decision making* | EU-COST Action CA16228 Team member
2016-2018	*Rationality and Deliberation* | GA16-09848S Team member
2013-2016	*Fully Probabilistic Design of Dynamic Decision Strategies for Imperfect Participants in Market Scenarios* | GA13-13502S Team member

Publications

[1] Ruman, M., & Guy, T.V. (2022). Learning state correspondence of reinforcement learning tasks for knowledge transfer. arXiv preprint arXiv:2209.06604, 2022. Under review in *International Journal of Machine Learning and Cybernetics*, IF: 4.38.

[2] Kárný, M., & Ruman, M. (2021). Mixture ratio modeling of dynamic systems. *International Journal of Adaptive Control and Signal Processing*, 35(5), 660-675, IF: 3.6, doi: 10.1002/acs.3219

[3] Kárný M., Ruman M.: Preference Elicitation for Markov Decision Processes in Fully Probabilistic Design Set Up. *Annals of Operation Research*. IF: 2.6, Under review.

[4] Ruman, M., & Kárný, M. (2019, December). Dynamic mixture ratio model. In *2019 International Conference on Control, Artificial Intelligence, Robotics & Optimization (ICCAIRO)* (pp. 92-99). IEEE, doi: 10.1109/ICCAIRO47923.2019.00023

[5] Guy, T. V., Ruman, M., Hůla, F., & Kárný, M. (2017, August). Experimental Performance of Deliberation-Aware Responder in Multi-Proposer Ultimatum Game. *Proceedings of the NIPS 2016 Workshop on Imperfect Decision Makers* (pp. 51-60). PMLR.

[6] Ruman, M., Hůla, F., Kárný, M., & Guy, T. V. (2016, September). Deliberation-aware responder in multi-proposer ultimatum game. In *International Conference on Artificial Neural Networks* (pp. 230-237). Springer, Cham.

[7] Hůla, F., Ruman, M., & Kárný, M. (2016, September). Adaptive proposer for ultimatum game. In *International Conference on Artificial Neural Networks* (pp. 330-338). Springer, Cham.

[8] M. Ruman: Mixture Ratios for Decision Making. *Master's thesis at Faculty of Nuclear Sciences and Physical Engineering CTU Prague*, 2018.

[9] M. Ruman: Decision making in Multi-proposer Ultimatum Game. *Bachelor thesis at Faculty of Nuclear Sciences and Physical Engineering CTU Prague*, 2016.

Co-supervised theses

[T1] J. Ružejnikov: Bayesian estimation for adaptive dynamic decision making. *Bachelor Thesis at Faculty of Nuclear Sciences and Physical Engineering CTU Prague*, 2021.

[T2] A. Jedlička: Knowledge Transfer in Q-learning. *Research project at Faculty of Nuclear Sciences and Physical Engineering CTU Prague*, 2021.

[T3] A. Jedlička: Exploration in Knowledge Transfer. *Master Thesis at Faculty of Nuclear Sciences and Physical Engineering CTU Prague*, 2023.

Hobbies

Playing guitar in improvisational groups, surfing, fitness and healthy lifestyle, analogue photography