Rati Devidze

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Objective: I am a Reinforcement Learning researcher and engineer with over 7 years of experience across academia and industry. I hold a Ph.D. focusing on Reward Design for Reinforcement Learning Agents from the Max-Planck Institute. My interests lie in the areas of Reinforcement Learning, Machine Learning, Data Science, AI, and Robotics.

Education

Aprinl 2024 – Nov 2018 | ***Ph.D. - Computer Science*** **- Saarland University (UdS)** – Germany
- **Thesis:** Reward Design for Reinforcement Learning Agents.

Aug 2018 – Sep 2016 | ***Graduate School of Computer Science*** **- Saarland University (UdS)** – Germany
- **Completed Courses:** *The Elements of Statistical Learning*, *Deep Learning*, *Information Retrieval and Data Mining*.

July 2016 – Sep 2012 | ***B.Sc. - Computer Science*** **- Tbilisi State University (TSU)** – Georgia
- **GPA:** 4/4 (Excellent)
- **Selected courses:** *Algorithms and Data Structures*, *Statistics*, *Discrete Mathematics*, *Operation Research*, *Multivariable Calculus*, *Linear Algebra*.
- **Honors:** President's Scholarship holder.

Skills

- **Reinforcement Learning:** Reward design; Preference Learning; Meta Reinforcement Learning; Inverse Reinforcement Learning; Large Language Models.
- **Machine Learning:** Deep Learning; Inferential Statistics; Applied, Algorithmic, and Theoretical Machine Learning; Optimization; Statistics; Data Science.
- **Soft Skills:** Scientific and Non-scientific Presentations; Teaching; Leadership; Self-management.
- **Languages:** Georgian (native); English (professional); German (C1); Russian (A2).

Work Experience

present – May 2024 | ***RL/ML Engineer*** **- minds.ai** – Remote (Germany)
- I worked on improving the RL agent prediction by reducing the state dimension of the environment.
- Applied Direct Preference Learning to learn a policy without any RL algorithms directly. This approach led to faster training and improvement of KPIs in a very complex semiconductor FAB.

May 2024 – Nov 2018 | ***Ph.D. Research Assistant*** **- Max Planck Institute (MPI-SWS)** – Germany
- I started a Reinforcement Learning research at the MPI-SWS. I conduct research focused on reward design in reinforcement learning [3, 1, 2].
- (Inverse-)Reinforcement learning, scientific publications, papers writing, leading research, built systems to gather, process, and analyze different reinforcement learning algorithms and data.

May 2018 – Feb 2018 | ***Research Immersion Lab*** **- Max Planck Institute (MPI-SWS)** – Germany
- I worked in Machine Teaching Group of Dr. Adish Singla. I contributed to our project with Dr. Parameswaran Kamalaruban where we worked on the iterative machine teaching problem in the context of the Markov Decision Process [4].
- I implemented a Markov Decision Process solver and performed experiments to evaluate theoretical results.

Sep 2017 – July 2017 | ***Research Immersion Lab*** **- Helmholtz Center for Information Security (CISPA)** – Germany
- Worked on accountability of security protocols. Analyzed the security of these protocols using the theorem prover Tamarin.

Aug 2016 – May 2016 | ***.Net Software Developer*** **- Prodware Group** – Georgia
- Implemented new software products for business ideas.
- Added new features to existing software.

May 2016 – Mar 2014 | ***Engineer Programmer*** **- Akhali Kselebi Ltd** – Georgia
- Implemented desktop applications for the station operators.
- Analysed international call statistics using ASP.NET charts
- Implemented Windows and Web-services ofthe billing system for telecommunications

Projects

- **Explicaple Reward Design for Reinforcement Learning Agents:** Scientific work where we seek to capture two properties of reward functions: (a) informativeness so that the rewards speed up the agent's convergence, and (b) sparseness so that the rewards are easy to interpret and debug [3, 2].

- **Exploration-Guided Reward Shaping for Reinforcement Learning under Sparse Rewards:** Scientific work where we used meta-gradient reinforcement learning methods to derive a framework that operates in a fully self-supervised manner and can accelerate an agent's learning even in sparse-reward environments [1].
- **Curriculum Design for Teaching via Demonstrations:** Scientific work where we studied teaching via demonstrations in sequential decision-making settings. In particular, how to design a personalized curriculum over demonstrations to speed up the learner's convergence [4, 5].

Teaching

- **2021:** Teaching Assistant for Reinforcement Learning course at MPI-SWS and Saarland University.
- **2020:** Teaching Assistant for seminar course Multi-agent Reinforcement Learning at MPI-SWS and Saarland University.
- **2019:** Teaching Assistant for seminar course Machine Teaching at MPI-SWS and Saarland University.

Honors and Awards

- Scholarship at Graduate School of Computer Science at Saarland University (3% of the applicants are selected).
- Granted a German Academic Exchange Service (DAAD) scholarship in 2014 for German language training at RWTH Aachen University.
- President's Scholarship holder at Tbilisi State University

Selected publications

My work has been published at top venues in machine learning, including ICML, NeurIPS, IJCAI, AAMAS, and more. For a complete list of publications, kindly check my Google Scholar or DBLP profile.

[1] Rati Devidze, Parameswaran Kamalaruban, and Adish Singla. Exploration-guided reward shaping for reinforcement learning under sparse rewards. In *Advances in Neural Information Processing Systems 36th Annual Conference on Neural Information Processing Systems 2022, NeurIPS 2022*.

[2] Rati Devidze, Parameswaran Kamalaruban, and Adish Singla. Informativeness of reward functions in reinforcement learning. In *Proceedings of the 2024 International Conference on Autonomous Agents and Multiagent Systems, AAMAS 2024*.

[3] Rati Devidze, Goran Radanovic, Parameswaran Kamalaruban, and Adish Singla. Explicable reward design for reinforcement learning agents. In *Advances in Neural Information Processing Systems 35th Annual Conference on Neural Information Processing Systems 2021, NeurIPS 2021*.

[4] Parameswaran Kamalaruban, Rati Devidze, Volkan Cevher, and Adish Singla. Interactive teaching algorithms for inverse reinforcement learning. In *Proceedings of the Twenty-Eighth International Joint Conference on Artificial Intelligence, IJCAI 2019, Macao, China, August 10-16, 2019*, pages 2692–2700, 2019.

[5] Gaurav Yengera, Rati Devidze, Parameswaran Kamalaruban, and Adish Singla. Curriculum design for teaching via demonstrations: Theory and applications. In *Advances in Neural Information Processing Systems 35th Annual Conference on Neural Information Processing Systems 2021, NeurIPS 2021*.