Rudenko Varvara

Data Scientist/ RL Researcher

Rudenko.VD@phystech.edu

github.com/Rudenshtok

hse.ru/persons

Interests

- Reinforcement learning
- Stochastic optimization
- MCMC

Grants

- High Professional Potential Group (HSE Personnel Reserve) Category "New researchers"
- Laureate of the scholarship for achievements in the field of numerical optimization methods
- Optimization, training and control methods in the tasks of synthesizing the motion of complex robotic systems with many degrees of freedom in a dynamic environment

Publications

Algorithm for Constrained Markov Decision Process with Linear Convergence — AISTATS 2023

https://arxiv.org/pdf/2206.01666.pdf

The problem of constrained Markov decision process is considered. A new dual approach is proposed with the integration of two ingredients: entropy regularized policy optimizer and Vayda's dual optimizer, both of which are critical to achieve faster convergence. The complexity expressed in terms of the optimality gap and the constraint violation significantly improves upon the existing primal-dual approaches.

Markov Decision processes and convex optimization — CRM 2023

http://crm.ics.org.ru/journal/issue/245/

The main goal was to translate existing RL information into Russian and combine existing results for further work in this area. The existing algorithms of Q-learning and the existing estimates for various types of MDP. Also considered the open problem of reducing the gap between the upper and lower estimates on AMDP.

Conferences

65th All-Russian Scientific Conference of MIPT "Markov Decision processes and convex optimization"

Fall into ML 2023 "ALGORITHM FOR CONSTRAINED MARKOV DECISION PROCESS WITH LINEAR CONVERGENCE"

Work experience

Researcher — 2024 - today
Institute of Artificial Intelligence (AIRI)

Researcher — 2024 - today
Laboratory of the theoretical foundations of Artificial Intelligence models

Lecturer/The seminarian/Teacher — 2023 - today
RL course MIPT University/ HSE University/ MIPT Olympiad school

Researcher — 2021 - 2024
Laboratory of mathematical methods of optimization

Researcher — 2020 - 2024
International Laboratory of Stochastic Algorithms and Multidimensional Data Analysis

Education

2019 - 2023

MIPT Bachelor's degree Department of Control and Applied Mathematics
Mathematical physics, computer technology and mathematical modeling in economics

2023 - today

MIPT Master's degree Department of Control and Applied Mathematics
Mathematical physics, computer technology and mathematical modeling in economics

English C1

French B1

Charitable activity

10/2022 - today

Teaching mathematics at a charity school for cancer-stricken children
Charity Fund "Gift of life"

Professional development

Student — **2020**
Sirius University of Science and Technology in the program "Modern methods of information theory, optimization and management" with the direction " Sampling, management and optimization"

Student — **2021**
"Fundamentals of Reinforcement Learning", The Alberta Institute & Alberta Machine Intelligence Institute

Student — **2021**
Sirius University of Science and Technology in the program "Modern methods of information theory, optimization and management" with the direction "Stochastic algorithms and machine learning"

Student — **2022**
Sirius University of Science and Technology in the program "Modern methods of information theory and optimization" with the direction "Modern methods of optimization"

Student — **2024**
Sirius University of Science and Technology in the program "Artificial intelligence in climate sciences"

Projects

UVIP: Model-Free Approach to Evaluate Reinforcement Learning Algorithms — **2020**

Proposed to use the KBSF method to estimate the probabilistic transition and an algorithm was written that simplifies the work, unlike the classical KBRL. Work on articles arxiv.org/pdf/2010.11366.pdf arxiv.org/pdf/1801.02309.pdf with subsequent preparation of seminars for HDI lab. In development, an algorithm for two Gaussians is being tested.

Langevin Monte Carlo: random coordinate descent and variance reduction — **2022**

Overcome the peak jam for the ULA algorithm using a randomized coordinate vector. Work was carried out with the Langevin function and options for working with ULA and MALA algorithms.

Regret Minimization for Discounted MDPs by Variance-Reduced Q-learning — **2023**

The main idea was to propose a new adaptation of classical Q-learning algorithm and introduce Q-learning with Hoeffding bonuses and Bernstein Bonuses.