Jacob H. Adamczyk

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Education

University of Massachusetts - Boston (UMB) — **Boston, MA**
Applied Physics Doctoral Candidate. GPA: 3.98 — *2020-*

Cleveland State University (CSU) — **Cleveland, OH**
Honors B.S. Physics, B.S. Mathematics. GPA: 3.91 — *2017-2020*

Experience

Deep RL Internship at Sony AI — **Remote**
Advisor: Yunshu Du — *Spring 2025*
Research on average-reward deep reinforcement learning for video games.

Research Assistant at UMB — **Boston, MA**
Advisor: Rahul Kulkarni — *Fall 2021-*
Theoretical and computational applications of statistical mechanics to reinforcement learning.

Research Internship at SJSU — **San José, CA**
Advisor: Stas Tiomkin — *Summer 2024*
Developed novel algorithms for deep reinforcement learning.

Instructor at UMB — **Boston, MA**
Developed the first lecture series on deep learning for undergraduates, graduates, and faculty. — *Spring 2023 & 2024*

Physics SI and Lab Instructor at UMB — **Boston, MA**
Supervisors: Niraj Kumar, Thomas Endicott — *2020-2023*
Instructed discussion sections and laboratory sessions for calculus-based introductory physics.

Publications and Preprints

Jacob Adamczyk and Josiah C. Kratz. "CASH: Cache Alignment with Specified Horizons." To appear at the Generalization and Planning Workshop at AAAI 2025.

Jacob Adamczyk. "Inferring Transition Dynamics from Value Functions" To appear at the Planning and RL Workshop at AAAI 2025.

Jacob Adamczyk, Volodymyr Makarenko, Stas Tiomkin, and Rahul V. Kulkarni. "Average-Reward Deep Reinforcement Learning with Entropy Regularization." To appear at Planning and RL Workshop at AAAI 2025.

Jacob Adamczyk, Volodymyr Makarenko, Stas Tiomkin, and Rahul V. Kulkarni. "Eigenvector-based Average-Reward Learning". To appear at the Generalization and Planning Workshop at AAAI 2025.

Jacob Adamczyk, Volodymyr Makarenko, Stas Tiomkin, and Rahul V. Kulkarni. "Bootstrapped Reward Shaping". AAAI 2025.

Jacob Adamczyk "New Proofs for a Bound on the Spectral Radius of the Hadamard Geometric Mean". Graduate Journal of Mathematics. 2024, Vol. 9, Issue 2.

Josiah C. Kratz*, **Jacob Adamczyk***. "Reinforcement Learning for Optimal Control of Adaptive Cell Populations". NeurIPS ML4PS Workshop 2024. (Equal contribution)

Jacob Adamczyk, Volodymyr Makarenko, Stas Tiomkin, and Rahul V. Kulkarni. "Boosting Soft Q-Learning by Bounding." RLC 2024.

Argenis Arriojas, **Jacob Adamczyk**, Stas Tiomkin, and Rahul V. Kulkarni. "Bayesian Inference Approach for Entropy Regularized Reinforcement Learning with Stochastic Dynamics." UAI 2023. (Spotlight Award, Top 5%)

Jacob Adamczyk, Volodymyr Makarenko, Argenis Arriojas, Stas Tiomkin, and Rahul V. Kulkarni. "Bounding the Optimal Value Function in Compositional Reinforcement Learning". UAI 2023.

Argenis Arriojas, **Jacob Adamczyk**, Stas Tiomkin, and Rahul V. Kulkarni. Phys. Rev. Research **5**, 023085. "Entropy regularized reinforcement learning using large deviation theory".

Jacob Adamczyk, Argenis Arriojas, Stas Tiomkin, Rahul V Kulkarni. "Utilizing Prior Solutions for Reward Shaping and Composition in Entropy-Regularized Reinforcement Learning". AAAI 2023
Krista G. Freeman, **Jacob Adamczyk**, and Kiril A. Streletzky. "Effect of Synthesis Temperature on Size, Structure, and Volume Phase Transition of Polysaccharide Microgels". Macromolecules 2020.

Under Review

Josiah C. Kratz*, **Jacob Adamczyk***. "Reinforcement Learning for Control of Non-Markovian Cell Dynamics". Under review at the International Conference on Learning Representations 2025. (Equal Contribution)
Jacob Adamczyk, Tharon Holdsworth. "Complex hyperbolic secant pulses for quantum control and sensing". Under review at Quantum Science and Technology.

Skills

Computational: Python, PyTorch, git, LaTeX

Theoretical: Reinforcement Learning, Statistical Mechanics

Interpersonal: Communication, Public Speaking, Mentorship, Teaching

Selected Presentations

Machine Learning for Quantum Technologies: Average Reward Algorithms for Deep RL.
Invited Talk for SPS CSU Alumni Presentation: Machine Learning from the Perspective of Physics.
2024 APS March Meeting (Oral Presentation, Minneapolis, MN):
- *Average-Reward Reinforcement Learning Using Insights from Non-Equilibrium Statistical Mechanics*.

8th Annual CSM Student Success Showcase: *Boosting Soft Q-Learning by Bounding*.
2023 APS March Meeting (Oral Presentation, Las Vegas, NV):
- *Results from a Mapping Between RL and Non-Equilibrium Statistical Mechanics*.

7th Annual CSM Student Success Showcase: *Utilizing Prior Solutions for Reward Shaping and Composition*.
2022 APS March Meeting (Oral Presentation, Chicago, IL):
- *Novel Bounds for Maximum Entropy RL Using Nonequilibrium Statistical Mechanics*.
- *Closed-Form Analytical Results for Maximum Entropy RL Using Large Deviation Theory*.

Selected Awards

2024 GDS IMPACT Award: Research Excellence Award for $500 *APS GDS*
2024 Graduate Student Leadership Award: Academic Service and Excellence Award *UMB*
2024 GDS Travel Award: Research Travel Award for $500 *APS GDS*
2024 IAIFI Travel Award: Research Travel Award for $500 *IAIFI*
2024 ΣΠΣ Honors Society: Inducted with Lifetime Membership at CSU Chapter ΣΠΣ
2023 Spring CSM Dean's Doctoral Research Fellowship: Research excellence *UMB*
2023 AAAI-23 Student Scholarship: Research Travel Award from AAAI for $500 *AAAI*
2023 Fall CSM Dean's Doctoral Research Fellowship: Research excellence *UMB*
2020 Outstanding Physics and Mathematics Senior Awards: Academic excellence *CSU*
2019 SPS National Scholarship: Leadership Award for $2000 *CSU*

Professional Activities

- Reviewing: NeurIPS 2024; ICLR 2025; AISTATS 2025, ICML 2025.
- Institute for Artificial Intelligence and Fundamental Interactions (IAIFI) Junior Investigator.
- CSU Machine Learning Club Co-founder. Treasurer position: 2019-2020