Cyrus Neary

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Researcher with experience in both academia and engineering industry. Expertise in reinforcement learning (single-agent/multi-agent/hierarchical), deep learning, sequential decision making (MDPs), formal methods, numerical optimization, nonlinear system identification, and scientific computing. Interested in devising solutions to challenging research problems with impactful applications, particularly in the realm of autonomous decision-making and control for safety-critical systems.

Education

The University of Texas at Austin September 2018 - December 2023 (Expected Graduation)
PhD & Master of Science in Computational Science, Engineering, and Mathematics *Austin, TX*
Cumulative GPA Over 39 Credits – 4.00 | Member of the Autonomous Systems Group | Advisor: Ufuk Topcu

The University of British Columbia September 2013 - May 2018
Bachelor of Applied Science in Engineering Physics, Minor in Honours Mathematics *Vancouver, BC*
Cumulative GPA Over 177 Credits – 91.4% | Co-operative Education Program | Graduated with Distinction

Work Experience

The University of Texas at Austin - *Graduate Research Assistant* September 2020 - Present
◇ Researching how prior knowledge can be incorporated into learning algorithms to improve data efficiency and robustness.
◇ Published 3 papers in highly competitive peer-reviewed conferences, with 4 additional papers currently under review.

MDA Systems Ltd. - *Mission Systems Engineering Co-op* May 2017 - August 2017
◇ Contributed to the design of the control algorithms for the European Space Agency's (ESA) ExoMars 2022 rover. Communicated recommendations to the ESA and other international companies through a 100+ page technical report.

MDA Systems Ltd. - *Research and Development Co-op* May 2016 - December 2016
◇ Developed, implemented, and validated an algorithm to improve object characterization in synthetic aperture radar images. The algorithm provided a marked improvement over the technique previously implemented in company software.

D-Wave Systems Inc. - *Processor Development Co-op* January 2015 - May 2015
◇ Designed and executed physics experiments to improve the company's magnetic shielding techniques.

Computer Skills

Programming languages Python, LaTex, MATLAB, Java
Software libraries Learning (Jax, Pytorch, OpenAI Gym), optimization (Gurobi, Mosek, CVX), Unity

Selected Research Projects

Physics-Constrained Neural Networks
◇ Developed algorithms to incorporate physics-based side information into neural network models of dynamical systems. Empirically, this side information greatly improves the data efficiency and generalizability of the learned models.

Verifiable and Compositional Reinforcement Learning
◇ Developed a framework to compose RL sub-systems to safely execute large and complex tasks. The framework is modular; it enables independent training of these sub-systems while providing performance guarantees on the composite system.

Reward Machines for Multi-Agent Reinforcement Learning
◇ Established a methodology to encode–and to automatically decompose–desired team behaviors in multi-agent RL systems. Proved theoretical conditions guaranteeing that training the agents individually to complete the decomposed behaviors results in successful execution of the team behavior. This decentralized algorithm significantly outperforms prior methods.

Selected Publications

Verifiable and Compositional Reinforcement Learning Systems 2022
Cyrus Neary, Christos Verginis, Murat Cubuktepe, and Ufuk Topcu
Under review at *The International Conference on Automated Planning and Scheduling (ICAPS) 2022*

Neural Networks with Physics-Informed Architectures and Constraints for Dynamical Systems Modeling 2022
Franck Djeumou*, **Cyrus Neary***, Eric Goubault, Sylvie Putot, Ufuk Topcu – * Indicates equal contribution
Under review at *The Learning for Dynamics and Control Conference (L4DC) 2022*

Reward Machines for Cooperative Multi-Agent Reinforcement Learning 2021
Cyrus Neary, Zhe Xu, Bo Wu, and Ufuk Topcu
The International Conference on Autonomous Agents and MultiAgent Systems (AAMAS) 2021