Armin Lotfy

Applied AI | Reinforcement Learning | Optimization | Control Systems

armin.lotfy@carleton.ca 6132658697 Ottawa, Canada linkedin.com/in/armin-lotfy

https://arminlotfyfp.github.io/ github.com/arminlotfyFP

Professional Summary

Applied AI and Reinforcement Learning Engineer with a Ph.D. in Electrical Engineering and 5+ years of experience developing RL-based control and optimization systems. Expertise in PPO, SAC, TD3, deep learning, and simulation-to-deployment pipelines using Python, TensorFlow, and MATLAB/Simulink.

Professional Experience

Machine Learning Engineer (Reinforcement Learning), *Carleton University – Intelligent Robotic & Energy Systems Lab*
09/2020 – 09/2025 | Ottawa, Ontario

- Designed Python-based RL environments for partially observable dynamical systems and trained continuous-action policies (PPO, SAC, TD3) using TensorFlow, RLlib, and Optuna.
- Developed end-to-end RL pipelines including environment modeling, reward shaping, safety constraints, domain randomization, training, and evaluation.
- Built digital-twin simulation frameworks for electric vehicles, batteries, and hybrid energy-storage systems, enabling closed-loop validation.
- Integrated deep learning (CNN/LSTM) and EKF-based state estimation for SOC/SOH forecasting and robust control under uncertainty.
- Applied adaptive control, MPC, and optimization algorithms to improve efficiency, stability, and system lifetime in safety-critical applications.

Teaching Assistant, *Carleton University*
09/2022 – 04/2024 | Ottawa, Ontario

- (ECOR 1043/1044, Python) and Switching Circuits & Digital Design (ELEC 2607, VHDL).

Skills

- **Reinforcement Learning & AI** PPO, SAC, TD3, DDPG, MAPPO, Actor–Critic, Multi-Agent RL, POMDPs, CTDE, Safe RL
- **Machine Learning & Deep Learning** CNN, RNN, LSTM, CNN-LSTM, Time-Series Forecasting, State Estimation, EKF, Feature Engineering
- **Programming & Frameworks** Python, TensorFlow / Keras, Ray RLlib, Gymnasium, NumPy, Pandas, SciPy, MATLAB, Simulink
- **Optimization & Control** Adaptive Control, MPC, Stochastic & Robust Optimization, GA, PSO
- **Software & MLOps** Linux, Git/GitHub, Docker, Reproducible Pipelines, Model Evaluation

Selected Projects

POMDP-Aware Hybrid Energy Storage Control

- Modeled battery management as a partially observable Markov decision process (POMDP) and integrated CNN-LSTM with EKF-based state estimation for operation under sensor uncertainty.
- Reduced battery degradation by approximately 2% while maintaining stable system performance.
- Enhances system robustness under uncertainty and supports safer, longer-lasting energy storage operation.

Multi-Agent Reinforcement Learning for Battery SOC/SOH Equalization

- Implemented centralized training with decentralized execution (CTDE) PPO to coordinate current allocation across battery cells.
- Reduced cell-to-cell SOC imbalance from 7% to 0.51% and improved battery degradation metrics by approximately 39%.
- Extends battery lifetime, improves reliability, and reduces long-term replacement and maintenance costs.

RL-Based Energy Management System for BEVs

- Developed and trained PPO and TD3 reinforcement learning controllers to optimize power distribution and SOC balancing under variable operating conditions.
- Achieved performance comparable to dynamic programming benchmarks, with final SOC error below 0.3%, enabling high-accuracy control without requiring full system models, reducing modeling effort and development cost.
- Improves energy efficiency and control accuracy while lowering system modeling and calibration overhead.

RL-Based Power Sharing in Microgrids

- Developed a PPO-based controller in MATLAB/Simulink to manage power sharing among distributed energy resources.
- Reduced control error (integral of absolute error) by 27% in islanded mode and 36% in grid-connected mode compared to conventional controllers.
- Improves power quality, operational stability, and reliability in both standalone and grid-connected microgrid deployments.

Publications

Full list available on Google Scholar

- *IEEE Transactions on Vehicular Technology* (2024, 2025)
- *IEEE Access, ISIE 2025*

Education

Ph.D. in Electrical Engineering, Carleton University