

# Armin Lotfy

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## PROFILE

Innovative machine learning engineer with hands-on experience in energy management systems for electric vehicles (EVs) and microgrids. Skilled in Deep Learning (DL) algorithms such as LSTM and CNN, Reinforcement Learning (RL) algorithms like TD3, DDPG, PPO, and Multi-Agent systems, with advanced capabilities in Python, MATLAB, and TensorFlow. Proficient in designing data-driven models and performing feature engineering for real-time applications. Known for analytical skills, strong problem-solving, and clear communication, with a proven track record in both independent and collaborative settings.

## PROFESSIONAL EXPERIENCE

### Researcher Assistant Carleton University

2020 – present | Ottawa, Canada

### Teaching Assistant Carleton University

2022 – present | Ottawa, Canada

## SKILLS

### Machine Learning and Deep Learning algorithms

Machine Learning algorithms (K-means, Regression Trees, PCA), Reinforcement Learning algorithms (TD3, MATD3, DDPG, PPO, MAPPO, SAC), Deep Learning algorithms (CNN, RNN, LSTM)

### Programming & Tools

Python, MATLAB, TensorFlow, Git, Numpy, Scipy, Pandas, Matplotlib, LaTeX, VScode, Linux

### Specialized Knowledge

Deep Learning and Reinforcement modelling, RL-based controllers, Energy Management Strategies (EMS), battery modeling (ECM), battery aging and health management, cell balancing methods

## PROJECTS

### Proximal Policy Optimization-Based Power Sharing Controller for Smart Grids:

Developed a smart grid controller using Proximal Policy Optimization (PPO) to dynamically adjust control signals in response to changing network variables, optimizing power distribution and enhancing grid efficiency.

### Multi-Agent Energy Management System for BEVs

**Project:** Developed an energy management system using Multi-Agent Reinforcement Learning (MARL) for battery electric vehicles (BEVs).

- Created an environment based on Markov Decision Processes (MDP) and a reward function, implementing two TD3 agents for optimal energy efficiency and battery state-of-charge (SOC) balance.
- Successfully improved BEV driving range through real-time allocation strategies based on battery efficiency.

### CTDE Framework for Battery Health Optimization

Designed a Centralized Training with Decentralized Execution (CTDE) framework for SOC and state-of-health (SOH) equalization in multi-agent battery management.

- Leveraged Proximal Policy Optimization (PPO) agents to address multi-objective optimization, balancing current distribution for maximum performance and battery longevity.
- Achieved collaborative agent interaction through a shared reward function to maintain battery health and enhance system efficiency.

## PUBLICATIONS

**Enhancing Energy Management Strategy for Battery Electric Vehicles: Incorporating Cell Balancing and Multi-Agent Twin Delayed Deep Deterministic Policy Gradient Architecture**  
IEEE Transaction on Vehicular Technology  
2024

**Centralized Multi-Agent SOC Control for Battery Health Using Proximal Policy Optimization in EVs**  
IEEE Transactions on Vehicular Technology  
2024

Under review

## EDUCATION

### Ph.D. IN ELECTRONIC DIGITAL ENGINEERING

CARLETON UNIVERSITY

2020 – 2025 | Ottawa, Canada