Armin Lotfy *Ph.D. graduate in Electrical Engineering*

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SUMMARY

Ph.D. in Electrical Engineering with a strong focus on data-driven control and **probabilistic modeling for dynamic systems**, particularly in energy management for electric vehicles and smart grids. My research integrates **Reinforcement Learning (RL)**, **Deep Learning (DL)**, and **Bayesian inference** to design adaptive and robust controllers.

Experienced in developing **forecasting** models using DL architectures to **predict** system behavior under **uncertainty**, enabling proactive and informed control decisions. Additionally, I apply **Bayesian state estimation techniques—especially the Extended Kalman Filter (EKF)—**to monitor latent variables such as battery State-of-Charge (SOC) and degradation, improving real-time system observability.

Proficient in advanced RL algorithms such as **Proximal Policy Optimizatioan (PPO)**, **Soft Actor-Critic (SAC)**, and **Twin Delyed Deep Dterministic (TD3)** for continuous control under partial observability, closely aligned with **POMDP** frameworks. Skilled in **MATLAB/Simulink** and **Python-based** libraries (**TensorFlow, Ray, Stable-Baselines3**) for modeling, simulation, and deployment of intelligent control solutions.

EDUCATION

2020 – 2025 | Ottawa, Canada
Ph.D. in Electrical Engineering
Carleton University

2016 – 2019 | Tehran, Iran
M.Sc. in Electrical Engineering
Iran University of Science and Technology

PROFESSIONAL EXPERIENCE

2020 – 2025 | Ottawa, Canada
Researcher Assistant (ML researcher)
Carleton University
- Designed and implemented RL and DL algorithms for real-time control and optimization
- Developed predictive modeling techniques for dynamic system state estimation
- Utilized Python and MATLAB/Simulink for algorithm development, simulation, and validation

2022 – 2024 | Ottawa, Canada
Teaching Assistant
Carleton University
- Mechatronics and Circuits (Python) (ECORE 1043/44)
- Switching Circuits and Digital Design (VHDL) (ELEC 2607)

PUBLICATIONS

2025
Proximal Policy Optimization with Predictive and Memory-Aware Battery Management for BEVs Using Hybrid Energy Storage and Battery Health-Oriented Rewards
IEEE Transactions on Vehicular Technology (*Under Review*)

2025
Centralized Multi-Agent SOC Control for Battery Health Using Proximal Policy Optimization in EVs
IEEE Transaction on Vehicular Technology

2025 **Hierarchic Multi-Agent Energy Management for Extended Driving Range through Battery Cell Balancing**
34th IEEE International Symposium on Industrial Electronics (ISIE 2025)
Presented at the 34th IEEE International Symposium on Industrial Electronics (ISIE 2025).

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

SKILLS

Technical Skills

- **Machine Learning algorithms:** K-means Clustering, Regression Trees, Principal Component Analysis (PCA),
- Predictive and probability Modeling, Time Series Forecasting
- **Reinforcement Learning & Deep Learning algorithms:** TD3, MATD3, DDPG, PPO, MAPPO, SAC, CNN, LSTM
- **Programming & Frameworks:** Python, MATLAB, Simulink, **TensorFlow**, **Stable-Baselines3**, RLlib, NumPy, SciPy, Pandas, Matplotlib, **Git**, LaTeX, VS Code, **Linux Bash**, **VHDL**

PROJECTS

Developed and trained an RL-based controller for BEVs with hybrid battery-supercapacitor storage using Ray Python library.
IRES Lab

- Modeled the system's dynamic behavior in **POMDP** to enable realistic **PPO** training using historical and predicted future states with **uncertainty**.
- Implemented a **CNN-LSTM and EKF** model to **forecast and estimate** vehicle conditions and battery SOC, improving agent awareness and policy performance.

Designed a Centralized Training with Decentralized Execution (CTDE)-based multi-agent framework for SOC and SOH equalization in intelligent battery management systems.
IRES Lab

- Employed PPO to solve a **multi-objective optimization** problem, balancing current allocation to enhance performance and battery longevity.
- Developed a shared reward mechanism under a **POMDP and uncertainty** framework to foster agent collaboration.

RL-Based Energy Management System for BEVs
IRES Lab

- Developed an EMS using **MARL** to optimize energy distribution and improve efficiency.
- Built a custom **MDP**-based simulation with dynamic states, continuous actions, and a tailored reward function.
- Implemented and trained two **TD3** agents for power flow control and SOC balancing under variable loads.

VOLUNTEERING

Member of the Technical Program Committee, IEEE 102nd Vehicular Technology Conference (VTC2025)

- Served as a Technical Program Committee (TPC) Member for the IEEE 102nd VTC2025

IEEE Vehicle Power and Propulsion Conference (VPPC) 2025 Reviewer

- Contributed as a Technical Reviewer for IEEE VPPC 2025, an internationally recognized conference in electric mobility and powertrain systems

IEEE Vehicle Power and Propulsion Conference (VPPC) 2022 Reviewer

- Served as a Technical Reviewer for the IEEE Vehicle Power and Propulsion Conference (VPPC) 2022