Amirhosein Mohaddesi

AI/ML Engineer | Robotics & Agentic AI | Neural Networks | PyTorch & ROS2

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Summary

AI/Robotics Engineer with a Ph.D. in Robotics and 6+ years of experience in machine learning, multi-agent systems, and simulation. Currently specializing in Agentic AI—integrating Large Language Models (LLMs) with ROS2 to enable autonomous, language-driven decision-making in robotics. Proficient in PyTorch, Hugging Face, and LangChain, with a strong track record in reinforcement learning, transformer models, and emerging agentic AI applications.

Research Experience

Graduate Researcher *CARL Lab, University of California, Irvine* **CA, USA** *Sep 2021 - Jun 2025*

Platform to train and study navigation agents in ROS2 environment, GitHub

- Developed a realistic simulation environment in **ROS2** to study human-inspired navigation strategies in multi-agent systems.
- Integrated actual human navigation data from the **Spatial Neuroscience Lab (SNL)** to train decision-making agents using **PyTorch**.
- Enabled simultaneous exploration by multiple agents in environments previously restricted for human testing.
- Trained agents with **transformer-based models (Hugging Face)** for sequence prediction and spatial decision-making.
- Designed a communication-aware navigation system inspired by human close-contact behavior.
- **Extended the platform beyond RL/IL to integrate Agentic AI, enabling LLM-driven agents to plan, communicate, and coordinate in multi-robot navigation scenarios.**
- Simulated high-degree-of-freedom (DoF) robotic agents in Gazebo and Webots with vision-based decision models.
- **Deployed** neural network policies for visual and sequential input processing, targeting sim-to-real transfer.
- **Created** distributed training workflows for large-scale simulation using PyTorch (ready for DDP/cluster environments).

Manuscript based on this work is currently under review and expected to be published soon.

Benefits of Varying Navigation strategies in Robot Teams, GitHub

- Investigated the benefits of varying human-inspired navigation strategies (Route, Survey, and Mixed) in robot teams through simulation-based experimentation.
- Developed a multi-agent setup in **Webots** using **Clearpath PR2** robots to evaluate task performance and strategy efficiency.
- Implemented obstacle avoidance and conflict resolution algorithms using a **C++** controller.
- Analyzed the impact of navigation strategy on task completion time, environment coverage, and coordination effectiveness.
- Demonstrated that mixed strategies yield a robust balance between exploration and efficiency in team-based navigation tasks.
- Contributed insights applicable to real-world exploration, search, and rescue missions involving autonomous robot teams.

Presented at "From animals to animats 17, SAB2024" The related poster was accepted at IEEE ICDL2024.

Navigation and Cognitive Load in Telepresence Robots:

- Led a study evaluating cognitive load in manual vs. autonomous navigation using telepresence robots in a scavenger hunt task.
- Developed autonomous navigation features, including real-time SLAM mapping in ROS and a custom GUI using PyQt.
- Designed experimental metrics for cognitive load, spatial awareness, user presence, and task efficiency.
- Conducted user studies to evaluate performance across autonomous and manual navigation modes.
- Demonstrated that autonomous navigation reduced cognitive burden, improved movement efficiency, and enhanced memory retention and learning.
- Concluded that integrating autonomous navigation in telepresence systems improves usability in educational, healthcare, and workplace environments.

Presented at IEEE ICDL2024.

Assistant *NMI Lab, University of California, Irvine* **CA, USA** *Jul 2020 - Jul 2021*

8-bit quantization technique for spiking neural networks:

- Developed an 8-bit quantized spiking neural network (SNN) using **PyTorch** for power-efficient embedded deployment.
- Introduced a custom quantization technique that reduced energy consumption by **12%–18%**.
- Maintained model accuracy within a **3%–7%** margin, validating trade-offs between efficiency and performance.
- Enabled practical deployment of SNNs on resource-constrained devices by optimizing neural inference costs.

Selected Projects

Autonomous Agentic AI for Robotics *2025*

- Built an **LLM-driven autonomous agent** in Python using **LangChain** and OpenAI API.
- Connected the agent to a **ROS2** simulation for navigation and task execution.
- Implemented tool-use logic, memory, and multi-step planning to enable "agentic" decision-making for robots.
- Extended prior ROS2 platform to integrate agentic AI workflows for **multi-robot coordination**.

Lunar Lander Trajectory Prediction (LLTP), GitHub *2021*

- Developed a Predictive Model for Lunar Lander Trajectory Using **RNNs** and **Convolutional Autoencoders** in the **OpenAI Gym** environment. Demonstrated that simple RNNs can learn Newtonian motion laws and accurately predict trajectories.

Bee Navigation *2021*

- Developed a Bio-Inspired Obstacle Avoidance Controller for the **E-Puck** Robot Using Optic Flow in **WEBOTS** Simulation.

The Street View House Numbers (SVHN) classifier *2020*

- Developed a **CNN** using **PyTorch** and **Torchvision** to classify house numbers from the SVHN dataset, achieving 97% accuracy.

Skills

- **LLMs & Agentic AI**: OpenAI API, LangChain, RAG, Prompt Engineering, LoRA/PEFT Fine-tuning
- **Machine Learning**: CNN, RNN, Autoencoders, Transformers, Reinforcement Learning (DQN, PPO), Variational Autoencoders (VAE), Spiking Neural Networks (SNNs), Quantization
- **Programming Languages**: Python, C++, Bash
- **Frameworks / Libraries**: PyTorch, TensorFlow, OpenCV, Hugging Face Transformers, scikit-learn, Keras
- **Data Science/Visualization**: NumPy, Pandas, Matplotlib, Seaborn, SQL, Jupyter Notebook
- **Software / Tools**: Git, Docker, Conda, Linux
- **Simulation**: ROS2, Gazebo, Webots, OpenAI Gym
- **Operating Systems**: Linux (Ubuntu), Windows

Education

Irvine, CA *University of California, Irvine Ph.D. in Information Computer Science (ICS)* *Sep 2019 - Jun 2025*

- Cumulative GPA: 3.93
- Relevant Courses: Embedded Ubiquitous Systems, Machine Learning, Neural Networks, Computational Neuroscience, Cognitive Robotics
- Awards: Dean's Award, Donald Bren School of ICS

Tehran, Iran *Sharif University of Technology B.S. in Computer Engineering* *Sep 2015 - Jun 2019*

- Cumulative GPA: 3.95
- Relevant Courses: Computer Architecture, Embedded Systems, Electrical Circuits, VLSI, Real-Time Processing

Achievements

- **Direct PhD fellowship** Donald Bren School of Information and Computer Science **UCI, Irvine, CA** *2019*
- **Dean's Award** Donald Bren School of Information and Computer Science **UCI, Irvine, CA** *2019*
- **Silver Medal** in Iran's National Physics Olympiad, NODET **Tehran, Iran** *2013*

Additional Info

Authorized to work in the U.S. under F-1 OPT (valid through [6/13/2026]); Extendable by another two years under OPT-STEM. No immediate sponsorship required.