

# 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 Information & Computer Science (Robotics focus) and 5–6 years of experience in ML, 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.

- Authorized to work in the US (No sponsorship required)

## 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](#)

- Built a **multi-robot simulation platform in ROS2** to study human-inspired navigation strategies (*Route, Survey, Mixed*) for team-based exploration and coordination.
- **Scaled the system from Webots to ROS2**, enabling larger swarm sizes, realistic sensor simulation, and integration with SLAM Toolbox, Nav2, and map\_merge.
- Conducted **simulation-based experiments** measuring task efficiency, coverage, and cooperation among robot teams with varying navigation strategies.
- Designed a **communication-aware coordination framework** allowing robots to share exploration goals and avoid redundant paths.
- Integrated **C++ and Python nodes** for navigation, mapping, and data logging; visualized multi-robot states in RViz for live analysis.
- Planned extension toward **imitation learning from human trajectory data** and future integration with **LLM-based reasoning** for agent communication and planning.

#### Benefits of Varying Navigation Strategies in Robot Teams, [GitHub](#)

- Investigated the benefits of varying human-inspired navigation strategies (*Route, Survey, 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.

Mohaddesi, S.A.; Hegarty, M.; Chrastil, E.R.; Krichmar, J.L. "Benefit of Varying Navigation Strategies in Robot Teams." [Proceedings of SAB 2024](#) (17th International Conference on Simulation of Adaptive Behavior), *Lecture Notes in Computer Science*, Vol. 14993, pp. 63–77, Springer, 2024. DOI: 10.1007/978-3-031-71533-4\_5. A related study was also published in [IEEE ICDL 2024](#).

#### 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.
- Concluded that autonomy reduced cognitive burden and improved movement efficiency, memory retention, and usability.

Pan, G.; Weiss, T.; Mohaddesi, S.A.; Szura, J.W.; Krichmar, J.L. "Navigation and Cognitive Load in Telepresence Robots." [IEEE ICDL 2024](#), pp. 1–6, DOI: 10.1109/ICDL61372.2024.10644592.

### 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 efficiency/performance trade-offs.

## Selected Projects

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### AI-Driven Resume Builder (CrewAI Multi-Agent System)

2025

- Built a robust multi-agent automation system with CrewAI, JSON/LaTeX tooling, and custom validators to generate ATS-optimized resumes automatically.
- Engineered a modular pipeline with strict schema checks, LaTeX PDF generation, and 20+ supporting tools; *code available upon request*.

### Alter Ego: Personalized Conversational AI, [Hugging Face Demo](#)

2025

- Designed and deployed a conversational AI agent that represents my professional background and research expertise.
- Built using **Python, Gradio, and the OpenAI API** with local persona embeddings for adaptive, context-aware conversations.
- Deployed on **Hugging Face Spaces** for public access and website integration.

### Multi-Robot Coordination and Distributed Control System, UC Irvine – CARL Lab [GitHub](#)

2024

- Built a **ROS2 Humble-based simulation platform** for multi-robot coordination in disaster-response environments.
- Integrated **SLAM Toolbox, Nav2, map\_merge, and frontier exploration** for collaborative navigation and mapping.

### Benefits of Varying Navigation Strategies in Teams of Robots, UC Irvine – CARL Lab [GitHub](#)

2022

- Investigated how **Route, Survey, and Mixed** strategies affect multi-robot team efficiency in **ROS2 and Webots** with Clearpath PR2 robots.

### Lunar Lander Trajectory Prediction (LLTP), UC Irvine – PSYCH 239 [GitHub](#)

2021

- Built trajectory predictors with **RNNs** and **Convolutional Autoencoders** in **OpenAI Gym**; showed simple RNNs can learn Newtonian motion patterns.

## Skills

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- **LLMs & Agentic AI:** OpenAI API, LangChain, RAG, Prompt Engineering, LoRA/PEFT
- **Machine Learning:** CNN, RNN, Autoencoders, Transformers, RL (DQN, PPO), VAE, SNNs, Quantization
- **Programming:** Python, C++, Bash    **Frameworks:** PyTorch, TensorFlow, OpenCV, HF Transformers, scikit-learn, Keras
- **Data/Viz:** NumPy, Pandas, Matplotlib, Seaborn, SQL, Jupyter    **Sim:** ROS2, Gazebo, Webots, OpenAI Gym
- **OS/Tools:** Linux (Ubuntu), Windows, Git, Docker, Conda

## Education

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### Irvine, CA

University of California, Irvine    *Ph.D. in Information and 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

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|---|---------------------------------------|
| • <b>Direct PhD fellowship</b> – Donald Bren School of Information and Computer Science | <b>UCI, Irvine, CA</b><br><i>2019</i> |
| • <b>Dean’s Award</b> – Donald Bren School of Information and Computer Science          | <b>UCI, Irvine, CA</b><br><i>2019</i> |
| • <b>Silver Medal</b> – Iran’s National Physics Olympiad, NODET                         | <b>Tehran, Iran</b><br><i>2013</i>    |