# Seyed Ehsan Marjani Bajestani, PhD

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## Professional Summary

Ph.D. in Computer Engineering with strong experience in robotics, embedded systems, perception, and end-to-end robotic system development. Currently a Postdoctoral Researcher at Polytechnique Montréal, working on multi-agent robotic systems and autonomous platforms. Experienced in designing and integrating end-to-end robotic systems, including custom PCB design, embedded firmware, real-time systems, sensor integration, localization, and 3D perception pipelines. Skilled in hardware-software integration from rapid prototyping through deployment for robotics, autonomy, and intelligent systems.

## Technical Skills

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| **Programming Languages:** | C, C++, Python, MATLAB, JavaScript, Assembly, Pascal |
| **Embedded Systems:** | STM32, AVR, PCB Design, Sensor Integration, Firmware Development, Real-Time Embedded Systems, GPS Modules |
| **Robotics and Perception:** | ROS, OpenCV, Open3D, Computer Vision, Event-Based Vision, 3D Perception, CloudCompare, MeshLab, Localization, Mapping, Multi-Agent Robotics |
| **Communication Protocols:** | SPI, I2C, UART, USART, CAN, USB, Ethernet, RS-485 |
| **Industrial Platforms:** | UR10e, Gocator 3210, DLP4500, Altium Designer, KiCad, Proteus |
| **Engineering Tools:** | AutoCAD, SolidWorks, Qt, Docker, Git |

## Professional Experience

**Postdoctoral Researcher** **2025 - Present**
**Polytechnique Montréal, MIST Lab, Montréal, Canada**
Project: Swarm Robotics and Multi-Agent Coordination

- Conduct research on swarm robotics, decentralized coordination, and autonomous multi-agent systems inspired by orchestral synchronization and collective intelligence.
- Develop and validate distributed perception, communication, and control frameworks for multi-robot platforms through simulation and real-world experimentation.
- Mentor graduate students and research interns in swarm robotics, distributed autonomy, robotic simulation, and multi-agent systems.

**Postdoctoral Researcher** **2024 - 2025**
**Polytechnique Montréal, DMM Lab, NRC Aerospace (NSW), Montréal, Canada**
Project: Vision-Guided Robotic Welding

- Developed vision-guided robotic automation systems for collaborative robotic platforms using 3D sensing and robotic manipulation technologies.
- Designed perception and control pipelines for robotic localization, feature detection, point cloud processing, and visual servoing.
- Integrated robotic perception, sensor processing, and real-time control for autonomous inspection and manufacturing systems in collaboration with multidisciplinary engineering teams.

**Embedded Systems Engineer and PCB Designer** **2015 - 2018**
**Taravosh Danesh Negin Pardis Company, Mashhad, Iran**
Project: Autonomous Robotic Glass Cleaning Platform

- Designed and developed embedded systems, custom PCB hardware, and control electronics for an autonomous robotic glass cleaning platform.
- Developed embedded firmware and integrated sensing, control, and hardware-software subsystems for real-time robotic applications.
- Performed hardware bring-up, debugging, testing, prototyping, and system integration to validate designs and improve system reliability.

**Embedded Robotics Engineer (Freelance)** **2006 - 2019**

- Designed and developed robotics and embedded systems prototypes for industrial and research applications.
- Specialized in embedded firmware, PCB design, robotics integration, and autonomous systems.
- Built real-time GPS tracking systems, robotic automation systems, and sensor-integrated platforms.

## Education

**Ph.D. in Computer Engineering** **2019 - 2024**

Polytechnique Montréal, Canada (Making Innovative Space Technology (MIST) Lab)

Thesis: Event-Based Perception with Structured Light

**M.Sc. in Mechatronics Engineering** **2014 - 2018**

Islamic Azad University, Qazvin, Iran (Mechatronics Research Laboratory (MRL))

Focus: Robotics and Mechatronic Systems Design

**B.Sc. in Electrical Engineering (Telecommunications)** **2007 - 2012**

Islamic Azad University, Mashhad, Iran

## Selected Projects

**PCB Designer** | **Portiloop v2** **2023 - Present**

- Designed PCB hardware for an open-source EEG closed-loop stimulation platform.
- Worked on embedded integration and hardware prototyping.

**Prototype Designer** | **E-RGB-D: Event-Based Perception with Structured Light** **2019 - 2024**

- Developed a real-time event-based RGB-depth perception prototype using structured light.
- Integrated ROS, Qt GUI, calibration tools, and real-time perception pipelines.

**Robotics Developer** | **Search and Rescue with Sparsely Connected Swarms** **2021 - 2022**

- Developed decentralized search and coordination methods for autonomous robot swarms.
- Validated distributed belief-map coordination in simulation and real-world experiments.

**Robotics Developer** | **Autonomous Planetary Exploration Robotics** **2020 - 2021**

- Contributed to multi-robot autonomous exploration systems for lunar lava tube mapping.
- Project selected for the IGLUNA platform in Switzerland.

**Robotics Developer** | **RoboCup Middle Size League Robotics** **2014 - 2018**

- Designed custom PCB hardware for RoboCup Middle Size League soccer robot kicker systems.
- Developed ball tracking and multi-robot coordination methods for autonomous robotic gameplay.

**Embedded Developer** | **Real-Time Vehicle GPS Tracker 3G** **2017 - 2018**

- Developed embedded hardware and firmware for a real-time GPS vehicle tracking and anti-theft system with wireless communication.

**Embedded Robotics Engineer** | **Autonomous Inter-Floor Document Transfer Robot** **2012 - 2013**

- Designed, manufactured, and deployed an autonomous document delivery robot integrating embedded control, sensing, mechanical design, and navigation.

## Teaching Experience

**Programming Instructor (C/C++)** **2026–Present**

Private Technology and Data Processing Company

- Deliver online instruction in C and C++, using hands-on exercises to teach programming fundamentals, problem solving, debugging, and object-oriented programming.

**Graduate Instructor (Swarm Intelligence)** **Jan 2026–Apr 2026**

Polytechnique Montréal, Montréal, Canada

- Covered complex systems, network dynamics, multi-agent consensus, and swarm robotics optimization.

## Leadership and Community

- **Executive Committee Member** | RoboCup MSL (Canada 2018, Australia 2019, Virtual 2021, Thailand 2022, France 2023, Netherlands 2024)
- **Technical Committee Member** | RoboCup Middle Size League (MSL), RoboCup 2017 Japan
- **League Chair** | RoboCup Asia-Pacific 2017, MSL, Bangkok, Thailand
- **Technical and Organizational Committee Member** | Iranian RoboCup (2013–2017)
- **Reviewer** | RSS, AAMAS, RoboCup Symposium, Swarm Intelligence Journal

## Honors and Awards

- **Selected Participant**, IGLUNA 2021 Space Robotics Campaign - EPFL/ETH Zurich (MIST Team)
- **World Champion**, RoboCup 2015 MSL Technical Challenge - Hefei, China (MRL Team)
- **1st Place**, IranOpen RoboCup 2017 MSL - Tehran, Iran (MRL Team)
- **3rd Place**, RoboCup 2016 MSL Technical Challenge - Leipzig, Germany (MRL Team)
- **Talented Student**, National Organization for Development of Exceptional Talents (NODET)

## Patent and Publications

- **Patent: Smart Glove for Finger Motion Detection and Wireless Data Transmission**
  Industrial Property Office of Iran, Patent No. 76632 (2012)
- **Technical Report of Building a Line Follower Robot**
  2010 International Conference on Electronics and Information Engineering (ICEIE) (2010)
- **Event-Based RGB Sensing with Structured Light**
  IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (2023)
- **Search and Rescue with Sparsely Connected Swarms**
  Autonomous Robots, Springer (2023)
- **Personalizing Brain Stimulation: Continual Learning for Sleep Spindle Detection**
  Journal of Neural Engineering (2025)
- **Event-Based Vision for Robot Soccer**
  RoboCup International Symposium, Eindhoven, Netherlands (2024)
- **MRL Middle Size Team: RoboCup 2016 Team Description Paper**
  RoboCup International Symposium, Leipzig, Germany (2016)
- **MRL Middle Size Team: RoboCup 2015 Team Description Paper**
  RoboCup International Symposium, Hefei, China (2015)