Hamza Ba-mohammed

PhD Candidate in Artificial Intelligence | Adversarial Robustness of Multi-Agent Systems
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Research Interests

Adversarial robustness of cooperative multi-agent reinforcement learning (MARL); parameter sharing and behavioral diversity; inter-agent communication; adaptive test-time defense; secure distributed intelligence for networks and embedded systems.

Education

Mohammed VI Polytechnic University (UM6P) Oct 2024 – Present
PhD Candidate in Artificial Intelligence, College of Computing *Benguerir, Morocco*
Supervisors: Prof. Mustapha Hedabou (UM6P) and Prof. Jamal Bentahar (Khalifa University / Concordia University)
Expected completion: September 2028

ENSIAS, Mohammed V University (UM5R) Sep 2021 – Jul 2024
Master of Engineering in Computer Science and Artificial Intelligence *Rabat, Morocco*

CPGE Moulay Youssef Sep 2019 – Jun 2021
Mathematics and Physics; national competitive examination (CNC), with distinction *Rabat, Morocco*

Research Experience

Doctoral Researcher | College of Computing, UM6P Oct 2024 – Present
Adversarial robustness of cooperative MARL *Benguerir, Morocco*

- Investigate how input perturbations affect individual agents, propagate to their peers, and change team performance in cooperative MARL.
- Conduct controlled experiments on parameter sharing versus parameter isolation and inter-agent communication across 4 continuous robotic control tasks in VMAS.
- Develop theoretical and empirical characterizations of local sensitivity and propagation, examining their relationship to observed performance degradation.
- Develop a survey of adversarial multi-agent deep reinforcement learning; current manuscript under revision.

AI Research Intern | Ai Movement, UM6P Feb 2024 – Aug 2024
Multi-agent reinforcement learning for agile Earth-observation satellites *Rabat, Morocco*

- Developed and improved a multi-agent deep reinforcement learning algorithm for agile Earth-observation satellites.
- Worked with PyTorch, OpenAI Gym, MAPPO, MADDPG, MADQN, LSTM, GRU, and Dec-POMDPs.

AI Research Assistant | Ai Movement, UM6P Jun 2023 – Oct 2023
Modeling and control of satellite networks *Rabat, Morocco*

- Developed a physics-based simulation package for low-Earth-orbit satellite swarms, incorporating Keplerian orbital dynamics, geodetic coordinate transformations, and inter-satellite communication.
- Implemented satellite attitude modeling and control using Euler angles to support multi-agent reinforcement learning experiments.

Publications and Research Outputs

Manuscripts

H. Ba-mohammed, L. El Bouga, A. Andam, M. Essoullami, D. Benhlima, J. Bentahar, and M. Hedabou. **A Survey on Adversarial Multi-Agent Deep Reinforcement Learning.** *ACM Computing Surveys (CSUR)*, under major revision.

Published conference paper

M. Lazaar, **H. Ba-mohammed**, H. Filali, and Y. El Madani El Alami. **Assessing the Evolution of Meteorological Seasons and Climate Changes Using Hierarchical Clustering.** In *Artificial Intelligence, Data Science and Applications* (ICAISE 2023), Lecture Notes in Networks and Systems, vol. 838, pp. 117–123. Springer, 2024. DOI: 10.1007/978-3-031-48573-2_17.

Research presentation

A Distributed Framework of Exoplanet Detection using Semi-Supervised Machine Learning. Oral presentation, African Astronomical Society (AfAS), April 2024. Conference programme.

Additional Professional Experience

AI Consultant | **AY Automate** Nov 2023 – Jun 2025
Applied AI solutions for international clients *Remote*

- Developed a teaching assistant using retrieval-augmented generation and OCR, and machine-learning solutions for sports prediction and sales forecasting.
- Used Azure AI, Python, TensorFlow, scikit-learn, pandas, and Streamlit to build and deliver applied AI tools.

Software Engineering Intern | **National Center of Nuclear Studies (CNESTEN)** Jul 2022 – Sep 2022
IoT systems and real-time monitoring *Kenitra, Morocco*

- Developed an IoT architecture for remote, real-time monitoring of radiation portal monitors using Django, databases, WebSockets, TCP/IP, and embedded platforms.

Data Engineering Intern | **ARCHITEO** Sep 2022 – Oct 2022
Conversational AI *Remote, Morocco*

- Collected and prepared training data for a website chatbot using RASA and NLP tools.

Selected Projects

Smart Micro-Grid Oct 2022 – May 2023
Designed an IoT microgrid architecture for university campuses using renewable energy and Q-learning-based management.

SparkBuild Apr 2023
Developed a platform for forecasting and optimizing building energy consumption using PyTorch Geometric and PySolar.

ExoWeb.AI Oct 2023
Developed a distributed framework for exoplanet detection using machine learning.

Technical Skills and Training

Research and ML: MARL, PPO, DDPG, DQN, POMDPs, graph neural networks, PyTorch, PyTorch Geometric, OpenAI Gym, VMAS, PGD, FGSM.

Programming and systems: Python, NumPy, pandas, scikit-learn, SciPy, Git, Django, TCP/IP, WebSockets, IoT and embedded platforms.

Additional training: Winter School on Mean Field Type Game Theory, ENSIAS, Mohammed V University, January 2024.

Selected Awards

- **1st Prize**, Moroccan Days for Data Science Hackathon (MDFDS), ESI, May 2024.
- **1st Prize**, Connected Innovation and Technology X.0 International Contest (CITX.C), ENSAM Rabat, April 2024.
- **Global Nominee**, NASA Space Apps Challenge, 2023 edition; 3rd place in Rabat.
- **1st Prize**, Moroccan Greenergy Competition, ENSMR, February 2023.
- **Bronze Medal**, Game of Codes competitive programming contest, INSEA, May 2022.

Open-Source Contributions

Time-LLM: Contributed an accepted fix to an LLM-call issue affecting resource usage. Repository.

Microsoft Azure documentation: Corrected tutorial code and improved clarity. Accepted pull request.

Leadership and Outreach

Founder and President, Moroccan Mathematical Community (Mar 2022 – Jul 2026): organized the first Moroccan Pi-Day and delivered more than five public workshops on mathematics, AI, and embedded systems.

Deputy President, ENSIAS AI Club (Jun 2022 – Jun 2023): mentored more than 30 engineering students on AI projects.

Deputy President, ENSIAS IT Club (Jun 2022 – Jun 2023): helped establish a network of six computing schools and prepared programming problems and computer-science lectures for programming competitions.

Languages

Arabic: Native | **French:** Bilingual | **English:** B2 | **Russian:** Basic