Amirhossein **Mesbah**

GRADUATE STUDENT · RESEARCH ASSISTANT

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Education

University of Tehran   *Tehran, Iran*

M.SC. IN ARTIFICIAL INTELLIGENCE AND ROBOTICS   *2020 - 2023*

- Thesis: Subgoal Discovery using Subspaces and a Free Energy Paradigm
- Supervisors: Dr. Nili Ahmadabadi, Dr. Hosseini
- Advisor: Dr. Shariatpanahi
- Overall GPA: **19.48/20 (4/4)**

University of Tabriz   *Tabriz, Iran*

B.S. IN COMPUTER ENGINEERING   *2016 - 2020*

- Thesis: news scrapping dashboard using Scrappy and Django frameworks for news clustering
- Overall GPA: 18.23/20 (3.79/4)
- **3rd Rank** among Graduated Bachelor Students based on Overall GPA among 70 students

Research Interests

Reinforcement Learning	Deep Reinforcement Learning
Deep Learning	Theory of Deep Learning
Machine Learning	Trustworthy ML

Research Experience

Research Assistant   *Tehran, Iran*

COGNITIVE SYSTEMS LAB, UNIVERSITY OF TEHRAN   *2021 - present*

- Exploring the role of **Free Energy** and **Subspaces** in **Subgoal Discovery** for **Goal-Conditioned RL** and **Hierarchical RL**.
- Developing new methods for **Social Reinforcement Learning.**
- Compared different methods of Social Reinforcement Learning in a **systematic review. (Link)**

Publications

Subgoal Discovery using Subspaces and a Free Energy Paradigm   *Reinforcement Learning*

A.Mesbah, R.HOSSEINI, P.SHARIATPANAHI, M.NILI   *2023*

- Preparing to submit

Who to Learn from: A Preference-based Method for Social Reinforcement Learning   *Reinforcement Learning*

B.KARIMIAN, *E.MIRZAEI, *A.Mesbah, R.HOSSEINI, P.SHARIATPANAHI, M.NILI (* EQUAL CONTRIBUTION)   *2022*

- submitted to IEEE Transactions on Cognitive and Developmental Systems (TCDS). (Link)

Teaching Experience

Regular Teaching Assistant   *Neuromatch Academy*

UNITED STATES (VIRTUAL - ONLINE)   *2022*

- Selected as TA for full-time supervision on the learning of 16 students **from different countries**, and leading 2 research group projects during 3 weeks in English for Computational Neuroscience. (Certificate)

Mentor   *HooshBaaz Summer School*

UNIVERSITY OF TEHRAN, TEHRAN, IRAN   *2022*

- Group collaboration with 7 other mentors for educating 80 students during 14 workshops on Data Analytics and Machine Learning.

Teaching Assistant for Graduate Courses   *University of Tehran*

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING, COLLAGE OF ENGINEERING, UNIVERSITY OF TEHRAN, TEHRAN, IRAN   *2021-2023*

- TA of advanced courses like **Advanced Deep Learning**, **Interactive Learning**, Machine Learning, and Data Analytics.

Teaching Assistant for Reinforcement Learning course *Sharif University of Technology*

COMPUTER ENGINEERING DEPARTMENT, SHARIF UNIVERSITY OF TECHNOLOGY, TEHRAN, IRAN *2023*

- Holding a practical workshop on coding RL agents and environments, Collaborating in designing theoretical problems for homework of the HRL and Offline RL section.

Projects

Deep Learning & Machine Learning (Link)

- Utilizing **federated learning** methods (**FedAVG, FedADMM**) for image segmentation task locally for each car.
- Training Distributed Deep Neural Networks for Fashion MNIST classification using **Gossip Training** method.
- Implementing **Generative Cooperative Network** for generating images with given style and facial expression.
- Setting up a Machine translation system with **transformers** and **Attention** mechanism (English to Persian).
- Implementing an **Image Captioning** Deep Network by combining VGG Network and LSTMs to generate captions for given images.
- Performing **Semantic segmentation** on Camvid Dataset for detecting different objects from the perspective of an autonomous car.
- Detecting Parkinson's disease using signals of speech data with **ensemble learning**.

Reinforcement Learning (Link)

- Desinging personalized environments and wrappers using different libraries like **Gymnasium, Pybulet, and Panda-Gym**.
- Implementing **Multi-Agent Reinforcement Learning Algorithms** for Grid Environment.
- Training Deep Reinforcement Learning Agents for turning the forest fires off in a cooperative multi-agent setting.
- Finding the best route for packet routing in the network with multi-armed bandit algorithms.

Neuroscience (Link)

- Implementing multiple Neural Dynamic models of single cell and population models.
- Evaluating Discrete-Time Neural Signals.
- Studying Continuous-Time Neural Signals for different data modalities.
- Analyzing behavioral data of subjects collected by designing a Psychopy task.
- Investigating the Role of Imitation and Emulation in Decision Making.

BigData (Link)

- Launching a real-time **data pipeline** on the Crypto and Stocks market.
- Using Apache Spark for NLP, Social Networks Analysis and dimensionality reduction tasks.

Skills

Theoretical Experience	Statistical Machine learning, Reinforcement Learning, Deep Learning, Design of Algorithms and Databases
Programming & Scripting	Python, SQL, HTML, CSS, JavaScript, Matlab, C, C++ and Java and LaTeX
Libraries and Frameworks	PyTorch, Tensorflow, Keras, Numpy, Scipy, Scikit-learn, Pandas, BeautifulSoup, NLTK, Opencv,Django and Scrapy

Languages

English - TOEFL IBT (overall of 103 - R:30, L:28, S:21, W:24) *Fluent*

Persian *Native*

Turkish *Native*

Academic Courses

Principles of cognitive science, 19.49/20	*2022*
Massive Data Analysis and Systems, 20/20	*2022*
Data Analysis, 19.5/20	*2021*
Distributed Optimization and Learning (Special Topics in Control Eng), 19/20	*2021*
Deep Learning with applications in machine vision and audio processing, 19.5/20	*2021*
Biological Computing, 19.6/20	*2021*
Interactive Learning (Special Topics in Control Eng), 18.5/20	*2020*
Machine Learning, 19.9/20	*2020*