Alireza Masoumian

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Research Interests

I am interested in sequential decision-making under uncertainty and by multiple agents. *Learning in Games* and *Multi Agent Reinforcement Learning (MARL)* are close keywords. I am also interested in statistical learning, and the common ground between information theory and statistics. This implies being interested in:

Game Theory Reinforcement Leaning, Bandits, Online Learning Statistical Learning

Education

University of Alberta — Edmonton, Canada
M.Sc in **Computing Science** / Supervisor: James R. Wright — Jan 2023–Now

Sharif University of Technology — Tehran, Iran
B.Sc. in **Electrical Engineering** and **Mathematics** as a minor field — 2017–2022

Publications and Preprints

1. A. Masoumian, J. R. Wright, 2024, **"Model Selection for Average Reward RL with Application to Utility Maximization in Repeated Games"**, *ArXiv preprint link*

2. A. Masoumian, S. Kiyani, and M.H. Yassaee, 2021, **"Sequential Estimation under Multiple Resources: a Bandit Point of View"**, *ArXiv preprint link*

Research Experiences

Maximization in Repeated Games
University of Alberta — Oct 2023 - Nov 2024

- The motivating question was "How should a utility maximize learner play against an opponent with limited memory?". This turned into making an online model selection algorithm for average reward RL. Average reward RL is the best fit to the utility maximization, and since the opponent's memory is unknown to the learner an online model selection is needed to find the optimal MDP class. *link* to the paper.

University of Tübingen Remote Internship
University of Tübingen (Remotely) — Jun 2021 - Sep 2021

- I worked on a multi-armed bandit problem, under the supervision of Prof. Maghsudi. The problem was about a **non-stationary contextual bandit with costly features**. We worked on multiple related ideas and algorithms of this area such as EXP-4, e.t.c.

Member of Prof. Yassaee's Research Group
Sharif University of Technology — Sep 2020 - July 2021

- We worked on a problem at the intersection of **Distributed Estimation** and **Sequential Decision-Making**. We modeled the setting of the Distributed Estimation as a Multi-Armed Bandits problem. First we defined a meaningful notion of regret with some statistical interpretations. The aim was finding the underlying fundamental limit of this novel setting and state an achieving algorithm. The result of the project was an article that is mentioned in the publication section.

Member of Prof. Aminzadeh Gohari's Reading/Research Group
Tehran Institute of Advanced Studies (Teias) — Jul - Sep 2019 / Feb 2020 - Feb 2021

– Topics of this group, at first was ML and Generalization Error with an information-theoretic view point and after that about High Dimensional Probability/Statistics. We read some articles and books on these topics and presented them to the other members under the supervision of Dr. Aminzadeh Gohari and Dr. Yassaee. In addition, we had some free discussion and presentations by invited speakers.

Investigating Inter-Sensory Synchronization and Its Application
Computational Neuroscience project, AirLab, Sharif University of Technology Sep 2018 - Sep 2019

– To perceive the auditory and visual aspects of an event simultaneously brain must adjust for differences in physical transmission time and sensory processing time. The project was based on some stochastic stimuli and analyzing their corresponding responses. We worked in Airlab, a neuroscience laboratory under the supervision of Prof. Hamid Karbalai Aghajan at Sharif University.

Teaching Assistant

- **Machine Learning 1** F24
  Under-Grad Course / Vlad Tchakuk
- **Introduction to AI** W23
  Under-Grad Course / Prof. James Wright
- **Information Theory, Stat., and Learning** F21
  Graduate Course / Prof. Mohammad Hossein Yassaee
- **High Dimensional Probability** W21
  Graduate Course / Prof. Mohammad Hossein Yassaee

Selected Courses

- **RL Theory** W23
- **Human in Loop RL** F23
- **Bayesian Statistics and Learning** F21
- **Coding for Networked Systems** W20
- **Distributed Systems** W20
- **Functional Analysis** F21
- **Modelling Human Strategic Behaviour** W24
- **ML Theory** F23
- **Bandit Theory** W21
- **Block Chain** F19
- **Algorithmic Game Theory** F21
- **Information Theory** F19
- **Principals of Economy** W19

Honors and Awards

Silver Medal in National Mathematics Olympiad 2016
Exams include problems in Number Theory, Elementary Algebra, Geometry, and Combinatorics.

Programming Skills

- **Python**
- **Matlab**

Languages

- **Farsi:** Native
- **English:** Proficient

Other Experiences

Hesabet Money Management Application
Asre Danesh Afzar Company Summer 2021

– We work on this project as a team in the Asre Danesh Afzar company. The aim was to improve the performance of a money management application. In more detail, the accuracy of classifying transactions to some major clusters was increased by some semi-supervised and transfer learning algorithms.

Committee Member of The 6th Iranian Geometry Olympiad

An event containing 55 countries May 2019 - Sep 2019

- The Iranian Geometry Olympiad is an annual academic competition for high school students in geometry problem-solving. More than 6000 contestants participated in the 6th event from many 55 countries such as China, Russia, Romania, Brazil, etc..

Member of Prof. Salehkaleybar's Data Science Team

Sharif University of Technology Sep 2019 - Feb 2020

- The main concern was about challenges in working with big data. Some tricks and theoretical basis of data mining were discussed every session. Attending in International Data Analysis Olympiad (IDAO) was also in the plan.

Data Science and Machine Learning Summer School

Khatam University Aug 2019

- Compelling challenges, including distributed data analysis, AutoML, Submodularity in data science, etc have been discussed by mighty speakers.

Young Scholar Club Summer Mathematics Olympiad Camp

National Elite Foundation Summer 2016

- It's the final stage of Iran's national Olympiad. Each year about 40 students are chosen nationwide. These students take part in courses including Number Theory, Elementary Algebra, Geometry, and Combinatorics.

Allameh Helli High School Mathematics Olympiad

Allameh Helli High School Jun 2017 - May 2019

- The Allameh Helli High School is the school with the highest pride and awards in Iran. I taught General Combinatorics to students preparing for Mathematics Olympiad. Also I was a member of problem designer committee.