Seyed Moeen Tayebi

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Research Interests

- Computational Neuroscience (focused on Learning, Memory and Decision Making)
- Dynamical Systems and Complex Networks
- Reinforcement Learning, Control Theory, and Robotics

Education

- Master of Science - Amirkabir University of Technology, Tehran, Iran
  Biomedical Engineering (Bioelectric) September 2022–2024 (Prospective)
  CGPA of Technical Courses until now: **18.80/20.00** (4.0/4.0)
- Bachelor of Science - Amirkabir University of Technology, Tehran, Iran
  Electrical Engineering (Control) September 2017–September 2022
  CGPA: **18.04/20.00** (3.82/4.0), last two years GPA: **18.98/20.00** (4.0/4.0)

Publications

- Kamkar H, **Tayebi S M**, Khanghahi S A, Kamkar M, Baghaee A, et al. Application of Artificial Intelligence in Image Processing of Neurodegenerative Disorders: A Review Study. Interv Pain Med Neuromod. 2022;2(1):e134223. https://doi.org/10.5812/ipmn-134223.

Research Experience

- M.Sc. Thesis Project: To use a **Deep Reinforcement Learning** algorighm to find an optimal tumor resection strategy with a focus on robotic surgery (ongoing)
  Amirkabir University of Technology, Tehran, Iran April 2023–Present
  - Conducted literature review of robotic surgery, and the usage of deep reinforcement learning on it
  - Studying Deep Reinforcement Learning and simulation platforms (such as Unity)
  - Examined the available data to be used for an initial Learning-from-Demonstration phase

  Supervising Professor: Dr. Hamed Azarnoush
- B.Sc. Dissertation Project: To design a **Generative Adversarial Network (GAN)** model to **translate MRI scans into PET scans** for Alzheimer's disease diagnosis
  Amirkabir University of Technology, Tehran, Iran September 2021–September 2022
  - Conducted literature review of medical image-to-image modality translation applications with a focus on GANs
  - Applied for and was granted access to the Alzheimer's Disease Neuroimaging Initiative (ADNI) dataset based on an independent research proposal
  - Created a **preprocessing pipeline** using FreeSurfer and FSL for preparing selected ADNI data for training
  - Implemented and trained a **conditional GAN model in TensorFlow** for medical image modality translation

  Supervising Professor: Dr. Mohammad Bagher Menhaj
- Neuromatch Academy 2022 Computational Neuroscience Course Project (**group project**): To explore the possible impact of reward value on behavior and neuronal activity
  Neuromatch Academy Summer School (online) July 2022
  - Educated ourselves on the datasets from **Steinmetz et al. (2019)** and prepared a semi-proposal
  - Explored and visualized the effects of task difficulty on **reaction time** across sessions using **modulation indices**
  - Investigated **firing rate changes** in post-stimulus windows in relevant brain areas

  Mentor: Dr. Mohammadreza Abolghasemi Dehqani
- Final project for the Chaos and Nonlinear Dynamics course: To reimplement the "**Spike-burst chimera states in an Adaptive Exponential Integrate-and-Fire neuronal network**" paper by Santos et. al
  Amirkabir University of Technology, Tehran, Iran December 2021
  - Conducted literature review on chimera states in neuronal networks and the AEIF model
  - Implemented the proposed **AEIF network connected via chemical synapses** and reobtained the paper's results
  - Investigated the spatial coherence, or lack thereof, using a local order parameter based on a **phase model approach**

- Implemented the numerical integrations with the **forward Euler and Runge-Kutta** methods while maintaining speed and numerical stability

Course Instructor: Dr. Sajad Jafari

- Internship project: To facilitate direct utilization of the "fast-dm" program in MATLAB for modelling **binary decision making** with the **drift diffusion model**

  Institute For Research In Fundamental Sciences (IPM), Tehran, Iran — July 2020–Sep 2020
  - Studied the drift diffusion model and the fast-dm program to understand how it models decision making
  - Scripted a code to run fast-dm directly from MATLAB based on configurations stored in structure arrays
  - Implemented a variety of plotting options for visualizing the data produced by running the fast-dm program

  Supervisors: Dr. Reza Ebrahimpour, Dr. Sajjad Zabbah

Teaching Experience

- Amirkabir University of Technology, Tehran, Iran
  - Lead Teaching Assistant for the Digital Image Processing course — September 2023–Present
- Allame Helli High school (campus no. 5), Tehran, Iran
  - C++ course designer and lead instructor for 10th grade students — September 2023–Present
- **Neuromatch Academy Summer School (online)**
  - Teaching Assistant for the Computational Neuroscience course (in an English-speaking group) — July 2023
- Allame Tabatabaei High School (Abshenasan campus), Tehran, Iran
  - **C++** Instructor and course developer, both at a general level and for students aiming to compete in the International Olympiad in Informatics — July 2022–May 2023
- Allame Helli Middle School (campus No. 1), Tehran, Iran
  - Director, the Programming Group — June 2021–August 2022
    - Coordinated ∼15 teachers teaching ∼20 year-long courses on Python programming and research in software and hardware engineering
  - Instructor, course developer, and research advisor — Sep 2019–August 2022
    - Designed and taught **neuroscience** and **machine learning** courses
    - Designed and taught algorithmic thinking and **programming in Python**
    - Supervised students to develop and complete **research projects in deep learning** and Microcontrollers

Skills

- Programming Languages: Python (7+ years), C/C++ (9+ years), LaTeX (4+ years), Julia (Familiar), R (Familiar)
- **MATLAB** (9+ years): **Psychtoolbox**, Simulink, Control System and Statistics and Machine Learning Toolboxes
- Python frameworks (mostly for ML and Comp Neuro): PyTorch, scikit-learn, Pandas, NumPy, OpenCV, matplotlib, TensorFlow, Gymnasium, Stable Baselines3, Brian 2, Nengo
- Other Tools: Linux, Git, FreeSurfer, FSL, NEURON, Unity
- Electrical Engineering Tools: Proteus Design Suite, Keil μVision, Vivado Design Suite
- Languages: Farsi (Native), English (Fluent; **TOEFL Overall: 117, S: 28, W: 29)**, German (Beginner)

Selected Courses

University Courses

- Neural Networks and Advanced Topics in Neural Networks (Both Grad)
- Cognition and Brain Physiology (Grad)
- Chaos and Nonlinear Dynamics (Grad)
- Electrophysiology (Grad)
- Digital Image Processing (Grad)
- Advanced Programming (Undergrad)
- Digital Signal Processing (Undergrad)
- Introduction to Robotics (Undergrad)

Online Courses

- **Neuromatch Academy** Computational Neuroscience Course
- Deep Learning Specialization, Coursera
- Neuronal Dynamics, EPFL Online Platofrm (Audited)
- Deep Reinforcement Learning, UC Berkley CS 285 (Audited)
- Deep Reinforcement Learning, Hugging Face
- Neural Data Science, University of Tübingen (Audited)
- Generative Adversarial Networks Specialization, Coursera
- TensorFlow Developer Specialization, Coursera
- Reinforcement Learning Specialization, Coursera

Honors and Awards

- Ranked **39th** among $>$ 12,000 in the Bioelectric major of the national university entrance exam (Konkoor) for graduate studies in electrical engineering. Iran's Ministry of Science, Research and Technology, July 2022.

- Ranked consistently in **top-3** (of 39) students majoring in control engineering, and in **top 10%** (of 132) students majoring in electrical engineering. Amirkabir University of Technology, Tehran, Iran. 2017–2022.
- Granted the option for direct entry for masters graduate studies by the Talented Student Office of Amirkabir University of Technology, Tehran, Iran, 2020. (Option wasn't used.)
- Ranked 4^{th} among$\sim$35 participants in Shenakht Pajouh's Artificial General Intelligence contest, Sharif University of Technology, Tehran, Iran, 2018.
- Ranked 588^{th} among $>$ 148,000 in Physics and Mathematics in the national university entrance exam (Konkoor) for undergraduate studies. Iran's Ministry of Science, Research and Technology, August 2017.

References

- Dr. Hamed Azarnoush
  M.Sc. thesis supervisor and M.Sc. course instructor (Digital Image Processing)
  Dept. of Biomedical Engineering
  Amirkabir University of Technology, Iran
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- Dr. Mohammad Bagher Menhaj
  B.Sc. dissertation project supervisor
  Dept. of Electrical Engineering
  Amirkabir University of Technology, Iran
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- Dr. MohammadAzam Khosravi
  B.Sc. course instructor (Electrical Circuits (I) and Introuction to Robotics)
  Dept. of Electrical Engineering
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