Mohammad Rezaei

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Education

University of Tehran, *Tehran, Iran* Sep 2024 – Present
M.Sc., Biomedical Engineering, Sport Engineering track (in progress)
Thesis: *Distinct cortical–subcortical contributions underlying accuracy–speed networks following motor task learning: a resting-state fMRI study*
Research Group: Motor Control & Computational Neuroscience Lab

Azad Tehran University of Medical Sciences, *Tehran, Iran* Sep 2019 – Jul 2024
B.S., Biomedical Engineering
Capstone: *A comprehensive analysis of gray matter alterations and structural complexity in Alzheimer's disease: implications for cognitive decline*

Peer-Reviewed Journal Articles

1. **Rezaei, M.**, Mohammadikhaveh, S., Faraji, H., Ardalani, R., Rezaei, M., Shirazinodeh, A.
Early diagnosis of Alzheimer's disease based on brain morphological changes: A comprehensive approach combining voxel-based morphometry and deep learning.
NeuroImage: Reports 6(1), 100315 (Mar 2026). DOI: 10.1016/j.ynirp.2025.100315.

Manuscripts Submitted / Under Review

1. **Rezaei, M.**, Bahrami, F., Tahmasebi Boroujeni, S., Talesh Jafadideh, A.
Distinct cortical–subcortical contributions underlying accuracy–speed networks following motor task learning: a resting-state fMRI study.
Nature Communications (Collection: Cortical–subcortical brain loops). Submitted Feb 18, 2026. Manuscript ID: **NCOMMS-26-015461**.

2. **Rezaei, M.**, Zarei, A., Talesh Jafadideh, A.
Neural efficiency in creative decision-making: a sparse directed subnetwork in soccer experts revealed by fMRI.
NeuroImage. Status: Under Review. Submitted Dec 20, 2025. Manuscript ID: **NIMG-25-2529**.

3. **Rezaei, M.**, Talesh Jafadideh, A.
Permutation-Controlled Lag-Aware Inference of Sparse Brain Network Backbones in Real-World Creative Decision-making: A fMRI Study.
IEEE Journal of Biomedical and Health Informatics. Status: Under Review. Submitted Feb 16, 2026. Manuscript ID: **JBHI-01108-2026**.

Conference Papers & Presentations (Peer-Reviewed; Oral)

- **Rezaei, M.***, Siami, M., Zarei, A., Talesh Jafadideh, A.
Brain network reconfiguration during creative playmaking: a task-fMRI study.
Oral presentation, **32nd National and 10th International Iranian Conference on Biomedical Engineering (ICBME)**, Nov 19–20, 2025.

- **Rezaei, M.***, Talesh Jafadideh, A., Bahrami, F., Tahmasebi Boroujeni, S.
Effective connectivity alterations within the cortico–basal ganglia circuit associated with motor skill learning.
Oral presentation, **ICBME**, Nov 19–20, 2025.

*Presenter.

Teaching Experience

Teaching Assistant (M.Sc. level): Biological Signal Processing, *University of Tehran* Spring 2026
Led recitations and problem-solving sessions; supported MATLAB/Python-based assignments; helped students with EEG/EMG fundamentals (filtering, spectral analysis, artifact handling), and evaluation rubrics.

Selected Research Projects

M.Sc. Thesis: Effective Connectivity After Motor Skill Learning (Resting-State fMRI) 2024 – Present
Whole-brain directed connectivity analysis of pre/post-training resting-state fMRI; PCMCI-based estimation of time-lagged dependencies across 112 cortical/subcortical ROIs; family-wise error control across links; linking network reconfiguration to kinematic learning (accuracy vs speed).
Tools: SPM12/FSL, MATLAB/Python, reproducible pipelines and QC.

Deep Computer Vision for Clinical Movement Scoring: KIMORE Squat 2024
Pose-based action quality assessment using Kinect 3D skeleton sequences (KIMORE). Built a temporal feature pipeline; compared CNN→BiLSTM with dilated TCN; achieved F1 ≈ 0.80 and balanced accuracy ≈ 0.80; robustness to tempo/phase variation.
Tools: PyTorch, NumPy.

Particle Filtering for EEG Ocular Artifact Removal 2023–2024
Bayesian denoising to jointly track clean EEG and time-varying EOG leakage; robust ocular-artifact suppression while preserving neural rhythms for downstream analysis.
Tools: Python, NumPy, MNE.

Criticality in Excitatory–Inhibitory Neural Networks 2023
Izhikevich E–I spiking networks; mean-field and bifurcation analyses to identify regimes of synchrony/stability and avalanche-like dynamics.
Tools: Python, XPPAUT/MatCont.

Network-Level Signatures of Risk-Taking in ADHD (Task-fMRI, BART) 2023
Adults with ADHD vs controls ($n = 38/38$). BIDS/fMRIPrep preprocessing; subject-level GLMs; whole-brain cluster-FWE inference; Schaefer-400 mapping; network interpretation.
Tools: fMRIPrep, SPM12.

Professional Experience

R&D Researcher, *Cognitive Science & Technology Innovation Center, Tehran, Iran* 2025 – Present
Designed an affect-aware decision architecture for NPC behavior based on Valence–Arousal mapping; wrote an evaluation protocol (human-likeness checklist, scoring rules, SAM rater guidance, reliability plan: ICC/Krippendorff's α); produced engineering hand-off specifications and coordinated reviews across NLP/speech/vision teams.

Biomedical Engineering Assistant (Intern), *Omid Hospital, Tehran, Iran* Dec 2022 – Jun 2023
Preventive maintenance and troubleshooting of clinical devices; safety/performance checks and workflow documentation; contributed to compliance reporting with clinical engineering staff.

Academic Service & Outreach

Peer Reviewer — *NeuroImage*; *Biomedical Signal Processing and Control*.
Open Education — Founder, MoScientific (YouTube): bilingual (EN/FA) tutorials on fMRI concepts, preprocessing & QC, SPM GLM workflows, and neuroimaging visualization (MRIcroGL, BrainNet Viewer).

Skills

Programming & Reproducibility — Python, MATLAB; Git, Linux, LaTeX; reproducible research workflows.
Neuroimaging — fMRI preprocessing/QC; GLM; morphometry (VBM/CAT12); functional/effective connectivity; DTI basics. Tools: SPM12, FSL, FreeSurfer, CAT12, LST, fMRIPrep.
Signal Processing — EEG/EMG filtering, referencing, artifact correction, time–frequency analysis, feature extraction.
Machine Learning — supervised/unsupervised learning, imbalanced data, cross-validation/ablations, interpretability (SHAP/permutation).
Statistics — GLM/mixed-effects; nonparametrics; reliability/agreement (ICC, Krippendorff's α); calibration; principled error control.

Notable Coursework

Biomedical & Neuroscience	**Signals & Imaging**	**Mathematics, ML & Statistics**
Biological Signal Processing; Dynamical Systems in Neuroscience; Biomedical Instrumentation; Physiology	Digital Image Processing; Signals & Systems; Linear Control	Machine Learning; Statistical Data Analysis; Linear Algebra; Stochastic Processes; Engineering Mathematics

Certifications

- **Calibration of Medical Equipment** — Azad University, Science and Research Branch (2023)
- **Neuroscience & Neuroimaging Specialization (Audited)** — Johns Hopkins University, Online (2024)
- **Python for Data Science, AI & Development** — IBM, Online (2024)
- **Data Management for Clinical Research** — Vanderbilt University, Online (2024)
- **Brain Mapping, Brain Networks & Low-Intensity TMS (liTMS** $< 150\,\mu$**T) Workshop** (2025)

Extracurricular & Athletics

Competitive soccer (team captain in local leagues); swimming and general fitness.

References

Prof. Fariba Bahrami — Professor of Electrical & Computer Engineering, School of ECE, University of Tehran — Tehran, Iran
fbahrami@ut.ac.ir

Prof. Alireza Talesh Jafadideh — Professor of Engineering Science, College of Engineering, University of Tehran — Tehran, Iran
alireza.talesh@ut.ac.ir