

# Ali Mirzakhani

---

Computational Neurotechnology Researcher | Signal, Image & Video Data Analysis – and the Instrumentation Behind It

Tehran, Iran | [A\\_mirzakhani@razi.tums.ac.ir](mailto:A_mirzakhani@razi.tums.ac.ir) & [ali.mirzakhani94@gmail.com](mailto:ali.mirzakhani94@gmail.com) |  
ORCID: [0009-0002-5056-2792](https://orcid.org/0009-0002-5056-2792) | GitHub: [github.com/Ali-mirzakhani](https://github.com/Ali-mirzakhani) |

## RESEARCH SUMMARY

---

Computational researcher analyzing signal, image, and video data—sensor time series, markerless-tracking kinematics, medical images, and behavioral recordings—across clinical, animal, and computational studies. Uniquely, I also build the acquisition systems behind that data: microcontroller-based instrumentation (Arduino, tactile/contact sensing) and reproducible Python pipelines, so I understand the full chain from sensor to signal to result. Doctoral work delivered an end-to-end measurement-and-analysis system in a controlled model; principal interest going forward is clinical digital biomarkers and open-source neurotech-nology tools, moving these computational methods toward human, clinical application.

## EDUCATION

---

**Ph.D. in Neuroscience** 2022 – Present  
*Tehran University of Medical Sciences (TUMS), Tehran, Iran*

- Thesis: a driving-inspired behavioral paradigm quantifying procedural motor-skill acquisition and its degradation under amyloid- $\beta$  pathology.
- Designed and validated the complete experimental stack: custom behavioral apparatus, timestamped tactile-sensor acquisition, high-frame-rate video with DeepLabCut kinematics, and a reproducible statistical pipeline.

**M.Sc. in Biomedical Engineering** 2018 – 2022  
*Iran University of Science & Technology (IUST), Tehran, Iran*

- Thesis: biomechanical soft-tissue deformation modeling using Digital Image Correlation (DIC); developed a Python pipeline for ventricular deformation analysis.

## PUBLICATIONS

---

**Author name shown in bold.** (Peer-reviewed)

1. Mokhtari Masoumi Alamdarloo, S., **Mirzakhani, A.**, Azhdarloo, M., Haghani-Samani, E., & Nazari, A. (2026). Effectiveness of AI and rule-based conversational agents for depression, anxiety and stress: a meta-analysis. *npj Digital Medicine*. doi:10.1038/s41746-026-02820-1
2. Azhdarloo, M., Ataei, R., Mokhtari Masoumi Alamdarloo, S., **Mirzakhani, A.**, & Nazari, A. (2026). Effectiveness of group-based art interventions for late-life depression: a systematic review and meta-analysis of randomized controlled trials. *BMC Medicine*, 24:188. doi:10.1186/s12916-026-04728-9
3. Mohammadi, S., Ghorbandaiepour, T., Zahmatkesh, M., Karimi-Zandi, L., & **Mirzakhani, A.** (2026). Potential role of extrapineal melatonin as a neurohormone in the pathophysiology of Alzheimer's disease: unanswered questions. *ACS Chemical Neuroscience* (Articles ASAP). doi:10.1021/acschemneuro.5c00401

*In preparation*

- **Mirzakhani, A.**, et al. A driving-inspired behavioral paradigm for skill signatures of amyloid- $\beta$  neurotoxicity. Manuscript in preparation; bioRxiv preprint forthcoming. [\[target journal\]](#)

## RESEARCH EXPERIENCE

---

**Doctoral Researcher — Motor-Behavior Data Analysis & Acquisition System** 2022 – Present  
*Neuroscience Laboratory, Tehran University of Medical Sciences*

- Analyzed behavioral movement via markerless kinematic tracking (**DeepLabCut**) from 60 fps video, building a reproducible **Python** pipeline: linear mixed-effects trajectory modeling, Mann-Whitney effect-size estimation, and subject-level aggregation as the unit of analysis.
- Processed timestamped tactile/contact-sensor recordings as binary time series ( $\sim 3.6$  Hz), integrated with the kinematic analysis into a single motor-skill measure.

- Also designed and built the acquisition system behind the data—custom behavioral apparatus and sensor instrumentation—giving end-to-end control from sensor to result.
- Enforced rigorous data quality control with explicit retention reporting (95.2% sensor, 89.3% kinematic) across an 84-trial dataset; within-subject pre/post design isolating change in an *acquired* skill under pathology.

### Graduate Researcher — Biomechanical Deformation Modeling

2018 – 2022

*Iran University of Science & Technology*

- Developed a Python computational pipeline for ventricular deformation analysis using Digital Image Correlation; investigated segmentation and deformation-estimation methods for medical imaging data, including machine-learning-assisted masking.

### Developer — Rehabilitation Robot with Joystick Serious Game

B.Sc. era

*Payame Noor University / independent project*

- Built a wrist continuous-passive-motion rehabilitation robot (Arduino + stepper motors) linked via **Processing 3** to a joystick-controlled 2D serious game, making repetitive rehabilitation movement interactive. Arduino and Processing 3 code available.

### Undergraduate Researcher — CPM Wrist Rehabilitation Device

2015 – 2017

*Payame Noor University*

- Designed the mechanical structure (SolidWorks) and developed an Arduino-based motor control system for a continuous passive motion wrist rehabilitation device.

## TECHNICAL SKILLS

---

**Programming & data analysis:** Python (NumPy, pandas, scikit-learn), linear mixed-effects modeling, statistical analysis, C++ (basic)

**Signal, image & video analysis:** tactile/contact-sensor time-series analysis, DeepLabCut markerless pose estimation & video kinematics, Digital Image Correlation, medical imaging (3D Slicer, Mimics)

**Instrumentation & hardware (differentiator):** Arduino & microcontroller-based data acquisition, tactile/contact sensing, embedded prototyping, Raspberry Pi

**Open science & workflow:** Git/GitHub, reproducible analysis pipelines, L<sup>A</sup>T<sub>E</sub>X

**CAD & simulation:** SolidWorks, Abaqus

## CONFERENCE PRESENTATIONS

---

- **Oral presentation (presenter):** “Computational Neuroscience in Neuroendocrinology Studies,” 13th Basic and Clinical Neuroscience Congress (BCNC), Tehran, Iran, 2023.
- Participant: First International Congress on AI in Medical Sciences; NeuroTalk 2023.

## GRANTS, AWARDS & OUTREACH

---

- **IBRO Grant** (2025) — awarded to support neuroscience outreach and public engagement activities.
- **Brain Awareness Week (BAW) Organizer** (2025) — organized public events promoting neuroscience education and brain-health awareness.

## CERTIFICATIONS & LANGUAGES

---

**Certification:** Technical Manager for Medical Equipment — Iranian Medical Device Society (IMEDS).

**Languages:** Persian (native); English (professional working proficiency).