MAHDI BABAEI

Tel: +98(991) 250-3407
Main E-mail Address: mahdibabaeiee@gmail.com - Backup: mahdi78babaei@gmail.com
Github: https://mahdibabaei78.github.io - LinkedIn: www.linkedin.com/in/mahdi78babaei
Address: Sharif University of Technology, Azadi Ave, Tehran, Iran

EDUCATION

- **B.Sc., Electrical Engineering (Bioelectric)** 2018 - 2023
  Sharif University of Technology, Iran
  - **CGPA: 16.06/20**
  - Foundations of Neuroscience and Lab
  - Computational Intelligence
  - Convex Optimization
  - Foundations of Machine Learning
  - Digital Signal Processing

Publications

1. Kia, M., Babaei, M., Hajipour, S., Keung, M., Diab, H., Sreenivasan, V., Ayala, J., Mirian, M. S., Luczak, A., & McKeown, M. J. (2024, September). Variability in brain responses to galvanic vestibular stimulation: A Granger causality analysis of independent components in resting-state EEG. Paper submitted to the Brain Stimulation Conference.

RESEARCH EXPERIENCES & INTERNSHIPS & PROJECTS

- **Finding the best EVS for Parkinsonian subjects** April 2024 - Present
  *Research Intern at **UBC***

  Prepared a semi-automatic pipeline to preprocess the EEG signals containing EOG, EMG and the electrical stimulation artifacts

  Extracted PD biomarkers from the EEG signals: Beta Waveform Features (Sharpness and Steepness), Beta-Gamma Phase Amplitude Coupling, and Beta Power features

  Found the best stimuli groups using a **weakly supervised** approach

  (Currently writing a paper)

- **A novel feature extraction method from EEG signals** Oct 2021 - Present
  *Research Assistant at **Sharif University of Technology***

  Filtered EEG signals and removed EOG and EMG artifacts with PCA and ICA algorithm

  Extracted CTP and ECTP features, as well as a novel feature extraction method called RCTP

Selected better features with the Fisher feature selection algorithm

Compared the classification performance of these features with utilizing the raw time samples (a traditional method)

(Preparing to submit)

- **Classification of MDD EEG signals** April 2023 - Present
  *Research Intern at **NUST, Islamabad***

  Utilizing a denoising diffusion probabilistic model for data augmentation

  Using a hybrid CNN-Transformer model for classification

- **Source Reconstruction Analysis of EEG Data** Jul 2023 - Mar 2024
  *Remote Intern at the **University of Oslo** and the **CUNY***

  Utilized the New York City head model

  Implemented eLORETA and LCMV source reconstruction methods using the Fieldtrip toolbox

  Visualized the results using the Fieldtrip toolbox and MATLAB UI figure

- **Neural Data Analysis Summer School** Jul 2022 - Nov 2022
  ***IPM** Institute for Research in Fundamental Sciences*

  Preprocessed LFP and neuron's spike data and plotted PSTH and raster plot of spikes

  Computed mutual information and classified the data with SVM algorithm

  Computed correlation, p-value, area under the ROC curve and their confidence interval

  Plotted time-frequency map with multitaper and wavelet

  Computed phase locking value and multitaper coherency

- **Classification of Mental Tasks utilizing EEG Recordings** May 2022 - Jun 2022
  Computational Intelligence Course project

  Extracted statistical, spectral and entropy-based features from preprocessed EEG signals

  Selected better features with Fisher algorithm and classified the processed data with SVM

  Implemented **Particle Swarm Optimization (PSO)** feature selection algorithm

  Selected better features with PSO and classified the processed data with SVM

  Compared Fisher and PSO feature selection methods

- **Analysis of Neural Spike Trains in Macaque Monkey** Dec 2021 - Jan 2022
  Foundations of Neuroscience Course Project

  Derived PSTH and raster plot of neuron's spikes

  Plotted neuron's ISI distribution and found point process type

  Applied non-parametric hypothesis testing methods (permutation, bootstrap, jackknife) on specific events during the task

  Checked LFP time-domain signals in specific events during the task

RESEARCH INTERESTS

1. Signal and Image Processing (with a focus on biosignals and medical images)
2. Computational Neuroscience
3. Applications of Machine Learning and Artificial Intelligence
4. Computer Vision

TEACHING EXPERIENCES

- **Teaching Assistant, Computational Intelligence** — Oct 2022 - Oct 2023
  Sharif University of Technology — *2 semesters*
  - Held classes for solving homework assignments

- **Teaching Assistant, Electrical Energy Conversion 1** — Jan 2020 - Jan 2022
  Sharif University of Technology — *4 semesters*
  - Held Simulink tutorial sessions and prepared tutorial videos
  - Graded homework assignments

- **Teaching Assistant, Statistics & Probability** — Oct 2021 - Jan 2022
  Sharif University of Technology — *1 semester*
  - Graded homework assignments

- **Teaching Assistant, Principles of Electronics** — Oct 2021 - Oct 2022
  Sharif University of Technology — *2 semester*
  - Prepared homework assignments, quizzes and teaching materials

- **Teaching Assistant, Principles of Electrical Engineering 1** — Oct 2021 - Jan 2022
  Sharif University of Technology — *1 semester*
  - Prepared homework assignments and quizzes
  - Graded homework assignments and quizzes

- **High School Physics Teacher and Private Tutor** — 2018 - Present
  NODET and Salam High School

AWARDS & CERTIFICATES

1. Selected as the Top 15% of The Senior Projects Done at Sharif University of Technology, Oct 2023, Received a Certificate
2. Final Project Completion of Neural Data Analysis Summer School at IPM, 2023, Received a Certificate
3. Captain of EE Department Futsal Team at Sharif University Futsal Tournament, Ranked **1st** among all departments, 2023, Received a Certificate
4. Nationwide University Entrance Exam, Ranked **44th** among 150000 participants, 2018, Received a Certificate

SKILLS

- **Programming Languages**
  - Skilled at Python and MATLAB®
  - Familiar with C and C++
- **Web Languages**
  - Familiar with Javascript, HTML and CSS
- **Applications**
  - Skilled at LaTeX, OrCAD PSpice, HSPICE, Altium Designer, Simulink, Microsoft Office Package, Adobe Premiere and Camtasia Studio
  - Familiar with Proteus, Comsol Multiphysics and CodeBlocks

LANGUAGE

∗ English - TOEFL Score: 100 (Advanced) - Fluent