Mahini Sheikhhosseini, Reza
Current affiliation: Department of Neuroscience and Biomedical Engineering (NBE), Aalto University, Espoo, Finland.
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Research Interests:

Computational neuroscience and biomedical signal processing, with a focus on EEG/MEG and ERP analysis, spatiotemporal modeling, and consensus-driven clustering methods (hypergraph and deep ensemble approaches). Neural biomarker discovery and characterization, particularly for affective and neurological disorders, using machine learning-based feature engineering and predictive modeling. Real-time prediction and forecasting of brain dynamics, including epilepsy and mental health applications.

Education

University of Jyväskylä, Jyväskylä, Finland 2020- 2023

Ph.D. Computer and information sciences (Computational Neuroscience)
Thesis title: Consensus Clustering for Analyzing Spatiotemporal ERP Data.
Supervisors: Prof. Timo Hämäläinen and Prof. Fengyu Cong

Dalian University of Technology, China 2015- 2021

Ph.D. Researcher in Biomedical Engineering
Research: Signal Processing and Advanced Cluster Analysis for EEG/ERP.
Supervisor: Prof. Fengyu Cong

Azad University of Qazvin, Iran 2006 - 2008

M.Eng. in Computer Engineering, Software Engineering
Thesis title: Development of Alert and Prediction Systems for Space Weather.
Supervisor: Prof. Caro Lucas

University of Tabriz, East Azerbaijan, Iran 1999 - 2003

B.Sc. in Applied Mathematics
Study: Fuzzy Inference Systems (FIS) and Prediction.

Research Experience

Postdoctoral Researcher / Visiting Postdoctoral Researcher : 2024 (Feb) - (now)

- Sequence-based cluster analysis for phenotyping Major Depressive Disorder (MDD)
- MDD biomarker engineering for prediction pipelines.

PIs: Prof. Matias Palva and Prof. Satu Palva

Site of research: Aalto University, Palva Lab, Espoo, Finland.

PhD researcher: 2020- 2023

- Thesis: Multi-set Consensus Clustering for Analyzing Spatiotemporal ERP Data

PIs: Prof. Timo Hämäläinen and Prof. Cong Fengyu Cong

Site of research: University of Jyväskylä, Jyväskylä, Finland.

PhD researcher: 2015- 2021

- Research: Advanced Signal Processing Methods and ERP/EEG Analysis

  PI: Prof. Fengyu Cong

  Site of research: Dalian University of Technology, ASAP Lab, China.

Research Funding and Awards

- Awarded University of Jyväskylä's funding for doctoral study. 2022
- Awarded University of Jyväskylä's funding for doctoral study. 2021
- Awarded Finnish government scholarship for doctoral study. 2020
- Awarded from the UK-China UCEER Future Engineers' Leadership and Innovation Academy (FELIA) program. 2018
- Outstanding Reviewer in Applied Soft Computing Journal, Elsevier. 2018
- The best paper award, Ph.D. Students' Competition in DUT. 2016
- Awarded a Chinese government scholarship (CSC) for four years. 2015
- First place at the 3rd PNU Open Robotic competitions, Iran. 2013
- Best paper and presentation at ISFS_2008 conference, Iran. 2008

Technical Skills

AI & Machine Learning

- Frameworks: PyTorch, TensorFlow, scikit-learn (Python)
- Architectures: CNNs, LSTMs, VAEs, Deep Embedded Clustering (DEC)
- Practices: End-to-end model development

Programming & Software Development

- Languages: Python (Advanced), MATLAB, R, C++, C#
- Tools: Git/GitHub, Docker, API integration

Data Science & Statistical Analysis

- Data Analysis & Statistics: Pandas, NumPy, SciPy, Statsmodels, R
- Platforms & Databases: SPSS, Statistica, SQL Server

High-Performance Computing

- GPU-accelerated computing on academic HPC clusters (e.g., Triton systems)

Computational Neuroscience & Neuroinformatics

- EEG/MEG Analysis: MNE, EEGLAB
- Source Localization & Multivariate Analysis: sLORETA, CARTOOL, RAGU

Professional Tools

- Single_Trial EEG_MSCC MATLAB Toolbox (2023): Consensus clustering-based pipeline for single-trial EEG epoch clustering. https://github.com/remahini/Single_trial_EEG_MSCC.
- Deep clustering for ERP R Toolbox (2023): Semi-supervised and unsupervised deep clustering for cluster analysis modeling. https://github.com/remahini/Deep_Clustering.

- Opt_NC ERP MATLAB Toolbox (2022): To determine the optimal number of clusters in spatio-temporal ERP and processing ERP. https://github.com/remahini/OptNC_ERP.
- ERP_CC MATLAB Toolbox (2020): To determine the best time window in spatio-temporal ERP and processing ERP. https://github.com/remahini/ERP_MSCC.

Teaching Experience

Academic staff at Payame Noor University-Tabriz 2008 - 2015

Main Courses (BEng. students): Computer Systems Organization, Computer Architecture, Data Structure, Logical Circuits, Machine Languages.

Academic staff at Payame Noor University-Bostanabad 2007- 2015

Main Courses (BSc. students): Computer Architecture, Artificial Intelligence (AI), Programming in Matlab, C, and Pascal, Management Information Systems (MIS), IT Project Management, Logical Digital Circuits, Software Engineering, Programming Languages Design, Advanced Topics in Computer Science (Data Mining).

Professional Academic Activity

- Guest Editor of Frontiers in Sports and Active Living 2024-Present
- Reviewer of Journal of Neuroscience Methods 2024-Present
- Reviewer of Frontiers in Psychology 2024-Present
- Reviewer of Frontiers in Neuroscience 2024-Present
- Reviewer of Frontiers in Human Neuroscience 2024-Present
- Reviewer of iScience , CellPress 2023-Present
- Reviewer of Biomedical Signal Processing and Control, Elsevier 2023-Present
- Reviewer in the journal of Applied soft computing , Elsevier 2013-Present
- Member of CIBR Jyväskylä PhD Brain & Mind 2022-2024
- Invited speaker to the symposium on Language, Cognition, and Neuroscience (LCN2018), Dalian University of Technology, China. 2018
- Member of the technological development center (robotic) at Payame Noor University of East Azerbaijan. 2011-2015

Conference Organization

- Member of the scientific and organizing committee in "Jyväskylä Brain & Mind PhD Symposium - Crossing Borders in Brain 2023" (6 June). 2023
- Member of the scientific and program committee at the 6th Mathematics Conference of Payame Noor Universities 2015

Linguistic Skills

Turkish (Native), English (Very good), Farsi (Very good), Finnish (Acquaintance), and Chinese (Acquaintance).

Career Breaks

Military service (21 months) 2004-2006

Selected published works

Peer-reviewed scientific articles:

Mahini, R., Zhang, G., Parviainen, T., Düsing, R., Nandi, A. K., Cong, F., & Hämäläinen, T. (2024). Brain Evoked Response Qualification Using Multi-Set Consensus Clustering: Toward Single-trial EEG Analysis. *Brain Topography*, 35, 537–557, https://doi.org/10.1007/s10548-024-01074-y.

Mahini, R., Li, F., Zarei, M., Nandi, A. K., Hämäläinen, T., & Cong, F. (2023). Ensemble deep clustering analysis for time window determination of event-related potentials. *Biomedical Signal Processing and Control, 86*, 105202. https://doi.org/10.1016/j.bspc.2023.105202.

Mahini, R., Xu, P., Chen, G., Li, Y., Ding, W., Zhang, L., Qureshi, N. K., Hämäläinen, T., Nandi, A. K., & Cong, F. (2022). Optimal Number of Clusters by Measuring Similarity Among Topographies for Spatio-Temporal ERP Analysis. *Brain Topography*. https://doi.org/10.1007/s10548-022-00903-2.

Li, F; Yan, R; **Mahini, R**; Wei, L; Wang, Zh; Mathiak, K; Liu, R; Cong, F (2021). End-to-end sleep staging using convolutional neural network in raw single-channel EEG. *Biomedical Signal Processing and Control*, 63, 102203. DOI: 10.1016/j.bspc.2020.102203.

Mahini, R., Li, Y, Ding, W, Fu, R, Nandi, A. K., Chen G, Cong, F. (2020). Determination of the Time-Window of Event-Related Potential Using Multiple-Set Consensus Clustering., *Frontiers in Neuroscience*. 10.3389/fnins.2020.521595.

Hu, G., Zhou, T., Luo, S., **Mahini, R.**, Xu, J., Chang, Y., & Cong, F. (2020). Assessment of nonnegative matrix factorization algorithms for electroencephalography spectral analysis. *Biomedical Engineering Online, 19*(1), 61. https://doi.org/10.1186/s12938-020-00796-x.

Rezazadeh H., **Mahini R.**, Zarei M., (2011). Solving a Dynamic Virtual Cell Formation Problem by Linear Programming Embedded Particle Swarm Optimization Algorithm, *Applied Soft Computing, Elsevier*, Volume 11, Issue 3, 3160-3169. https://doi.org/10.1016/j.asoc.2010.12.018.

Naderi, B., Kheiri, H., Heydari, A., **Mahini, R.**, (2016). Optimal Synchronization of Complex Chaotic T-Systems and Its Application in Secure Communication. Journal of Control, Automation and Electrical Systems 27, 379-390 (Scopus Q2, IF 1.5), https://doi.org/10.1007/s40313-016-0245-3.

Conference papers:

Mahini, R., Zhou, T., Li, P., Nandi, A.K., Li, H., Li, H., Cong, F., (2017). Cluster Aggregation for Analyzing Event-Related Potentials. In: Cong, F., Leung, A., Wei, Q. (Eds.), *Advances in Neural Networks - ISNN 2017*: 14th International Symposium, ISNN 2017, Lecture Notes in Computer Science, vol 10262. Springer, Cham. https://doi.org/10.1007/978-3-319-59081-3_59.

Mahini, R., Lucas, C., Mirmomeni, M., Rezazadeh, H. (2011). A Rough Set Approach Aim to Space Weather and Solar Storms Prediction. In: Murgante, B., Gervasi, O., Iglesias, A., Taniar, D., Apduhan, B.O. (eds) Computational Science and Its Applications - ICCSA 2011. ICCSA 2011. Lecture Notes in Computer Science, vol 6782. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-21928-3_43.

Doctoral theses:

Mahini, R. (2023). Consensus clustering for group-level analysis of event-related potential data. *JYU dissertations*. http://urn.fi/URN:ISBN:978-951-39-9863-9