Zohaib Hassan

Postdoctoral Fellow (Assistant Researcher), ICPBR-ION-CAS, Shanghai, China

D.O.B: 1990.04.29 ⊠ drzohaibh@gmail.com ♠ (+86) 186 2110 6209 ♀ www.drzohaibh.com

Research Interests

Computational Neuroscience, Machine learning, Deep learning, Manifold learning, Supervised/Unsupervised learning, and Pattern recognition.

My research focuses on the intersection of data analysis, machine learning, and neuroscience. I am committed to developing advanced machine learning solutions for diverse applications, with a particular emphasis on gaining deeper insights into brain dynamics.

Education

Shanghai Jiao Tong University, China	2017 - 2022
PhD. Control Science and Engineering (Supervisor: Prof. Hu Lisheng) Thesis: On Manifold Learning Based Feature Extraction and Applications.	
COMSATS Institute of Information Technology, Pakistan	2013 - 2016
M.Sc. Electrical Engineering	
Thesis: Implementation of Wind Turbine System for Fault Tolerant control.	
University of Engineering & Technology, Pakistan	2008 - 2012
B.Sc. Electrical Engineering	
Thesis: Design of a Scheme for Automatic Power Factor Improvement.	
Experiences	
Institute of Neuroscience, Chinese Academy of Sciences	Sep 2024 – Present
Postdoctoral Fellow, International Center for Primate Brain Research (ICPBR), ION, CA	S, Shanghai, China.
Currently, as a member of the Dynamic Embodied Brain Laboratory, 1 am engaged in	the aavancea analysis of

Research Center for Frontier Fundamental Studies

Postdoctoral Fellow, Zhejiang Lab, Hangzhou, China.

multidimensional neural and bodily activity data.

The postdoctoral project employs machine learning-based feature extraction to investigate sleep dynamics. Our research has identified evidence of sleep stage 2 duality, sleep stage inertia, and heterogeneity. This project is also supported by the funding from China Postdoctoral Science Foundation under grant number 2023M743264.

Saba Power Plant Pvt. Ltd. Lahore, Pakistan

Electrical & Instrumentation Engineer.

Sep 2022 – Sep 2024

IEC Pvt. Ltd. Lahore, Pakistan

Production Engineer.

Publications

[1] The Hidden Structure of Sleep Stage 2: Unveiling subtypes and their role in ultradium rhythm and sleep regulation.

MZH. Shah et al.

Nature Communications, 2025, (in preparation). Contributions:

- Machine learning based feature extraction methodology found the evidence of sleep stage 2 (N2) duality.
- Differential roles of N2 subtypes in N3/REM stage onset, sleep regulation and sleep disordered subjects are identified.
- [2] DBM Transient: Unsupervised Feature Representation Based on Deep Boltzmann Machine for Seizure Detection.

T. Liu, MZH. Shah, X. Yan, and DP. Yang

```
IEEE Transactions on Neural Systems and Rehabilitation Engineering (Q1), IF = 4.9, 2023,
```

(a)10.1109/TNSRE.2023.3253821.

Contributions:

- An unsupervised Deep Boltzmann Machine (DBM) is trained to a new transient state.
- DBM based dimensionality reduction surpasses other methods in distinguishing epileptic activity.
- [3] Unsupervised Feature Representation of Sleep EEG Data with Transient Deep Boltzmann Machine.

MZH. Shah, T. Liu, Y. Wei, and DP. Yang

Annual International Conference IEEE Engineering in Medicine and Biology Society (IEEE EMBC), Sydney, Australia, 2023, @10.1109/EMBC40787.2023.10340365.

Contributions:

- Joint time-frequency domain features are extracted from the EEG recordings.
- Unsupervised DBM transient is adopted for binary sleep stage classification in a 2D feature space.
- [4] Control Conditions for Equal Power Sharing in Multi-Area Power Systems for Resilience Against False Data Injection Attacks.

Z. Ahmed et al. Energies, 2024, @10.3390/en17225757.

[5] WLLTSA: Weighted Linear Local Tangent Space Alignment via Geometrically Inspired Weighted PCA for Fault Detection.

MZH. Shah, Z. Ahmed, and L. Hu

IEEE Transactions on Industrial Informatics (Q1), **IF = 12.3**, 2023, @10.1109/TII.2022.3166784. Contributions:

- Weighted LTSA is presented based on weighted PCA to construct accurate tangent spaces.
- Geometrically inspired parameter selection approach for graph laplacian is defined.
- [6] MLPP: Modified LPP based on Riemannian metric for feature extraction and fault detection.
 MZH. Shah, L. Hu, and Z. Ahmed Measurement (Q1), IF = 5.6, 2022, @10.1016/j.measurement.2022.110923.
 Contributions:

- Riemannian metric is adopted to overcome the shortcoming of geometric distortion in classical LPP.
- In MLPP, the embeddings are augmented with an estimate of the Riemannian metric.
- [7] ILPP-SVDD: Feature extraction and fault detection scheme via improved locality preserving projection and SVDD.

MZH. Shah, L. Hu, and Z. Ahmed *Transactions of the Institute of Measurement and Control, 2022, @10.1177/01423312221099855.* <u>Contributions:</u>

- A new quality assessment metric based on deviation of Riemannian metric from isometry is proposed.
- ILPP is combined with SVDD for classification based feature extraction and fault detection.
- [8] An Overview of Recent Advances of Resilient Consensus for Multiagent Systems under Attacks.
 M. Aslam, L. Du, Z. Ahmed, and MZH. Shah et al. Computational Intelligence and Neuroscience, 2022, 10.1155/2022/6732343.

 [9] Design and Implementation of a Robust FTC scheme for the Benchmark model of Wind Turbine System.
 MZH. Shah, L. Hu, and T. Humayun International Conference on Power Generation Systems and Renewable Energy Technologies (PGSRET), 2018,
 10.1109/PGSRET.2018.8685997.

Projects

- **Project Leader:** Research on duality of sleep stage 2 and sleep staging based on feature extraction methodology, China Postdoctoral Science Foundation, 2023M743264, 2023.11, 8 万元.
- **Participant:** Biophysical modeling and nonlinear dynamic analysis of the nighttime sleep regulation mechanism combining neurobiological basis and clinical data of sleep, National Natural Science Foundation of China (NSFC), 12175242, 2022.01-2025.12, 78 万元.