Mr. Xiaoyang Huang

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OVERVIEW

As a motivated, collaborative, and innovative engineering student, I have a strong passion for medical information processing and artificial intelligence. Throughout my undergraduate studies, I gained valuable experience in neurobiology, medical imaging, and machine learning. My achievements include publishing a scientific paper and winning awards in several competitions. During my master's studies, I focused on EEG signal noise reduction, authored three scientific papers, and submitted them for publication, with one already receiving a positive response.

EDUCATION

University of Science and Technology of China (USTC), Hefei, China — *Sep. 2022 — Present*
Master of Engineering in Information and Communication Engineering — GPA: 3.65/4.30
Scholarship: First-Class Scholarship * 3

Hefei University of Technology (HFUT), Hefei, China — *Sep. 2018 — Jul. 2022*
Bachelor of Engineering in Biomedical Engineering — GPA: 3.47/4.30
GPA Ranking: 5/81

RESEARCH EXPERIENCE

EEGDfus: A Conditional Diffusion Model for Fine-Grained EEG Denoising — *Feb. 2024 — Present*
Advisor: ***Prof. Xun Chen****, Professor, Deputy Dean, School of Information Science and Technology, USTC*
Major Contribution:

- First application of the diffusion model to the field of EEG denoising, achieving high-precision EEG denoising.
- To adapt the diffusion model specifically for EEG denoising, this work developed a novel dual-branch structure based on a combination of CNN and Transformer, replacing the conventional denoising model used in traditional diffusion models.

Unpaired EEG Denoising Via Contrastive Learning-Guided GAN — *Jul. 2023 — Jan. 2024*
Advisor: ***Prof. Xun Chen****, Professor, Deputy Dean, School of Information Science and Technology, USTC*
Major Contribution:

- Proposed for the first time an unpaired EEG denoising algorithm, enabling deep models to eliminate reliance on simulated data, thereby enhancing performance in real-world EEG denoising tasks.
- Utilized contrastive learning to guide the Generative Adversarial Network (GAN), leading the model to generate more realistic noisy EEG signals.

A Bidirectional Denoising Framework for Real EEG Signals based on the KAN — *Oct. 2022 — Jun. 2023*
Advisor: ***Prof. Xun Chen****, Professor, Deputy Dean, School of Information Science and Technology, USTC*
Major Contribution:

- This work proposes a Transformer-guided CNN framework for EEG-based epilepsy prediction, aiming to leverage the complementary advantages of both CNN and Transformer models.
- This work introduces a new Transformer module consisting of a Local Information Layer, a Squeezed Multi-Head Self-Attention Layer, and a Residual Feed-Forward Network.

EEG-based Seizure Prediction via Transformer Guided CNN — *Feb. 2022 — Sep. 2022*
Advisor: ***Prof. Chang Li****, Associate Professor, Department of Biomedical Engineering, HFUT*
Major Contribution:

- This work proposes a Transformer-guided CNN framework for EEG-based epilepsy prediction, aiming to leverage the complementary advantages of both CNN and Transformer models.
- This work introduces a new Transformer module consisting of a Local Information Layer, a Squeezed Multi-Head Self-Attention Layer, and a Residual Feed-Forward Network.

PROJECTS

For details of these projects, please refer to my personal homepage.

EEG Denoising Toolbox — Developed in Python
Project Design and Program Development

- Developed in Python with a GUI interface, supporting multiple denoising Smodels and visualizing denoising results.
- Based on deep learning methods, supporting both GPU and CPU environments.

An Automatic Diagnosis Application for COVID-19 Based on X-ray Scans Developed in Python
Project Design and Program Development

- Developed in Python with a user-friendly GUI, it provides high identification accuracy, rapid inference speed, and substantial clinical application value.
- It achieved a test accuracy of up to 96% on public datasets and includes real-time analytics capabilities.

Foreground Object Segmentation Algorithm for Non-Specific Categories Developed in Python
Project Design and Program Development

- Dual-layer Nested UNet Based on Attention Mechanism. Convolutional Block Attention Module (CBAM).
- Model Compression: Knowledge Distillation. Lightweight Deployment Based on Libtorch. (C++)

A Single-Camera Pedestrian Tracking System Based on PaddlePaddle Developed in Python
Project Design and Program Development

- Explore the new deep learning framework, PaddlePaddle, to build and train deep models.
- Successfully completed the single-camera multi-target pedestrian detection task with high identification accuracy.

PUBLICATIONS

[1] C. Li, **X. Huang,** R. Song, R. Qian, X. Liu, X. Chen, **"EEG-based seizure prediction via Transformer guided CNN."** *Measurement*, 2022, 203: 111948. Published.
[2] **X. Huang,** C. Li, A. Liu, R. Qian, and X. Chen, **"EEGDfus: A Conditional Diffusion Model for Fine-Grained EEG Denoising."** *IEEE Journal of Biomedical and Health Informatics, Accepted for Publication, November 19, 2024.*
[3] **X. Huang,** C. Li, A. Liu, R. Qian, and X. Chen, **"Unpaired EEG Denoising Via Contrastive Learning-Guided Generative Adversarial Network."** *IEEE Transactions on Neural Networks and Learning Systems, Under Review, 2024.*
[4] **X. Huang,** C. Li, A. Liu, R. Qian, and X. Chen, **"EEGKDNet: A Novel Bidirectional Denoising Framework for Real EEG Signals based on the Kolmogorov-Arnold Network."** *IEEE Transactions on Neural Systems and Rehabilitation Engineering, Under Review, 2024.*

PATENTS

[1] Li C., Cai G., **Huang X.**, Liu Y., Song R., Cheng J., Chen X., EEG Signal Classification Method Based on Transformer-Guided Convolutional Neural Networks. CN114564991A. 2024.02.20.
[2] Chen X., **Huang X.**, Liu A., EEG Signal Artifact Removal Method Based on Conditional Diffusion Model. CN118069993A. 2024.05.24.

AWARDS & HONOURS

China College Students Service Outsourcing Innovation and Entrepreneurship Competition *Aug. 2021*
One of only three five-star competitions in the National College Student Computer Competition Index.

- **Award:** National Third Prize. **(Top 10% of 6,000+ Teams)**
- **Award-winning work:** "Foreground Object Segmentation Algorithm for Non-Specific Categories"

Anhui Provincial College Students Statistical Modeling Competition *Dec. 2020*

- **Award:** Provincial Second Prize. **(Top 25% of 300+ Teams)**
- **Award-winning work:** "EEG-Based Emotion Recognition Method Using Convolutional Recurrent Neural Networks with Attention Mechanism"

VOLUNTEER EXPERIENCE & LEADERSHIP

Volunteer, Shanxing 100 Initiative

- Supported rural children's projects with 100+ volunteer hours (China Rural Development Foundation).

Chair, Student Union

- Led the student union in organizing campus activities and fostering student-faculty communication during undergrad.

Captain, Debate Team

- Led the faculty debate team to the university's final four, enhancing team collaboration and competitive skills.

SKILLS

- **Language Skills:** English (Fluent), Mandarin (Native)
- **Programming:** Python, MATLAB, Java, C++, HTML, CSS, JavaScript, LaTeX
- **Software:** Origin, AI, PS, PR
- **Hobby:** Hiking (multiple 100-kilometer hikes completed)