Haizhou Xu

Phone: +86 13652297061, Personal Website: **[Link]**
Email: 2007700059@e.gzhu.edu.cn

EDUCATION

Guangzhou University **09/2020 – 06/2024**

- **Major:** Robot Engineering (BE)
- **GPA:** 85/100
- **Honor:** The First Prize Scholarship of Guangzhou University (Top 5%) **2022-2023**
- **Core Courses:** *Artificial Neural Network Technology (3.9/4.0), Introduction to Machine Learning (4.0/4.0), Fundamentals of Machine Vision (4.0/4.0), Modeling and Simulation of Robot System (4.0/4.0), Robot Sensing Technology (4.0/4.0).*

PUBLICATION

- **H. Xu**, J. Wu, Y. Yu, J. Ni* and W. Huang*, " Occult lymph Node Metastasis Prediction in Non-Small Cell Lung Cancer Based Self-Supervised Pretrained and Hyperbolic Theory," in *Applied Soft Computing*, vol. 164, p. 111949, 2024. **[Link] (Top Journal Q1 IF=7.2)**
- W. Huang*, **H. Xu** and Y. Yu, "MRP-Net: Seizure detection method based on modified recurrence plot and additive attention convolution neural network," in *Biomedical Signal Processing and Control*, vol. 86, p. 105165, 2023. **(First Student Author) [Link] (Q1 IF=4.9)**
- W. Huang*, Y. Yu, **H. Xu**, Z. Su and Y. Wu, "Hyperbolic Music Transformer for Structured Music Generation," in *IEEE Access*, vol. 11, pp. 26893-26905, 2023. **[Link] (Q2 IF=3.4)**

RESEARCH EXPERIENCE

Project: Research on Pregnancy Residue Segmentation and Prediction **08/2023 – 04/2024**

Research Leader

- **Communication and Collaboration with Medical Experts:** Established effective communication and collaboration channels with the Chief Physician from the Third Affiliated Hospital of Guangzhou Medical University. Collaborated on the retrospective collection of medical data from MRI examinations conducted at the hospital between 2012 and 2022 for patients with pregnancy residues. Identified and selected cases that met the specified research criteria.
- **Region of Interest (ROI) Delineation:** Utilized ITK-SNAP software to delineate the Region of Interest (ROI) for select patients with pregnancy residues, ensuring accurate and relevant regions were identified.
- **Data Cleaning and Feature Selection:** Conducted data cleaning and feature selection processes for clinical test data associated with the patients.
- **Development of Prediction Model:** Proposed an innovative Hyperbolic Multimodal Fine-Grained Alignment Network that integrates MRI and clinical feature data for the automatic diagnosis of retained products of conception.
- **Data Collection, Visualization, and Research Paper Writing:** Collected and organized experimental data. Performed data visualization to facilitate analysis and interpretation. Successfully completed the writing and submission of the graduation thesis, documenting the project's methodologies, results, and conclusions.

Project: Research on Occult Lymph Node Metastasis Prediction **05/2022 – 08/2023**

Research Leader

- **Communication and Collaboration with Medical Experts:** Established effective communication and collaboration channels with the Chief Physician from Tongji Hospital. Collaborated on the retrospective collection of medical data from chest plain CT examinations conducted at the hospital between 2016 and 2021, focusing on non-small cell lung cancer (NSCLC) patients. Meticulously selected cases that adhered to the specified research criteria.
- **Utilization of Hyperbolic Geometry for Metastasis Prediction:** Recognizing the limitations of Euclidean space

metrics in small-sample metric learning, introduced the Poincaré ball model from hyperbolic space to predict occult lymph node metastasis.

- **Innovative Self-Supervised Hyperbolic Metric Few-shot Learning Method:** Addressed the challenge of limited data in medical imaging by proposing a novel self-supervised hyperbolic metric few-shot learning method. Incorporated self-supervised mask reconstruction pre-training and hyperbolic metric few-shot learning to predict occult lymph node metastasis.
- **Prediction and Experimental Validation:** Conducted occult lymph node metastasis prediction using the proposed methods. Designed multiple comparative and ablation experiments to rigorously validate the performance of the proposed approaches.
- **Data Collection, Visualization, and Research Paper Writing:** Orchestrated the collection and organization of experimental data. Utilized data visualization techniques to enhance data analysis. Engaged in the preparation and writing of the project's research paper, outlining the methodologies, findings, and conclusions.

Project: EEG Seizure Detection Research Based on Deep Learning and Nonlinear Dynamics **05/2021 – 05/2022**

Research Leader

- **Literature Review and Methodological Assessment:** Conducted an extensive literature review to identify existing methods and shortcomings in EEG seizure detection.
- Summarized and synthesized various approaches and their limitations in this domain.
- **Development of Nonlinear Dynamics Analysis Method (MRP-Net):** Recognizing the nonlinear and nonstationary nature of EEG signals, proposed an innovative EEG seizure detection method, MRP-Net. MRP-Net employed phase space reconstruction and recurrence plot theory to map the nonlinear dynamic features of EEG signals onto a two-dimensional plane.
- **Design of Additive Attention-Based Convolutional Neural Network Module:** Designed an additive attention-based convolutional neural network (CNN) module to capture the autocorrelation of EEG signals and capture long-distance dependencies within the constructed recurrence plots.
- **Experimental Design and Evaluation:** Designed and conducted experiments on two publicly available datasets to compare the performance of MRP-Net with other seizure detection methods. Evaluated the model's effectiveness in detecting epileptic seizures and measured relevant performance metrics.
- **Data Collection, Visualization, and Research Paper Writing:** Supervised the collection and organization of experimental data. Utilized data visualization techniques to enhance the analysis of experimental results. Actively engaged in the preparation and writing of the research paper, which detailed the project's methodologies, results, and conclusions.

Project: Symbolic Music Generation Research **05/2021 – 08/2022**

Principal Researcher

- **Introduction of Hyperbolic Theory to Music Generation:** Introduced hyperbolic theory to music generation, improving hierarchical encoding with reduced distortion by shifting from Euclidean to hyperbolic space.
- **Mathematical Derivation of Music Hyperbolic Theory:** Conducted an in-depth review of relevant literature and engaged in mathematical derivations related to music hyperbolic theory. Provided the essential mathematical foundation to support the proposal of the Hyperbolic Music Transformer.
- **Development and Visualization of Hyperbolic Music Transformer:** Wrote relevant sections of the code for the Hyperbolic Music Transformer model. Conducted experiments and visualized the results to demonstrate the effectiveness of the model.

SOFTWARE & SKILLS

- **Language:** PTE:65, with L:66, R:59, S:67, W:69
- **Programming:** Python (Pytorch, TensorFlow), C, LaTeX, MATLAB, Markdown, Unix Script
- **Tools:** Vscode, Pycharm, ITK-SNAP, 3D Slicer, Origin, Visio