

RUOXIN WANG

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EDUCATIONAL BACKGROUND

Duke University

Master of Engineering in Artificial intelligence

Aug. 2024 – May 2026(Expected)

Hong Kong Baptist University

Bachelor of Science in Data Science

Sept. 2020 – Jun. 2024

TECHNICAL SKILLS

Languages: Python, R, SQL, Matlab, C++, Java, Go, HTML/CSS

Technologies/Frameworks: Linux, NumPy, Scikit-Learn, PyTorch, TensorFlow, AWS, Azure, Docker, Hadoop, Spark

INTERNSHIP EXPERIENCE

Multi-modal Medical Agent Research

Dec. 2024 – Present

Duke University

Durham, NC, United States

- Based on MMedAgent framework, innovated a comprehensive medical agent solving fifteen tasks across eight modalities.
- Aim to extend single-turn interactions into multi-turn dialogues, enabling agent to handle complex problems by reasoning and adjustment.
- Integrated voting-based methods consolidate results from multiple tools across modalities, enhancing the ability to utilize multiple tools for complex queries.

Multi-modal EEG-CLIP Research

Mar. 2024 – Jun. 2024

Guangdong Institute of Intelligence Science and Technology

Zhuhai, China

- Aligned latent spaces of EEG and image data using cosine similarity, inspired by **CLIP**'s modal alignment approach.
- Developed an EEG-Image MLLM using temporal convolution and transformer as the EEG encoder, and the CLIP pre-trained ViT for image encoding.
- Applied the EEG-MLLM for zero-shot image prediction, achieving a 5% accuracy improvement.
- Developed a **Mixture of Experts (MoE)** model with an EEG encoder and **Mamba** module, optimizing EEG processing for improved semantic extraction and model specialization.

Natural Language Processing Research

Apr. 2024 – Jun. 2024

Shanghai Zhangjiang Laboratory

Shanghai, China

- Investigated developments in Multimodal Knowledge Graphs (MMKG) and devised a framework for MMKG construction and completion tasks.
- Applied **knowledge distillation** techniques to MLLMs to derive a compact **GNN** model, leveraging it for advanced feature extraction in various graph learning applications.
- Implemented **multitask learning** for Multimodal Named Entity Recognition and Relation Extraction, to initialize MMKG with enriched semantic relationships found in GNN.

RESEARCH EXPERIENCE

Duke AI Hackathon 2024: Inception Swarm

Oct. 2024

1st Grand Prize, Enterprise Tools, and Productivity Track Winner, Best Use of LLM Agents Award

- Developed 'Inception Swarm,' a multi-agent swarm for rapid prototyping based on OpenAI's Swarm framework, enabling automatic creation of functional swarms through simple prompts.
- Implemented core modules including the 'Manager Agent' for concept refinement, 'Agent Creator' for custom agents, and 'Tool Creator' for specialized tool development.
- Successfully applied Inception Swarm across 10+ real-world scenarios, contributed code to the OpenAI Swarm GitHub.

A4-Unet: Deformable Multi-Scale Attention Network for Brain Tumor Segmentation

May. 2024

Regular Paper at IEEE BIBM 2024

Zhuhai, China

- Developed a brand-new CNN for brain tumor segmentation, using Deformable Large Kernel Attention and Swin Spatial Pyramid Pooling to enhance multi-scale mapping, established **SOTA** benchmark on BraTS datasets.
- Designed a Combined Attention Module that integrates Discrete Cosine Transform (DCT) with convolutional operations to optimize spatial weighting, effectively enhancing the focus on tumors while minimizing background noise.
- Formulated a novel frequency loss function paired with deep supervision strategies to emphasize high-frequency details, enabling the model to leverage textural nuances for more precise segmentation.

PUBLICATION

IEEE International Conference of Bioinformatics and Biomedicine

Dec. 2024

A4-Unet: Deformable Multi-Scale Attention Network for Brain Tumor Segmentation

Lisbon, Portugal