

# HUANG YANGZHI

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## EDUCATIONAL BACKGROUND

### The University of Hong Kong

Hong Kong, China

M.Sc. Artificial Intelligence

09/2023 – 03/2025

Research interests: LLM, Computer Vision, and Federated Learning

Supervisor: Professor Liangqiong Qu

- Thesis: *Federated Learning for Large Vision Models on Decentralized Heterogeneous Data*

### Northwest A&F University “Project 985”

Shaanxi, China

B.S. Information and Computation Science

09/2019 – 06/2023

- GPA: 3.7/4.0 | Average Score: **88.5/100** | Rank: **TOP 10%**
- Thesis: *Application of Weighted Tensor Rank-1 Decomposition in Hyperspectral Image Denoising*

## AWARDS AND HONOURS

- The **First-Class** Scholarship for Information and Computation Science Major in the 2019-2020, 2020-2021, and 2021-2022 Academic Years
- **Merit** Student of the 2019-2020, 2020-2021, and 2021-2022 Academic Years
- Outstanding Student Cadre of the 2021-2022 Academic Year
- The Second Prize (Provincial Level) in the 13<sup>th</sup> National Mathematics Competition for Undergraduate Students
- The Second Prize (World Class) in the International Mathematical Contest in Modelling (MCM)
- The Second Prize (World Class) in the Asia & Pacific Cup Mathematical Contest in Modelling
- The Second Prize (Provincial Level) in the 11<sup>th</sup> Challenge Cup Entrepreneurship and Innovation Contest for College Students
- The Third Prize (Provincial Level) in the 8<sup>th</sup> China International Internet+ Entrepreneurship and Innovation Contest for College Students
- The Second Prize in the Final of the 3<sup>rd</sup> National Computer Competency Challenge for Undergraduate Students (Advanced Application of Office Software)

## PUBLICATIONS

- GAO Xiaoyu, BAI Jingyuan, **HUANG Yangzhi**, et al. *Hyperspectral Image Denoising Based on Fast Tri-factorization and Group Sparsity Regularized* [J]. Acta Photonica Sinica, 2023, 52 (4) :0430002 (SCI)

## SOFTWARE COPYRIGHT

- CAO Yan, **HUANG Yangzhi**, TIAN Yunxin, CAO Yuting, and HAO Hongke. 2021. *A UAV-Based Management and Control System Focusing on Pine-Wood-Nematode-Driven Pest Damage Measurement* (V1.0). Patent 2021SR125794, filed 15<sup>th</sup> April 2021, and issued 17<sup>th</sup> August 2021.

## RECENT WORK

### [All-round AI Doctor with Rich Data Source and Functionality](#)

We proposed AIDoctor, a multi-modal medical chatbot using RAG technology. AIDoctor performs excellently in keyword extraction, text summarization, and question-answering tasks with minimal human supervision.

#### **My Contribution:**

- **Medical Dataset Collection and Processing:** Expertly collected and organized diverse, high-quality medical datasets through Python scraping and data cleaning.
- **Algorithm Development and Model Optimization:** Developed a Transformer-based model using Llama-7B for medical Q&A, optimizing performance with KeyBERT for keyword extraction and Phi-1.5 for predictive question generation.
- **Demand Analysis and Solution Design:** Addressed medical knowledge complexity and multi-modal needs by leveraging RAG with an external knowledge base, enhancing answer credibility and integrating U-Net and ResNet for audio data processing.

- **Product Application Scenarios and Commercial Value Analysis:** Assessed product potential in underserved regions and emergency settings, analyzing its commercial value with a focus on cost reduction, operational efficiency, and continuous service delivery.

## RESEARCH EXPERIENCES

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Capstone Research Project

[\*Federated Learning for Large Vision Models on Decentralized Heterogeneous Data\*](#)

05/2024 – 12/2024

**Position: Project Leader**

Developed Directional Normalization Adaptation (DNA) and FedDNA, novel parameter-efficient fine-tuning methods for heterogeneous federated learning in medical imaging. Achieved up to 2% accuracy improvement under severe heterogeneity, with faster convergence and stable training. Validated methods through extensive experiments and theoretical analysis, demonstrating effectiveness in privacy-preserving federated settings.

**My Contribution:**

- **Problem Identification:** Identified and analyzed the challenges in federated learning, including inconsistent local model performance and poor global aggregation due to label shift and data imbalance, particularly in severe data heterogeneity scenarios.
- **Algorithm Design and Model Optimization:** Proposed the DNA fine-tuning method, optimizing weight updates by decomposing them into amplitude and direction, and developed FedDNA to guide local updates using global key direction constraints, improving alignment and mitigating forgetting.
- **Experimental Validation and Analysis:** Led experiments with the ViT model on Retina and Derm datasets, demonstrating that DNA improves classification accuracy on heterogeneous data and that FedDNA achieves faster, more stable convergence while addressing local forgetting.

National Level Entrepreneurship and Innovation Programme for Undergraduate Students (No:202110712185)

[\*Application of Tucker Decomposition of Tensors and Tucker Rank in Tensor Recovery\*](#)

07/2021 – 05/2023

**Position: Project Leader**

Led and collaborated with members to learn and innovate, and innovated a algorithm, FTFGS successfully. (FTFGS explores the local low-rank characteristics of image blocks quickly and accurately under the framework of FTF, introduces a new group sparse regularization integrated low-rank noiseless small blocks, and better expresses the sparse characteristics)

**My Contribution:**

- **Technical Innovation and Method Design:** Led the design and implementation of a local low-rank feature extraction algorithm based on fast three-factor decomposition (FTF), introducing group-sparse regularization to enhance hyperspectral image denoising.
- **Experimental Design and Effect Validation:** Conducted rigorous experiments on multiple public datasets, demonstrating superior denoising performance through higher Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM) compared to five classical models.

## TECHNICAL SKILL

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Computer Programming

- **Python:** Have a good command of Python programming, skilled in utilizing it for data analysis, preprocessing, and deep learning tasks, with extensive experience using libraries such as NumPy, pandas, scikit-learn, and PyTorch. Proficient in implementing and optimizing machine learning algorithms and deep learning models, including CNNs, RNNs, Transformers, and LoRA-based fine-tuning methods. Familiar with developing scalable and efficient pipelines for training, evaluation, and deployment of models, as well as handling distributed computing and privacy-preserving frameworks in Python.
- **MATLAB:** Good at image processing (denoising in particular) and other machine learning tasks, such as building models, analyzing data, and visualizing results.

Others: Design (using Figma), Video Editing

## STANDARDISED TEST/ CERTIFICATE

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- IELTS: 7.0 (L:7.5 / R: 7.5 / W: 6.5 / S: 6.5)
- National Computer Rank Examination Grade 2