Hai Jiang
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Admission Committee   January 13, 2025
Fraunhofer Institute
Algorithms and Scientific Computing
AI in Parkinson's Disease

To whom it may concern,

I am writing to express my keen interest in the PhD position at your university. My academic background and research experience have equipped me with the skills and knowledge necessary for advanced study in this field.

My journey began with a strong foundation in Computer Science and Mathematics, leading me to pursue a Master's degree in Computational Mathematics in 2019, following a Bachelor's degree in Information Security in China. For my Master's project, I focused on Generative Adversarial Networks (GANs) of Deep Learning (DL), specifically for handwriting style imitation. In this project, I developed a GANs-based model to replicate individual handwriting styles, focusing on emulating the handwritten Chinese characters of Shiing Shen Chern from a dataset of around 220 characters. This experience provided me with hands-on expertise in GANs, data preprocessing, manuscript analysis, and code replication, culminating in my Master's thesis, *"GANs based Personal Style Imitation of Chinese Handwritten Characters."*

Following my Master's degree, I contributed to the Compressed Sensing MRI ADMM-Net project, which combined DL with numerical approximation theory. Traditional algorithms often lose image detail with repeated iterations, but by leveraging Convolutional Neural Networks (CNNs), our team demonstrated how DL can dynamically adjust parameters to preserve fine details. This project deepened my understanding of convergent algorithm theory, proof construction, and the balance between theoretical approaches and practical applications, while refining my programming and analytical skills.

After completing my degree, I joined a research group at Sun Yat-sen University focused on Computer-aided diagnosis, where I worked as a Research Assistant on several impactful projects. These included diagnosing Placenta Accreta Spectrum Disorders, predicting metastasis in Sentinel Axillary Lymph Nodes in breast cancer, and assessing responses to Neoadjuvant Chemotherapy via MRI. Through these projects, I gained further expertise in Python, PyTorch, and TensorFlow, along with experience in manuscript research and scientific writing.

I am confident that I am a strong candidate for this position within your research group. The focus of this position on addressing priority areas of high scientific and societal relevance to Parkinson's disease closely aligns with my interests and expertise. I am particularly passionate about developing AI/ML algorithms to support earlier diagnosis, patient subgroup stratification, prognosis, and treatment response prediction. Additionally, I am keenly interested in algorithms that enable more objective disease monitoring through digital voice and gait recordings, as well as neuroimaging. My interdisciplinary background, programming expertise, and research experience uniquely position me to excel in and make meaningful contributions to the challenges and rigor of this PhD opportunity.

My long-term goal is to establish a career in academia, contributing to the fields of Computer Science and Mathematics through impactful research and innovation. The cutting-edge nature and interdisciplinary of your research, coupled with the expertise and accomplishments of your team, aligns seamlessly with my academic and professional aspirations. This position represents an ideal next step in achieving my goals. I am eager to join an environment that fosters intellectual rigor, collaboration, and access to the resources necessary to realize my ambitions.

I am enthusiastic about the opportunity to join your research community and contribute actively while continuing to develop my expertise. Thank you for considering my application, and I look forward to discussing how my background, skills, and goals align with your program.

Sincerely,

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Education

09.2019–07.2022	**Master of Science in Computational Mathematics**, *Nankai University (NKU)*, **China**
Thesis	*GANs based Personal Style Imitation of Chinese Handwritten Characters.*
Advisors	Prof. Yunhua Xue, Prof. Chunlin Wu
Related Courses	Approximation Theory and Methods, Numerical Optimization, Convex Analysis, Variational Analysis, Real Analysis, Functional Analysis, Matrix Computation, Foundations of Measure Theory and Probability, Numerical Solutions of Partial Differential Equations, and more.
Cumulative GPA	3.06/4.00
09.2014–07.2018	**Bachelor of Engineering in Information Security**, *Lanzhou University (LZU)*, **China**
Thesis	*Improved Upper Bounds of Roman Domination Number in Maximal Outerplanar Graphs.*
Advisor	Prof. Zepeng Li
Related Courses	Discrete Mathematics, Operating Systems, Data Structures, C and C++ Programming Lab, Java Programming Lab, Database Theory and Lab, Computer Organization and Design, and more.
Cumulative GPA	4.15/5.00

Research Experience

11.2022–07.2024	**Research Assistant**, *Computational Medical Imaging Laboratory*
	School of Computer Science and Engineering, Sun Yat-sen University, China
Project	China Department of Science and Technology Key Grant, focused on Breast Cancer, aims to develop models with clinical interpretability and generalization.
Advisors	Prof. Yao Lu, Dr. Ting Song
Task Focus	Placenta Accreta Spectrum Disorders, T2-WI MRI, Prenatal Diagnosis, Multi-class classification.
Experience and Skills	Literature research, data preprocessing, model building (programming), research paper writing.
Publication	Submitted to ISBI 2025 and accepted: *"Anatomy-guided Multitask Learning for MRI-based Classification of Placenta Accreta Spectrum and its Subtypes."*
12.2023–01.2024	**Research Assistant**, *Computational Medical Imaging Laboratory*
	School of Computer Science and Engineering, Sun Yat-sen University, China
Project	National Natural Science Foundation of China, focused on Breast Cancer, aimed to develop a prediction model for the Chinese female population mainly with FFDM and US.
Advisors	Prof. Yao Lu, Dr. Xiang Zhang
Task Focus	Breast Cancer, Dual-Energy CT, Sentinel Lymph Nodes, Metestatic status, Multi-class classification.
Experience and Skills	The first comprehensive research experience involved conducting literature reviews, designing experiments, writing research papers, and working with the TensorFlow and Keras frameworks.
Publication	Submitted to MICCAI 2024 and revised for submission to the Journal of *Medical Physics*: *"DECT-Based Space-Squeeze Method for Multi-Class Classification of Metastatic Lymph Nodes in Breast Cancer."*
01.2022–06.2022	**Research Student**, *Image Analysis Team*
	School of Mathematical Sciences, Nankai University, China
Task	ADMM model from the manuscript *"Deep ADMM-Net for Compressed-Sensing MRI."*
Supervisors	Prof. Chunlin Wu, Prof. Yunhua Xue
Focus	Compressed-sensing Theory, Iterative Equations, Neural Networks, MRI reconstruction.
Experience and Skills	The second programming experience involved proving mathematical equations and applying Deep Learning techniques. I reproduced the iterative mathematical equations using C++, Python, and PyTorch.

01.2021–04.2021	**Research Student**, *Image Analysis Team*
	School of Mathematical Sciences, Nankai University, China
Task	ROF-model from the manuscript *"Nonlinear Total Variation Based Noise Removal Algorithms."*
Supervisor	Prof. Yunhua Xue
Focus	Image Restoration, Denoise, PDE, Total-Variation Penalty.
Experience and Skills	My initial project experience included proving mathematical equations and using both C++ and Python to develop the ROF model.

Other Work Experience

Funding

Proposal Writing	Accepted; National Key Research and Development Program of China [No. 2023YFE0204300].
Report Writing	Succeeded; Finished three Completion Reports and three Progress Reports; National Natural Science Foundation of China [No. 81971691, 12126610]; R&D Program of Pazhou Lab (Huangpu) [No. 2023K0606].

Specification

Patent	1 Patent Application Specification; under review.
Device	1 Medical Device Application Specification; succeeded.

Teaching Experience

Courses	Calculus; Mathematical Analysis
Thesis	*Breast Cancer Classification Method Based on Dual-Energy CT Images*

Language Proficiency

Mandarin	Native
English	Professional Level: IELTS 6.5; CET6 476/710; CET4 544/710
Cantonese	Intermediate

Skills

Technical	Python, PyTorch, Tensorflow + Keras, LaTeX, Git, C/C++, MATLAB
Other	Linux (Ubuntu), Microsoft Office, Adobe Photoshop
GitHub repository	https://github.com/pigejianghai/projects

Interest

Artificial Intelligence, Mathematics, Physics

Awards

2014 – 2018	Four-time recipient of the Third-Class Merit Scholarship for Academic Excellence at LZU.
2019 – 2022	Three-time recipient of the Third-Class Merit Scholarship for Academic Excellence at NKU.

References

Prof. Zepeng Li

Associate Professor in Machine Learning at Lanzhou University

Address	222 South Tianshui Road, Lanzhou 730000, Gansu Province, P.R. China
E-mail	lizp@lzu.edu.cn

Prof. Yunhua Xue

Associate Professor in Computational Mathematics at Nankai University

Address	94 Weijin Road, Nankai District, Tianjin, P.R. China 300071
E-mail	yhxue@nankai.edu.cn

Publications

[1]   **Hai Jiang** et. al. "Anatomy-Guided Multitask Learning for MRI-Based Classification of Placenta Accreta Spectrum and Its Subtypes." *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2025.

[2]   Jiawei Pan, Zilong He, Yue Li, Weixiong Zeng, Yaya Guo, Lixuan Jia and **Hai Jiang** et. al. "Atypical architectural distortion detection in digital breast tomosynthesis: a multi-view computer-aided detection model with ipsilateral learning." *Physics in Medicine & Biology* 68, no. 23 (2023): 235006.