

February 13, 2025

**Admission Committee**  
Max Delbrück Center (MDC)  
Molecular Medicine Berlin  
MDC International PhD Program

Dear Members of the Admissions Committee,

I am writing to express my enthusiastic interest in the PhD position in **Integrative Biomedicine** at the Max Delbrück Center. With a robust foundation in computational mathematics, hands-on experience in AI-driven medical data analysis, and a passion for developing interpretable models to bridge computational and biomedical sciences, I am eager to contribute to MDC's mission of unraveling the molecular basis of health and disease through cutting-edge research.

During my Master's in Computational Mathematics (2019-2022), I specialized in **Generative Adversarial Networks (GANs)**, focusing on cross-domain style transfer for structured data. My thesis, "*GANs for Personal Style Imitation of Chinese Handwritten Characters*," involved designing an end-to-end CycleGAN framework to replicate the nuanced calligraphic style of Shiling Shen Chern. By optimizing adversarial training and domain-specific preprocessing, I achieved **85% visual similarity** across 220 characters, outperforming baseline models by 10%. This project honed my ability to map heterogeneous data domains—a skill directly applicable to biomedical challenges such as integrating multi-omics datasets or enhancing medical image analysis pipelines.

As a researcher at Sun Yat-sen University's **Computational Medical Imaging Lab**, I led interdisciplinary projects that combined AI innovation with clinical relevance. For example, I developed a **multi-task learning model** to classify Placenta Accreta Spectrum Disorder severity using T2-WI MRI images, achieving an **AUC of 0.80**. In a separate project, I designed a CNN-based system to predict breast cancer metastasis in Sentinel Lymph Nodes via dual-energy CT scans, attaining an **AUC of 0.85** in cross-validation. Beyond algorithm development, I harmonized heterogeneous DICOM datasets while deploying models on hospital servers, demonstrating my proficiency in managing complex medical data workflows—a critical competency for advancing precision medicine. These efforts resulted in two first-authored papers (one accepted at ISBI 2025, one under revision).

Your program's emphasis on **Integrative Biomedicine** aligns with my aspiration to develop interpretable, generalizable AI frameworks for complex biological systems. My experience with GANs for structured data transformation and CNNs for medical imaging directly supports MDC's focus areas, such as Imaging and Image Analysis and Computational Biology. For instance, adversarial training techniques I employed to preserve stylistic fidelity in handwritten characters could be adapted to enhance synthetic data generation for rare disease modeling or improve feature extraction in high-throughput imaging. Additionally, my work on clinically validated models underscores my ability to translate computational innovations into tools that address pressing biomedical questions.

A PhD at MDC would provide the ideal interdisciplinary environment—spanning AI, mathematics, and molecular medicine—to advance my goal of pioneering interpretable AI solutions for biomedical discovery. Long-term, I aim to lead research focused on integrating multi-modal data (e.g., imaging, genomics, and clinical records) to uncover biomarkers for early disease detection and personalized treatment strategies. MDC's translational ethos, state-of-the-art facilities, and collaborations with clinical partners like the Charité Universitätsmedizin Berlin would empower me to drive innovations from bench to bedside, aligning with the Center's legacy in transformative medical research.

The MDC International PhD Program's focus on Biomedical Sciences offers unparalleled opportunities to refine my expertise in computational method development. I am particularly excited to collaborate on projects such as leveraging deep learning for single-cell RNA sequencing analysis or developing physics-informed neural networks for dynamic disease modeling. My technical background in AI/ML, coupled with my commitment to interdisciplinary problem-solving, positions me to contribute meaningfully to MDC's strategic initiatives in Integrative Biomedicine.

Thank you for considering my application. I would welcome the opportunity to discuss how my expertise in computational modeling, medical image analysis, and cross-disciplinary collaboration could support MDC's mission. I look forward to contributing to groundbreaking research at the intersection of AI, mathematics, and molecular medicine.

Sincerely,

**Hai Jiang**