Fan Xiao

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Education

Ludwig-Maximilians-Universität München, Munich, Germany 2023.09 – Now
PhD candidate in Medical Physics
Research focus: AI-based Efficient Sequence Modeling, Monte Carlo Simulation, Medical Image Segmentation

Southern Medical University, Guangzhou, China 2020.09 – 2023.06
MS in Biomedical Engineering, GPA 3.6/4.0

Wuhan University of Technology, Wuhan, China 2016.09 – 2020.06
BS in Communication Engineering

Research Experience

Benchmarking Mamba/Transformer/ConvLSTM for Dose Calculation | First Author 2025.07 – Now

- Designed a GPU-accelerated processing pipeline using CuPy to perform Ray-Casting for segment projection and Cubic B-spline resampling for Beam's Eye View (BEV) transformations
- Developed a unified benchmarking framework comparing CNN-Mamba, Transformer, CNN-ConvLSTM, and Unet for volumetric sequence modeling
- Developed an optimized inference pipeline integrating CUDA Graphs and Automatic Mixed Precision (AMP), achieving high-throughput inference (<40 ms/segment) with low memory footprint (2.9 GB), validated across multiple GPU generations
- Under revision: ***Physics in Medicine & Biology*** **(2026)**

Real-Time MRI-Only Photon Dose Calculation Engine | First Author 2024.10 – 2025.06

- Proposed a CNN-RNN framework (UNet-LSTM) to approximate computationally expensive Monte Carlo particle transport simulations directly from MRI data
- Solved the domain shift challenge (lack of electron density information in MRI) by integrating CT-MRI deformable registration with a segmentation-guided feature mechanism
- Achieved 12 ms per photon beam inference latency with a gamma passing rate (2%/2mm) exceeding 99.50% compared to Monte Carlo ground truth
- Published in ***Medical Physics*** **(2025)**, DOI: 10.1002/mp.70106

Proton Range Verification via Prompt Gamma Emission Prediction | First Author 2024.01 – 2024.09

- Architected an LSTM model by integrating heterogeneous data streams (anatomical relative stopping power maps and physical dose fields) to predict prompt gamma emissions across wide proton energies (125–210 MeV).
- Achieved sub-millimeter accuracy with a mean absolute range shift deviation of 0.15 mm against Monte Carlo ground truth.
- Reduced prediction time to <130 ms per pencil beam, facilitating sub-second feedback for adaptive proton therapy.
- Published in ***Physics in Medicine & Biology*** **(2024)**, DOI: 10.1088/1361-6560/ad8e2a

Technical Skills

- Languages: Python, C++ (Geant4 focus), Bash.
- Deep Learning: Pytorch, RNN/LSTM, Transformer, Mamba, Unet/nnUnet.
- Tools: Git, Docker, Slurm, Cupy, Plastimatch, Pydicom, RayStation scripting.

Additional Info and Awards

- Selected Talks:
  AAPM 2025 (Washington, DC), ICCR 2024 (Lyon), ECMP 2024 (Munich).
- Awards:
  Chinese National Scholarship (2022) – Top 2%;
  First-class Academic Scholarship (2022, 2023) – Top 20%.
- Languages:
  Chinese (Native), English (Professional Working Proficiency).