Lixuan Chen

📱 (+86) 159-1159-3450   ●   ✉ chenlx1@shanghaitech.edu.cn

🌐 maopaom.github.io   ●   📖 Google Scholar

Research Interests

Inverse Problems in Medical Imaging

○ MRI Reconstruction, Motion Correction, Atlas Construction, CT Metal Artifact Reduction, etc.

Model-based Deep Learning for Medical Imaging

○ Neural Representation, Diffusion Model, Deep Image Prior, etc.

Education

ShanghaiTech University   **Sep. 2021 - Exp July 2024**

○ *M.Sc. Computer Science*, GPA 3.63/4.00 (Major: 3.73/4.00); Advisor: Prof. Yuyao Zhang

ShanghaiTech University   **Sep. 2017 - July 2021**

○ *B.Eng. in Computer Science*

Research Experience

Flexible Diffusion Modeling of Dynamic MRI   **May. 2023 – Present**

Advisor: *Prof. Liyue Shen*   University of Michigan (Research Assistant)

○ Built a veritable diffusion model that provides data-driven prior for various dynamic MRI inverse problems.
○ Adopted a novel sampling strategy to train a 3D spatial-temporal diffusion model for unconditional and flexible conditional generation of high-quality dynamic MRI images.
○ Experimented on two public datasets: ACDC&MMs; generated high-quality cardiac cine images; achieved outstanding performance in both super-resolution (condition on image) and reconstruction (condition on k-space data) tasks.

Motion Correction in Parallel MRI with Score-Based Diffusion Model   **May. 2023 – Sep. 2023**

Advisor: *Prof. Yuyao Zhang* | Venue: *IEEE TMI (under review)*   ShanghaiTech University

○ Proposed an unsupervised method jointly estimating the motion parameters and coil sensitivity maps for accelerated MRI reconstruction.
○ Introduced score-based diffusion models as powerful priors and leveraged the physical acquisition process in multi-coil MRI to efficiently constrain the solution space, enabling accurate estimation and reconstruction.
○ Outperformed both model-based and score-based SOTA methods on fastMRI dataset.

Longitudinal Brian Atlas Construction via Implicit Neural Representation   **Sep. 2021 – July 2023**

Advisor: *Prof. Yuyao Zhang* | Venue: *MICCAI workshop PIPPI 2022, IEEE TMI (under review)*   ShanghaiTech University

○ Alleviated the temporal inconsistency issue caused by independently averaging brain images at discrete time points in existing longitudinal atlas construction methods
○ Formulated the time inconsistency issue as a 4D image denoising task, and used implicit neural representation to construct continuous and noise-free longitudinal brain atlases.
○ Improved temporal consistency while maintaining accurate representation of brain structures on two modalities of brain atlases (QSM and fetus atlases).

CT Metal Artifact Reduction   **Dec. 2022 – Sep. 2023**

Advisor: *Prof. Yuyao Zhang* | Venue: *NuerIPS 2023*   ShanghaiTech University

○ Proposed the first physics-driven unsupervised DL model to reduce CT metal artifacts from the perspective of the nonlinear inverse problem.
○ Incorporated a differentiable CT forward model that can accurately simulate the nonlinear acquisition process into implicit neural representation (INR), enabling the reconstruction of polychromatic CT images.
○ Outperformed supervised counterparts on in- and out-of-domain data; applied on the clinical data scanned by Bruker Skyscan 1276 micro-CT.

High-resolution 3D Isotropic Fetal Brain MRI Reconstruction   **Sep. 2021 – July 2023**

Advisor: *Prof. Yuyao Zhang* | Venue: *IEEE ISBI 2023, IEEE TMI (major revision)*   ShanghaiTech University

- Proposed an unsupervised iterative SVR-SRR framework for reconstruction from multiple motion-corrupted stacks of 2D thick slices without using external databases.
- Incorporated the MRI acquisition model into the SVR network to accurately predict the spatial transformation matrix aligning 2D slices to 3D volumes, providing a good initial volume for SRR.
- Utilized decoding network of DIP framework for SRR process to represent and reconstruct HR 3D volumes.
- Outperformed SOTA methods in four metrics on both simulated and clinical data.

Publications

1. <u>Lixuan Chen</u>, Xuanyu Tian, Jiangjie Wu, Ruimin Feng, Guoyan Lao, Yuyao Zhang, Hongjiang Wei ● *"JSMoCo: Joint Coil Sensitivity and Motion Correction in Parallel MRI with a Self-Calibrating Score-Based Diffusion Model"* ● IEEE Transactions on Medical Imaging (**IEEE TMI**) ● Under Review ● PDF

2. <u>Lixuan Chen</u>, Jiangjie Wu, Qing Wu, Hongjiang Wei, Yuyao Zhang ● *"COLLATOR: Consistent Spatial-Temporal Longitudinal Atlas Construction via Implicit Neural Representation"* ● IEEE Transactions on Medical Imaging (**IEEE TMI**) ● Under Review

3. <u>Lixuan Chen</u>, Jiangjie Wu, Qing Wu, Hongjiang Wei, Yuyao Zhang ● *"Continuous longitudinal fetus brain atlas construction via implicit neural representation"* ● International Workshop on Preterm, Perinatal and Paediatric Image Analysis (**MICCAI workshop PIPPI 2022**) ● Best Paper Honorable Mention Award ● PDF

4. Qing Wu, <u>Lixuan Chen</u>, Ce Wang, Hongjiang Wei, S Kevin Zhou, Jingyi Yu, Yuyao Zhang ● *"Unsupervised Polychromatic Neural Representation for CT Metal Artifact Reduction"* ● 37th Conference on Neural Information Processing Systems (**NeurIPS 2023**) ● PDF

5. Jiangjie Wu, <u>Lixuan Chen</u>, Zhenghao Li, Lihui Wang, Rongpin Wang, Hongjiang Wei, Yuyao Zhang ● *"ASSURED: A Self-supervised Deep Decoder Network for Fetus Brain MRI Reconstruction"* ● IEEE 20th International Symposium on Biomedical Imaging (**IEEE ISBI 2023**) ● PDF

6. Jiangjie Wu, <u>Lixuan Chen</u>, Zhenghao Li, Lihui Wang, Rongpin Wang, Hongjiang Wei, Yuyao Zhang ● *"SUFFICIENT: A scan-specific unsupervised deep learning framework for high-resolution 3D isotropic fetal brain MRI reconstruction"* ● IEEE Transactions on Medical Imaging (**IEEE TMI**) ● Major Revision

Internship Experience

Microsoft Research Asia   **June 2023 - Sep. 2023**
Research Intern; Supervisor: Dr. Xinyang Jiang

- Reduced artifacts caused by inevitable motion during the super-resolution ultrasound imaging
- Proposed hierarchical motion estimation method based on automatically partitioning motion patterns.
- Applied to clinical data; illustrated feasibility of our method by several downstream reconstruction tasks.

Bell Labs   **Dec. 2020 - June 2021**
Research Intern; Supervisor: Dr. Fei Gao

- Proposed a meta-learning-based approach for gesture recognition using WiFi CSI.
- Demonstrated rapid domain adaptation for new scenarios; achieved superior performance on two public datasets and real-world data.

Teaching Experience

CS270: Digital Image Processing, Fall 2021   **ShanghaiTech University**
Teaching Assistant

- Designing projects, assignments, and quizzes; Grading homework and exams.

Skills

- **Programming Language**: Python, Matlab, C++, C
- **Tools & Framework**: ITK-SNAP, FreeSurfer, ANTs, Slicer, LaTeX, Pytorch
- **Language**: Mandarin (Native), English (Fluent)

References

Prof. Yuyao Zhang
Assistant Professor, ShanghaiTech University
Relationship: Supervisor   **Address:** 393 HuaXia RD, Pudong, Shanghai, 201210
Email: zhangyy8@shanghaitech.edu.cn   **Tel:** +86-21-20684863