

# ZHENRONG SHEN

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## EDUCATION

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[Shanghai Jiao Tong University](#) (SJTU)

Shanghai, China

Ph.D. in Biomedical Engineering; Advisor: [Qian Wang](#)

Sep. 2020 - Jun. 2025

- **Ph.D. Thesis:** Research on Controllable Medical Image Synthesis Methods for Intelligent Disease Diagnosis.

[Beihang University](#) (BUAA)

Beijing, China

B.Eng. in Biomedical Engineering

Sep. 2016 – Jun. 2020

## RESEARCH EXPERIENCE

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**Chest X-ray Lung Nodule Synthesis for Lung Nodule Detection**

2020 – 2022

- Proposed an inpainting-based lung nodule synthesis network and a synthetic sample selection network to select effective synthetic samples for augmenting lung nodule detection. This work was accepted by *PRCV 2021*.
- Proposed a lung nodule synthesis framework that disentangles nodule attributes (*i.e.*, shape, size, and texture) and synthesize nodules in a controllable manner, and leveraged such controllability to design a hard example mining strategy for augmenting lung nodule detection. This work was accepted by *Medical Image Analysis*.

**Cervical Cytological Image Synthesis for Cervical Abnormality Screening**

2022 – 2025

- Proposed CellGAN, a conditional GAN that generates cytological images of various cervical cell types including NILM, ASC-US, ASC-H, LSIL, and HSIL cells for augmenting patch-level cervical cell classification. This work was accepted by *MICCAI 2023 (early accept)*.
- Incorporated CellGAN into a knowledge distillation framework for multi-class cervical cell detection, which facilitates the class-balanced pre-training of a teacher network. This work was accepted by *Neural Networks*.
- Proposed a two-stage diffusion-based framework that hierarchically generates global cervical cytological image and local abnormal cervical cells for augmenting image-level abnormal cervical cell detection. This work was submitted to *Neural Networks (major revision)*.

**Image Super-resolution for Arbitrary MRI Inter-Slice Spacing Reduction**

2022 – 2024

- Proposed HiFi-Diff, a diffusion model for arbitrary MRI inter-slice spacing reduction, which generates in-between MR slices from adjacent MR slices in the through-plane direction. This work was accepted by *MLMI 2023*.
- Proposed SA-INR, an implicit neural representation method for arbitrary MRI inter-slice spacing reduction in any direction. This work was accepted by *Medical Image Analysis*.

**Cross-modality PET Image Synthesis for Parkinson's Disease (PD) Diagnosis**

2023 – 2025

- Proposed a Metabolism-aware Anomaly Detection (MetaAD) framework, which leverages a cyclic modality translation workflow to identify metabolism anomalies of PD in  $^{18}\text{F}$ -FDG PET scans. This work was accepted by *MICCAI 2024 (Young Scientist Award)*.
- Propose a two-stage framework that synthesizes  $^{11}\text{C}$ -CFT PET images from real  $^{18}\text{F}$ -FDG PET scans for multi-modal PD diagnosis, which was based on the correlation between dopaminergic deficiency in the striatum and increased glucose metabolism in PD patients. This work was accepted by *European Journal of Nuclear Medicine and Molecular Imaging*.

**Whole-body MR-to-CT Synthesis for PET Attenuation Correction in PET/MR Imaging**

2024 – 2025

- Proposed a whole-body MR-to-CT synthesis framework that integrates structural guidance, spatial alignment, and semantic constraint to enhance synthetic CT image quality, thus facilitating PET attenuation correction. This work was accepted by *Medical Image Analysis*.

## JOURNAL PUBLICATIONS

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1. **Cross-Modality PET Image Synthesis for Parkinson's Disease Diagnosis: A Leap from [ $^{18}\text{F}$ ]FDG to [ $^{11}\text{C}$ ]CFT Using Deep Learning**  
Zhenrong Shen\*, Jing Wang\*, Haolin Huang, Jiaying Lu, Jingjie Ge, Honglin Xiong, Ping Wu, Zizhao Ju, Huamei Lin, Yuhua Zhu, Yunhao Yang, Fengtao Liu, Yihui Guan, Kaicong Sun, Qian Wang, Chuantao Zuo.  
*European Journal of Nuclear Medicine and Molecular Imaging*, January 2025.
2. **Image Synthesis with Disentangled Attributes for Chest X-ray Nodule Augmentation and Detection**  
Zhenrong Shen, Xi Ouyang, Bin Xiao, Jie-Zhi Cheng, Dinggang Shen, Qian Wang.  
*Medical Image Analysis*, February 2023.
3. **Two-stage Cytopathological Image Synthesis for Augmenting Cervical Abnormality Screening**  
Zhenrong Shen\*, Manman Fei\*, Xin Wang, Jiangdong Cai, Sheng Wang, Lichi Zhang, Qian Wang.  
*Neural Networks (major revision)*.
4. **Structure-Guided MR-to-CT Synthesis with Spatial and Semantic Alignments for Attenuation Correction of Whole-Body PET/MR Imaging**  
Jiaxu Zheng\*, Zhenrong Shen\*, Lichi Zhang, Qun Chen.  
*Medical Image Analysis*, April 2025.
5. **Distillation of Multi-class Cervical Lesion Cell Detection via Synthesis-aided Pre-training and Patch-level Feature Alignment**  
Manman Fei, Zhenrong Shen, Zhiyun Song, Xin Wang, Maosong Cao, Linlin Yao, Xiangyu Zhao, Qian Wang, Lichi Zhang.  
*Neural Networks*, October 2024.
6. **Segment Anything Model for Medical Image Segmentation: Current Applications and Future Directions**  
Yichi Zhang, Zhenrong Shen, Rushi Jiao.  
*Computers in Biology and Medicine (Highly Cited Paper)*, March 2024.
7. **Improving Self-Supervised Medical Image Pre-Training by Early Alignment with Human Eye Gaze Information**  
Sheng Wang\*, Zihao Zhao\*, Zhenrong Shen, Bin Wang, Qian Wang, Dinggang Shen.  
*IEEE Transactions on Medical Imaging*, January 2025.
8. **Learning Contrast and Content Representations for Synthesizing Magnetic Resonance Image of Arbitrary Contrast**  
Honglin Xiong, Yulin Wang, Zhenrong Shen, Kaicong Sun, Yu Fang, Yan Chen, Dinggang Shen, Qian Wang.  
*Medical Image Analysis*, May 2025.
9. **Exploring Multi-Connectivity and Subdivision Functions of Brain Network via Heterogeneous Graph Network for Cognitive Disorder Identification**  
Dongdong Chen, Mengjun Liu, Zhenrong Shen, Linlin Yao, Xiangyu Zhao, Zhiyun Song, Haolei Yuan, Qian Wang, Lichi Zhang.  
*IEEE Transactions on Neural Networks and Learning Systems*, October 2024.
10. **sTBI-GAN: An Adversarial Learning Approach for Data Synthesis on Traumatic Brain Segmentation**  
Xiangyu Zhao\*, Di Zang\*, Sheng Wang, Zhenrong Shen, Kai Xuan, Zeyu Wei, Zhe Wang, Ruizhe Zheng, Xuehai Wu, Zheren Li, Qian Wang, Zengxin Qi, Lichi Zhang.  
*Computerized Medical Imaging and Graphics*, March 2024.
11. **Uni-COAL: A Unified Framework for Cross-Modality Synthesis and Super-Resolution of MR Images**  
Zhiyun Song, Zengxin Qi, Xin Wang, Xiangyu Zhao, Zhenrong Shen, Sheng Wang, Manman Fei, Zhe Wang, Di Zang, Dongdong Chen, Linlin Yao, Qian Wang, Xuehai Wu, Lichi Zhang.  
*Expert Systems with Applications*, December 2024.
12. **Spatial Attention-based Implicit Neural Representation for Arbitrary Reduction of MRI Slice Spacing**

Xin Wang\*, Sheng Wang\*, Honglin Xiong, Kai Xuan, Zixu Zhuang, Mengjun Liu, **Zhenrong Shen**, Xiangyu Zhao, Lichi Zhang, Qian Wang.

*Medical Image Analysis, May 2024.*

13. **DW-Net: A Cascaded Convolutional Neural Network for Apical Four-chamber View Ssegmentation in Fetal Echocardiography**

Lu Xu, Mingyuan Liu, **Zhenrong Shen**, Hua Wang, Xiaowei Liu, Xin Wang, Siyu Wang, Tiefeng Li, Shaomei Yu, Min Hou, Jianhua Guo, Jicong Zhang, Yihua He.

*Computerized Medical Imaging and Graphics, May 2020.*

## CONFERENCE PUBLICATIONS

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1. **CellGAN: Conditional Cervical Cell Synthesis for Augmenting Cytopathological Image Classification**

**Zhenrong Shen**, Maosong Cao, Sheng Wang, Lichi Zhang, Qian Wang.

*MICCAI 2023 (early accept), October 2023.*

2. **Nodule Synthesis and Selection for Augmenting Chest X-ray Nodule Detection**

**Zhenrong Shen\***, Xi Ouyang\*, Zhuochen Wang, Yiqiang Zhan, Zhong Xue, Qian Wang, Jie-Zhi Cheng, Dinggang Shen.

*Chinese Conference on Pattern Recognition and Computer Vision (PRCV), October 2021.*

3. **MetaAD: Metabolism-Aware Anomaly Detection for Parkinson’s Disease in 3D <sup>18</sup>F-FDG PET**

Haolin Huang\*, **Zhenrong Shen\***, Jing Wang\*, Xinyu Wang, Jiaying Lu, Huamei Lin, Jingjie Ge, Chuantao Zuo, Qian Wang.

*MICCAI 2024 (Young Scientist Award), October 2024.*

4. **Arbitrary Reduction of MRI Inter-slice Spacing Using Hierarchical Feature Conditional Diffusion**

Xin Wang\*, **Zhenrong Shen\***, Zhiyun Song, Sheng Wang, Mengjun Liu, Lichi Zhang, Kai Xuan, Qian Wang.

*MICCAI 2023 Workshop on Machine Learning in Medical Imaging (MLMI 2023), October 2023.*

5. **MeLo: Low-rank Adaptation Is Better Than Fine-tuning for Medical Image Diagnosis**

Yitao Zhu, **Zhenrong Shen**, Zihao Zhao, Sheng Wang, Xin Wang, Xiangyu Zhao, Dinggang Shen, Qian Wang.

*ISBI 2024 (oral), May 2024.*

6. **One-Shot Traumatic Brain Segmentation with Adversarial Training and Uncertainty Rectification**

Xiangyu Zhao, **Zhenrong Shen**, Dongdong Chen, Sheng Wang, Zixu Zhuang, Qian Wang, Lichi Zhang.

*MICCAI 2023 (early accept), October 2023.*

7. **Consistent 3D Medical Image Inpainting via Implicit Representation and Multi-View Sampling**

Yuqi Hu, **Zhenrong Shen**, Zhiyun Song, Dongdong Chen, Liao Wang, Lichi Zhang.

*ICICSP 2024, September 2024.*

8. **Learnable Subdivision Graph Neural Network for Functional Brain Network Analysis and Interpretable Cognitive Disorder Diagnosis**

Dongdong Chen, Mengjun Liu, **Zhenrong Shen**, Xiangyu Zhao, Qian Wang, Lichi Zhang.

*MICCAI 2023, October 2023.*

9. **CAS-Net: Cross-View Aligned Segmentation by Graph Representation of Knees**

Zixu Zhuang\*, Xin Wang\*, Sheng Wang\*, **Zhenrong Shen**, Xiangyu Zhao, Mengjun Liu, Zhong Xue,

Dinggang Shen, Lichi Zhang, Qian Wang.

*MICCAI 2023, October 2023.*

10. **Self-supervised Learning with Adaptive Graph Structure and Function Representation for Cross-Dataset Brain Disorder Diagnosis**

Dongdong Chen, Linlin Yao, Mengjun Liu, **Zhenrong Shen**, Yuqi Hu, Zhiyun Song, Qian Wang, Lichi Zhang.

*MICCAI 2024, October 2024.*

11. **Robust Cervical Abnormal Cell Detection via Distillation from Local-Scale Consistency Refinement**

Manman Fei, Xin Zhang, Maosong Cao, **Zhenrong Shen**, Xiangyu Zhao, Zhiyun Song, Qian Wang, Lichi Zhang.

*MICCAI 2023, October 2023.*

12. **Gaze-DETR: Using Expert Gaze to Reduce False Positives in Vulvovaginal Candidiasis Screening**

Yan Kong\*, Sheng Wang\*, Jiangdong Cai, Zihao Zhao, **Zhenrong Shen**, Yonghao Li, Manman Fei, Qian Wang.  
*MICCAI 2024 (early accept), October 2023.*

13. **MITracker: Multi-View Integration for Visual Object Tracking**

Mengjie Xu\*, Yitao Zhu\*, Haotian Jiang, Jiaming Li, **Zhenrong Shen**, Sheng Wang, Haolin Huang, Xinyu Wang, Han Zhang, Qing Yang, Qian Wang.  
*CVPR 2025 (highlighted), June 2025.*

14. **Longitudinal Image Synthesis for Early Brain Development with Age Awareness**

Yu Fang, Honglin Xiong, Jiawei Huang, Xin Wang, **Zhenrong Shen**, Feihong Liu, Xinyi Cai, Han Zhang, Qian Wang.  
*ISBI 2025, April 2025.*

15. **Alias-Free Co-modulated Network for Cross-Modality Synthesis and Super-Resolution of MR Images**

Zhiyun Song, Xin Wang, Xiangyu Zhao, Sheng Wang, **Zhenrong Shen**, Zixu Zhuang, Mengjun Liu, Qian Wang, Lichi Zhang.  
*MICCAI 2023 (early accept), October 2023.*

## ACTIVITIES

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- **Journal Reviewer**

*Medical Image Analysis*

*IEEE Transactions on Neural Networks and Learning Systems*

*IEEE Transactions on Multimedia*

*IEEE Journal of Biomedical and Health Informatics*

*Neural Networks*

*Computerized Medical Imaging and Graphics*

*Medical & Biological Engineering & Computing*

- **Conference Reviewer**

*Medical Image Computing and Computer Assisted Interventions (MICCAI)*

*IEEE International Symposium on Biomedical Imaging (ISBI)*

- **Teaching Assistant**

*Computer Vision in Biomedical Engineering (SJTU BME7001) at Spring 2024*

## HONORS & AWARDS

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- [Young Scientist Award](#), MICCAI 2024 *Oct. 2024*
- Academician Yazhu Chen Scholarship, School of Biomedical Engineering, SJTU *Dec. 2023*
- 2nd Prize in Student Academic Forum, Medical Imaging Computing Seminar (MICS 2023) *Jul. 2023*
- 3rd Prize in Student Academic Forum, Medical Imaging Computing Seminar (MICS 2022) *Jul. 2022*
- 2nd Prize, 17th China Post-graduate Mathematical Contest in Modeling *Dec. 2020*
- Outstanding Graduate Award, BUAA *Jun. 2020*
- 1st Prize, National Biomedical Engineering Innovation Design Competition for College Students *Jul. 2019*
- (Twice) Meritorious Winner, Interdisciplinary Contest in Modeling (ICM) *2018 & 2019*