

# 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 (expected)

- **Ph.D. Thesis:** Research on Controllable Medical Image Synthesis for Disease Modeling.

[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 classification-based sample selection network to select effective synthetic samples for augmenting lung nodule detection.
- Proposed a lung nodule synthesis framework that disentangles nodule attributes (*i.e.*, shape, size, and texture) and synthesize nodules in a controllable manner. Leveraged the controllability of the framework to design a hard example mining strategy for data augmentation on lung nodule detection.
- One paper accepted by *PRCV 2021*; one paper accepted by *Medical Image Analysis*.

**Cervical Cytological Image Synthesis for Cervical Lesion Screening**

2022 – 2024

- 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.
- Incorporated CellGAN into a knowledge distillation framework for multi-class abnormal cervical cell detection, which facilitates the class-balance pre-training of a teacher network.
- One paper accepted by *MICCAI 2023 (early accept)*; one paper accepted by *Neural Networks*.

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

2023 – 2024

- 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.
- Propose a two-stage framework that synthesizes  $^{11}\text{C}$ -CFT PET images from real  $^{18}\text{F}$ -FDG PET scans for automatic PD diagnosis, which was based on the correlation between dopaminergic deficiency in the striatum and increased glucose metabolism in PD patients.
- One paper accepted by *MICCAI 2024 (Young Scientist Award)*; one paper submitted to *European Journal of Nuclear Medicine and Molecular Imaging (major revision)*.

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

2023 – 2024

- Proposed a whole-body MR-to-CT synthesis framework that integrates structural guidance, spatial alignment, and semantic authenticity to enhance synthetic CT image quality, thus facilitating PET attenuation correction.
- One paper submitted to *Medical Image Analysis (under review)*.

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

2022 – 2023

- Proposed HiFi-Diff, an MR image super-resolution diffusion model for arbitrary reduction of inter-slice spacing, which generates any desired in-between MR slice from hierarchical features of adjacent MR slices.
- One paper accepted by *MLMI 2023*.

## JOURNAL PUBLICATIONS

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1. Cross-Modality PET Image Synthesis toward 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 (major revision)*.

2. **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 (under review)*.
3. **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*.
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 (under review)*.
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, March 2024*.
7. **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*.
8. **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*.
9. **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*.
10. **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*.
11. **AdLER: Adversarial Training with Label Error Rectification for One-Shot Medical Image Segmentation**  
Xiangyu Zhao, Sheng Wang, Zhiyun Song, **Zhenrong Shen**, Linlin Yao, Haolei Yuan, Qian Wang, Lichi Zhang. *IEEE Transactions on Artificial Intelligence (under review)*.
12. **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 (under review)*.

## CONFERENCE PUBLICATIONS

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1. **MetaAD: Metabolism-Aware Anomaly Detection for Parkinson’s Disease in 3D  $^{18}\text{F}$ -FDG PET**  
Haolin Huang#, Zhenrong Shen#, Jing Wang#, Xinyu Wang, Jiaying Lu, Huamei Lin, Jingjie Ge, Chuantao Zuo, Qian Wang.  
*MICCAI 2024 (early accept & oral & Young Scientist Award), October 2024.*
2. **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.*
3. **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.*
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. **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.*
8. **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.*
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. **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.*
11. **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.*
12. **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 Multimedia*  
*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  | <i>Oct. 2024</i>       |
| • Academician Yazhu Chen Scholarship, School of Biomedical Engineering, SJTU                    | <i>Dec. 2023</i>       |
| • 2nd Prize in Student Academic Forum, Medical Imaging Computing Seminar (MICS 2023)            | <i>Jul. 2023</i>       |
| • 3rd Prize in Student Academic Forum, Medical Imaging Computing Seminar (MICS 2022)            | <i>Jul. 2022</i>       |
| • 2nd Prize, 17th China Post-graduate Mathematical Contest in Modeling                          | <i>Dec. 2020</i>       |
| • Outstanding Graduate Award, BUAA  | <i>Jun. 2020</i>       |
| • 1st Prize, National Biomedical Engineering Innovation Design Competition for College Students | <i>Jul. 2019</i>       |
| • (Twice) Meritorious Winner, Interdisciplinary Contest in Modeling (ICM)                       | <i>2018 &amp; 2019</i> |