Chengzhu Zhang

Scholar LinkedIn

Department of Radiation Oncology
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Professional Skills

Research Expertise Biomedical Imaging (X-ray CT, Photon-Counting CT, MRI, Image Reconstruction, Image Quality, Nerual Imaging), Medical Physics (Radiation therapy, Radiomics), Machine Learning and Deep Learning.
Programming Python (Pytorch, Tensorflow), MATLAB, C/C#/C++/CUDA, Java, ESAPI
Editorial Board Associate Editor and Reviewer for Medical Physics Journal (Distinguished referee in 2022)

Current Employment

- **Rutgers Robert Wood Johnson Medical School - RUTGERS, started July 1st, 2023**

Medical Physics Residency (2-year), The American Board of Radiology - Medical Physics - Part 1

Education

- **University of Wisconsin Madison, 2017-2023, Madison, USA**

Ph. D (graduated May 19th, 2023), **M.S.**, GPA: 3.84/4, Medical Physics

- **Tsinghua University, 2013-2017, Beijing, China**

B.S. with honors (top 1%), Engineering Physics, Department of Engineering Physics.
B.S. Management, School of Economics and Management.

- Overall GPA: **91**/100，**Ranking 1st/55**；Compulsory Courses Ranking **1st/55**

- **Georgia Institute of Technology, Atlanta, USA, 08/2015 -12/2015**

Exchange Student, Electrical and Computer Engineering, GPA: **4.00**/4.

Research Experience

- **Graduate Research Assistant, University of Wisconsin-Madison** Sep, 2017~May, 2023

Advisor: Guang-Hong Chen, Professor, gchen7@wisc.edu

- I developed and evaluated an AI-based COVID-19 pneumonia diagnosis model **[J6]**. I developed an ensemble AI model using multi-center, multi-vendor chest x-ray images that outperformed three radiologists (AUC 0.94 vs 0.85).
- I developed AI reconstruction models under extremal conditions (two-view reconstruction) **[J2]**. The reconstructed AI model was used to for prospective therapeutic dose planning and diagnostic image quality control.
- I developed an end-to-end AI-enabled CT image reconstruction framework for the difficult interior problem **[J5, C4]**. I made theoretical breakthrough that allowed AI to learn the needed prior knowledge from new feature space.
- I developed quality-assured AI-based medical image reconstruction methods **[J1, J7, C3]**. I combined deep learning and compressed sensing to address the accuracy and generalizability issues in deep learning medical imaging.

- **Visiting researcher at AIAI Lab, Johns Hopkins University** Jul, 2016~Sep, 2016

Advisor: J. Webster Stayman, Associate Professor, web.stayman@jhu.edu

- I extended the prior constrained compressed sensing method by eliminating the need for the prior model for imaging of surgical implants free of metal artifacts **[J4]**.

- **Undergraduate Research Assistant at Xing's Lab, Tsinghua University** Aug, 2015~July, 2017

Advisor: Yuxiang Xing, Associate Professor, xingyx@mail.tsinghua.edu.cn

- I developed an AI-based reconstruction method for artifact-free high-quality dental CT imaging **[J3]**. I used image-domain AI models to eliminate physics-induced image quality degradation.

Selected Papers

- **[J1] Chengzhu Zhang**, Yinsheng Li, Guang-Hong Chen. "Accurate and robust sparse-view angle CT image

reconstruction using deep learning and prior image constrained compressed sensing (DL-PICCS)." Medical Physics 48.10 (2021): 5765-5781.

- **[J2]** Juan Montoya (Co-First), **Chengzhu Zhang (Co-First)**, Yinsheng Li, Ke Li, Guang-Hong Chen. "Reconstruction of three-dimensional tomographic patient models for radiation dose modulation in CT from two scout views using deep learning." Medical physics 49.2 (2022): 901-916.
- **[J*] Chengzhu Zhang**, Guang-Hong Chen. "Deep-Interior: A new pathway to combine deep learning with a novel feature space crafted by human intelligence to enable interior tomographic image reconstruction from divergent beam projection data." Medical Physics, accepted.
- **[J3] Chengzhu Zhang**, Yuxiang Xing. "CT artifact reduction via a U-net." SPIE Medical Imaging conference proceedings 2018.
- **[J4] Chengzhu Zhang**; Wojciech Zbijewski, Xiaoxuan Zhang, Shiyu Xu, J Webster Stayman. "Polyenergetic known-component reconstruction without prior shape models. " SPIE Medical Imaging conference proceedings 2017.
- **[J5]** Yinsheng Li, Ke Li, **Chengzhu Zhang**, Juan Montoya, Guang-Hong Chen. "Learning to reconstruct computed tomography images directly from sinogram data under a variety of data acquisition conditions." IEEE transactions on medical imaging 38.10 (2019): 2469-2481.
- **[J6]** Ran Zhang, Xin Tie, Zhihua Qi, Nicholas B Bevins, **Chengzhu Zhang**, others. "Diagnosis of coronavirus disease 2019 pneumonia by using chest radiography: Value of artificial intelligence." Radiology 298.2 (2021): E88-E97.
- **[J7]** John Hayes, Juan Montoya, Adam Budde, **Chengzhu Zhang**, others. "High pitch helical CT reconstruction." IEEE Transactions on Medical Imaging 40.11 (2021): 3077-3088.

Oral Presentations

- **[C1]** Fully automated artifact reduction method for time-resolved cone-beam CT angiograp. In: RSNA, Chicago, IL, November 2021.
- **[C2]** Scalable and generalizable small ROI imaging using backprojection and deep learning. In: RSNA, Chicago, IL, November 2021.
- **[C3]** Deep learning in image reconstruction: vulnerability under adversarial attacks and potential defense strategies. In: SPIE Medical Imaging, online, February 2021.
- **[C4]** DeepInterior: new pathway to address the interior tomographic reconstruction problem in CT via direct backprojecting divergent beam projection data. In: SPIE Medical Imaging, online, February 2021.
- **[C5]** Deep learning enabled prior image constrained compressed sensing (DL-PICCS) reconstruction framework for sparse-view reconstruction. In: SPIE Medical Imaging, Houston, TX, February 2020.
- **[C6]** A divide-and-conquer strategy to overcome memory limitations of current GPUs for high resolution MRI reconstruction via a domain transform deep learning method. In: ISMRM, Montreal, Canada, April 2019.
- **[C7]** Subject-specific noise power spectrum via bootstrapping based generative adversarial networks. In: SPIE Medical Imaging, San Diego, CA, February 2019.
- **[C8]** Volumetric scout CT images reconstructed from conventional two-view radiograph localizers using deep learning. In: SPIE Medical Imaging, San Diego, CA, February 2019.
- **[C9]** Patient-specific noise power spectrum via generative adversarial networks. RSNA, Chicago, IL, Nov, 2018.
- **[C10]** Polyenergetic known-component reconstruction without prior shape models. In: SPIE Medical Imaging, San Diego, CA, February 2017.
- **[C11]** Impact of Charge-sharing Effects on Noise Variance of Sinogram Projection Daata in Photon-counting CT, In: RSNA, Chicago, IL, November 2023.
- **[C12]** Measuring patient-specific and local noise power spectrum from a single photon counting detector CT data, In: RSNA, Chicago, IL, November 2023.

Selected Awards

- **Fellowship of Spark Talent Program (top 1%)**, Tsinghua University, China 2015~2017
- **National Scholarship** (top 1%), Ministry of Education, China 2014
- **Robert F. Wagner All-Conference Best Student Paper Award at SPIE 2023, USA** 2023