Chengzhu Zhang

Homepage Scholar LinkedIn

Department of Radiation Oncology
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Professional Skills

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

Current Employment

- **Rutgers Robert Wood Johnson Medical School - RUTGERS, July 1st, 2023 – June 1st,2024 (expected)**

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% /3374), 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 a new framework to accurately measure local noise power spectrum **[J1, C1]**, and patient-specific NPS using PCD-CT **[J2, C2, C3]**. I also developed AI-based bootstrapping framework to estimate patient-specific NPS for a non-linear system **[C10, C12]**.
- I developed an end-to-end AI-enabled CT image reconstruction framework for the interior problem **[J8]**. I made theoretical breakthrough allowing AI to learn the needed prior knowledge from new feature space **[J3, C5, C7]**.
- I developed 3D volumetric CT reconstruction models under extremal conditions (two-view) **[J5]**. The reconstructed AI model can be for diagnostic image quality control and therapeutic onboard position and dose verification.
- I developed quality-assured AI-based medical image reconstruction methods **[J4, J10, C6, C8]**. I combined deep learning and compressed sensing to address the accuracy and generalizability issues in deep learning models.

- **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 **[J7]**.

- **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 **[J6]**. I used image-domain AI models to eliminate physics-induced image quality degradation.

Selected Papers

- **[J1] Chengzhu Zhang,** et al. ***(editor's choice)*** "Noise power spectrum (NPS) in computed tomography: Enabling local NPS measurement without stationarity and ergodicity assumptions. " Med Phys. 2024; 51: 4655–4672.
- **[J2] Chengzhu Zhang,** et al. "Noise power spectrum (NPS) in computed tomography: Enabling local NPS measurement without stationarity and ergodicity assumptions. " Med Phys. 2024; 51: 4655–4672.
- **[J3] Chengzhu Zhang**, Guang-Hong Chen. "Deep-Interior: A new pathway to interior tomographic image reconstruction via a weighted backprojection and deep learning. " Med Phys. 2024; 51: 946–963.
- **[J4] 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.
- **[J5]** 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.
- **[J6] Chengzhu Zhang**, Yuxiang Xing. "CT artifact reduction via a U-net." Proc. SPIE 10574R (2018).
- **[J7] Chengzhu Zhang**; Wojciech Zbijewski, Xiaoxuan Zhang, Shiyu Xu, J Webster Stayman. "Polyenergetic known-component reconstruction without prior shape models. " Proc. SPIE 10132 (2017)
- **[J8]** 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.
- **[J9]** 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.
- **[J10]** 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]** Local NPS Measurement Beyond Stationarity and Ergodicity Constraints. In: AAPM, LA, CA, July 2024.
- **[C2]** Measuring patient-specific and local NPS from a single Photon Counting Detector, In: RSNA, Nov 2023.
- **[C3]** Impact of charge-sharing effects on variance of Sinogram data in photon-counting CT, In: RSNA, Nov 2023.
- **[C4]** Fully automated artifact reduction method for time-resolved cone-beam CT angiograp. In: RSNA, Nov 2021.
- **[C5]** Scalable and generalizable small ROI imaging using backprojection and deep learning. In: RSNA, Nov 2021.
- **[C6]** Deep learning in image reconstruction: vulnerability under adversarial attacks and potential defense strategies. In: SPIE Medical Imaging, online, Feb 2021.
- **[C7]** DeepInterior: new pathway to address the interior tomographic reconstruction problem in CT via direct backprojecting divergent beam projection data. In: SPIE Medical Imaging, online, Feb 2021.
- **[C8]** Deep learning enabled prior image constrained compressed sensing (DL-PICCS) reconstruction framework for sparse-view reconstruction. In: SPIE Medical Imaging, Houston, TX, February 2020.
- **[C9]** 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.
- **[C10]** Subject-specific noise power spectrum via bootstrapping based generative adversarial networks. In: SPIE Medical Imaging, San Diego, CA, Feb 2019.
- **[C11]** Volumetric scout CT images reconstructed from conventional two-view radiograph localizers using deep learning. In: SPIE Medical Imaging, San Diego, CA, February 2019.
- **[C12]** Patient-specific noise power spectrum via generative adversarial networks. In: RSNA, Chicago, IL, Nov, 2018.
- **[C13]** Polyenergetic known-component reconstruction without prior shape models. In: SPIE, Orlando, FL, Feb 2017.

Selected Awards

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