

# Chengzhu Zhang



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## Education

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- **Rutgers Cancer Institute of New Jersey, New Brunswick, NJ** July, 2023~June, 2025
  - Chief Resident, Medical Physics Residency (2-year)
  - The American Board of Radiology - Medical Physics - Part 1
- **University of Wisconsin Madison, Madison, WI, USA** Sep, 2017~May, 2023
  - Ph. D, M.S. in Medical Physics, GPA: 3.84/4, Department of Medical Physics
- **Tsinghua University, Beijing, China (16th global, 1st in Asia)** Sep, 2013~July, 2017
  - B.S. with honors (top 1% /3374), Engineering Physics, Department of Engineering Physics.
  - B.S. Management, School of Economics and Management.
  - Ranking **1st** /55; Overall GPA: 91/100, Core Courses Ranking 1st/55
- **Georgia Institute of Technology** Aug, 2015~Dec, 2015
  - Exchange Student in Electrical and Computer Engineering, GPA: 4.00/4.

## Professional Service

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- **Associate Editor for the Medical Physics Journal.** Jan, 2023~Now
  - I organized over 40 high-quality reviews. I received two special thanks from the deputy editor.
- **Reviewers for prestigious journals and conference** 2021~Now
  - I am actively reviewing papers (over 100 times) for Medical Physics, Physics in Medicine & Biology, the Red Journal, Transactions of Computational Imaging, Frontiers in Oncology and Journal of Medical Imaging. I received distinguished reviewer award for the Medical Physics Journal in 2023. I also served two years' review service to RSNA conference.

## Clinical Experience

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- **Commissioning of Elekta Unity™ MR-Linac** Jan, 2025
  - *Leading resident* in the commissioning of Elekta Unity at the beginning of 2025. I received comprehensive MR-Linac physics and clinical training. I participated in the radiation survey.
- **Commissioning of Varian TrueBeam™** Sep, 2024
  - *Leading resident* in the acceptance test, radiation survey and full commissioning of the very first Varian TrueBeam™ at the Morris Cancer Center. I independently operated on the *PTW BeamScan® Water tank* for

beam model verification, MLC configuration (DLG/ELM), TG-51 output, and TPS dose verification. I established the commissioning workflow for the next two new TrueBeam™ machines.

- **Commissioning of VMAT-TBI program** Nov, 2023~
  - I grokked and adapted open-source ESAPI algorithms to clinical implementation. I planned multi-isocentric VMAT plans in-silico on several anthropomorphic whole-body phantoms and several clinical patients. I led the end-to-end test on a Rando phantom. I validated the feasibility of using SGRT to setup VMAT-TBI patients. *I presented the work on AAPM 2024 and the manuscript is in prep. [P1]*
- **Commissioning of tattoo-less SGRT-aided breast RT program** Jan, 2024~July, 2024
  - I evaluated the effectiveness of SGRT-guided patient setup vs kV/MV-guided setup for 30 clinical patients treated with the tattoo-less breast RT. The post-treatment dose evaluation was performed. I found that there is no statistical difference between SGRT setup and the conventional setup. This project served our clinical guidance to significantly relax the daily kV verification. *The manuscript of this paper is at submission.*
- **Clinical evaluation of “high-modulation” dosimetric leaf gap** Oct, 2023
  - I found MLC modulated beam fields have different optimal DLG values based on a retrospective study of 68 beam fields. Due to this finding, all SBRT/SRS fields were triaged and used a ‘high-modulation’ DLG with lower value than the clinical beam. 40 initially failed clinical beams passed QA after the use of this new DLG, greatly facilitating the QA workflow. *I presented the work on AAPM 2024 and the manuscript is in prep. [P2]*
- **Clinical Educational Lectures** Oct, 2023
  - I provided education lectures to the physics group on the following topics: “Demystify TG-21”, “Semiconductor Radiation Detectors & Dosimeters”, “Superposition Algorithm”, “TG-43 vs TG71”, “A comprehensive guide to prostate cancer brachytherapy”, “The roadmap for MR-Linac prostate cancer”. More will come.
- **ESAPI Programming** Sep, 2024~
  - I *proficiently* mastered ESAPI and developed several useful codes for data mining, knowledge-based planning, plan automation, dose evaluation, plan quality check and portal dosimetry etc.
- **Annual QA of Varian Truebeam™ and Halycon™** June, 2024; Aug, 2024
  - I *independently* completed the annual QA of both Varian machines. Besides extensive mechanical checks, I set up IBA Blue Phantom® with scanned data analyzed by myQA Accept software to extensively verify the beam model. The output was checked by TG-51 and tuned. An annual shielding survey was performed to verify the integrity of the shielding design. The dosimetric verification for TBI and TSET was also performed.
- **Annual QA of Mevion S250™ Proton System** Sep, 2023; Oct, 2024
  - I completed the annual QA in 2023 of the double-scattering proton system and verified all available beam models using the IBA Blue Phantom®. I am also the leading resident for the annual QA in 2024.
- **Brachytherapy Service** Apr, 2024~Aug, 2024
  - I provided *independent* coverage of brachytherapy for interstitial HDR prostate, vaginal cuff cylinder, multi-channel cylinder, Tandem and Ovoids. I completed procedures of salvage HDR prostate, LDR prostate, and Syed under the supervision of the physicist.
  - I conducted daily, and quarterly QA of the source exchange for Varian Bravo™ machine and performed two annual QA of BK medical transrectal ultrasound.
- **Special Procedures service: TBI/TSET/SIRT/3D-Printed Bolus** July, 2023~Now
  - I independently provided “physicist-in-service” for TBI/TSET, including treatment plan design and dosimetry

calculation for TBI/TSET. I collected in-vivo dosimetry via diodes for TBI and EBT3 film for TSET.

- I *independently* provided SIRT coverage including Y-90 for liver mets treatment and participated in Xofigo® and Pluvicto® treatment for prostate mets patients.
- I *participated* in the design and printing of patient-specific 3D-printed bolus for scalp cancer patients.

- **3D Conformal and IMRT Planning**

Oct,2023~March,2024

- I executed over 60 3D conformal plans of whole brain, T/L-spine, quad-shot, tangential breast, 3-field breast, IM node patching, curative lung, electron plans on various sites.
- I executed a comprehensive list of IMRT and SBRT clinical plans over H&N SIB, liver, kidney, pelvis, prostate+SV, extremities etc.

- **General Clinical Duties**

July,2023~Now

- Led the effort of monthly and annual QA for Varian TrueBeam, Halcyon, Mevion S250 Proton Therapy System, GE Lightspeed 16 CT, Philips Big Bore RT CT, and Varian Acuity.
- Worked as “physicist of the day” to resolve daily machine issues and conducted repairs and replacements for MLC motors to ensure minimal machine downtime.
- Supervised the collection of 4D CT with Varian Real-time Position Management (RPM) Respiratory Gating System and resolved various issues during 4D CT acquisition and reconstruction.
- In charge of physics equipment calibration including diodes, Sun Nuclear ArcCheck / MapCheck / ICProfiler / DQA3, IBA MatriXX, Varian Portal Dosimetry / MPC etc.
- Managed patient-specific QA for Varian TrueBeam, Halcyon, and Mevion S250 systems.
- Verified machine and VisionRT performance before SRS treatments via IsoCal and Winston-Lutz tests.
- Collected and analyzed in-vivo dosimetry using EBT3 film.

- **Future Rotations**

Oct,2024~

- Gamma Knife/SRS: Manage simulation, planning and treatment delivery of meningioma, glioblastoma, trigeminal neuralgia, acoustic neuroma, arteriovenous malformation clinical cases.
- Satellite Clinic Coverage: Elekta VersaHD, Mosaiq and Oncentra, Elekta Nucletron, and Accuray CyberKnife.

## Research Experience

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**Expertise:** Tomographic Image Reconstruction, Photon-Counting Detector CT, Quantitative Image Quality, Perfusion Imaging, Image-guided Radiation Therapy, Radiogenomics-based Cancer Prognosis, Machine Learning.

- **Collaborator, Rutgers University**

July, 2023~

Advisor: Ke Nie, Professor kn231@rutgers.edu; Matthew Deek MD, Assistant Professor deekmp@cinj.rutgers.edu.

- I worked on GEM prostate patient dataset from Turkey with patients who received pre- and post-radiation multi-modal imaging PSMA/CT/mpMRI. I extracted habitat radiomics features to provide risk prognosis of biorecurrence and enable focal boost radiation. *The grant proposal and manuscript are in prep.*

- **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, O1], and patient-specific NPS using PCD-CT [J2, O2]. I also developed AI-based bootstrapping framework to estimate patient-specific NPS for a non-linear CT system [O12, O12].
- I developed an end-to-end AI-enabled CT image reconstruction framework for the interior problem [J6]. I made theoretical breakthrough allowing AI to learn the needed prior knowledge from new feature space [J3, O5, O7].
- 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 onboard positioning and dose verification.

- I developed quality-assured AI-based medical image reconstruction methods [J4, J8, O6, O8]. 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 [C7].

- **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 [C6]. I used image-domain AI models to eliminate physics-induced image quality degradation.

## Peer-Reviewed Papers

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[J1] (*Editor's Choice*) **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.

[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**, et al. "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)**, et al.. "Reconstruction of three-dimensional tomographic patient models for radiation dose modulation in CT from two scout views using deep learning." *Med. Phys.* 49.2 (2022): 901-916.

[J6] 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.

[J7] 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. Related

[J8] John Hayes, Juan Montoya, Adam Budde, **Chengzhu Zhang**, others. "High pitch helical CT reconstruction." *IEEE Transactions on Medical Imaging* 40.11 (2021): 3077-3088.

[Chapter] Guang-Hong Chen, **Chengzhu Zhang** et al. *Deep Learning in CT Reconstruction: Bringing the Measured Data to Tasks*. Chapter 6, *Deep Learning for Biomedical Image Reconstruction*, Cambridge University Press

## Conference Proceedings

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[C1] Feng, Mang, Xu Ji, Kevin Treb, **Chengzhu Zhang** and others. "A unified artifact correction framework for C-arm photon counting cone beam CT." *Medical Imaging 2022: Physics of Medical Imaging*, p. PC120310K. SPIE, 2022.

[C2] Chengzhu Zhang, Yinsheng Li, and Guang-Hong Chen. "Deep learning in image reconstruction: vulnerability under adversarial attacks and potential defense strategies." *Medical Imaging 2021: Physics of Medical Imaging*, vol. 11595, pp. 482-488. SPIE, 2021.

[C3] **Chengzhu Zhang**; et al. "A divide-and-conquer strategy to overcome memory limitations of current GPUs for

high resolution MRI reconstruction via a domain transform deep learning method." Proceedings of the 27th International Society for Magnetic Resonance in Medicine (ISMRM19) (2019).

[C4] John Hayes, Ran Zhang, **Chengzhu Zhang** and others. "Unbiased statistical image reconstruction in low-dose CT." Proc. SPIE Vol. 10948. SPIE, 2019.

[C5] Yinsheng Li, Ke Li, **Chengzhu Zhang** and others. "Image reconstruction from fully-truncated and sparsely-sampled line integrals using iCT-Net." Proc. Vol. 10948. SPIE, 2019.

[C6] **Chengzhu Zhang**, Yuxiang Xing. "CT artifact reduction via a U-net." Proc. SPIE 10574R (2018).

[C7] **Chengzhu Zhang, et al.** "Polyenergetic known-component reconstruction without prior shape models. " SPIE Medical Imaging conference proceedings 2017.

## Oral Presentations

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[O1] Local NPS Measurement Beyond Stationarity and Ergodicity Constraints. In: AAPM, LA, CA, July 2024.

[O2] Measuring patient-specific and local NPS from a single Photon Counting Detector, In: RSNA, Nov 2023.

[O3] Impact of charge-sharing effects on variance of Sinogram data in photon-counting CT, In: RSNA, Nov 2023.

[O4] Fully automated artifact reduction method for time-resolved cone-beam CT angiography. In: RSNA, Nov 2021.

[O5] Scalable and generalizable small ROI imaging using backprojection and deep learning. In: RSNA, Nov 2021.

[O6] Deep learning in image reconstruction: vulnerability under adversarial attacks and potential defense strategies. In: SPIE Medical Imaging, online, Feb 2021.

[O7] 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.

[O8] Deep learning enabled prior image constrained compressed sensing (DL-PICCS) reconstruction framework for sparse-view reconstruction. In: SPIE Medical Imaging, Houston, TX, February 2020.

[O9] 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.

[O10] Subject-specific noise power spectrum via bootstrapping based generative adversarial networks. In: SPIE Medical Imaging, San Diego, CA, Feb 2019.

[O11] Volumetric scout CT images reconstructed from conventional two-view radiograph localizers using deep learning. In: SPIE Medical Imaging, San Diego, CA, February 2019.

[O12] Patient-specific noise power spectrum via generative adversarial networks. In: RSNA, Chicago, IL, Nov, 2018.

[O13] Polyenergetic known-component reconstruction without prior shape models. In: SPIE, Orlando, FL, Feb 2017.

## Poster Presentations

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[P1] Feasibility of using surface guidance to setup multi-iso VMAT TBI. In: AAPM 2024.

[P2] One DLG is not for all: beam field specific DLG to improve portal dose prediction accuracy. In: AAPM 2024,

[P3] Accurate NPS Measurement from a Single Ultra-Low Dose PCD-CT Acquisition. In: AAPM, 2024

## Awards

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[R1] Robert F. Wagner All-Conference Best Student Paper Award at SPIE 2023, USA

[R2] Distinguished Referee in 2023 for the Medical Physics journal, 2022, USA

[R3] National Scholarship (top 1%) from Ministry of Education, China.

[R4] Fellowship of Spark Talent (Research) Program (top 1%), Tsinghua University, China