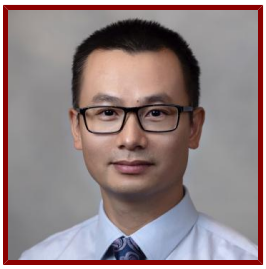
Stanford



Xianjin Dai, PhD, DABR

Clinical Assistant Professor, Radiation Oncology - Radiation Physics

Bio

BIO

Dr. Xianjin Dai is a Clinical Assistant Professor and the American Board of Radiology certified Medical Physicist in the Department of Radiation Oncology at Stanford University. Dr. Dai completed the CAMPEP-credited Therapeutic Medical Physics residency at Emory University and earned his PhD in Biomedical Engineering at the University of Florida. His research focuses on developing and translating novel biomedical imaging techniques to enhance the diagnosis, management, and treatment of cancer diseases. Dr. Dai's research interests encompass artificial intelligence in medicine, therapeutic physics, medical image analysis, multimodal imaging, biomedical optics, photoacoustic imaging, ultrasound imaging, and optical coherence tomography. He is a recipient of the DOD Prostate Cancer Research Program (PCRP) Early Investigator Research Award and the American Association of Physicists in Medicine (AAPM) Research Seed Funding Grant.

ACADEMIC APPOINTMENTS

- Clinical Assistant Professor, Radiation Oncology - Radiation Physics
- Member, Stanford Cancer Institute

ADMINISTRATIVE APPOINTMENTS

- Associate Editor, Medical Physics Journal, (2023- present)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, AAPM (The American Association of Physicists in Medicine) (2018 - present)
- Member, SPIE (the international society for optics and photonics) (2017 - present)
- Member, Optica(formerly OSA) (2016 - present)

PROFESSIONAL EDUCATION

- DABR, The American Board of Radiology , Therapeutic Medical Physics
- Residency, Emory University
- Certificate, University of California, Los Angeles
- PhD, University of Florida
- MS, BS, University of Electronic Science and Technology of China

LINKS

- google scholar: https://scholar.google.com/citations?user=gyrHTzgAAAAJ&hl=en

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

AI in Medicine

Biomedical Physics

Multimodal Imaging

Medical Device

Biomedical Optics

Photoacoustic/Thermoacoustic Imaging

Optical Imaging (Microscopy, OCT, DOT, FMT)

Ultrasound Imaging

1. Artificial intelligence (AI) has great potential for improving the efficiency, precision, accuracy, and overall quality of radiation therapy for cancer patients. AI platforms are still not widely adopted in clinical practice due to challenges associated with the clinical development and implementation of AI-based tools in radiation oncology. The goal of this project is to address these challenges with innovative concepts and strategic developments.

2. A multimodal imaging platform that combines the strengths of several different imaging modalities has the capability to characterize biological tissue more completely, offering improved diagnosis, management, and treatment of diseases. While multimodality images can be obtained by performing each individual modality separately without integrating them into a single platform, it is, however, time-consuming to acquire multimodality images through such a process. Additionally, it is hard to avoid errors from the required complex image registration, and more importantly, impossible to capture dynamic biological processes simultaneously. This project has demonstrated a multimodal imaging system integrating three emerging biomedical imaging techniques: photoacoustic imaging (PAI), optical coherence tomography (OCT), and ultrasound imaging (USI) to obtain optical absorption, scattering, and acoustic properties of tissue simultaneously. Several applications of the multimodal imaging platform have been explored preclinically.

3. X-ray luminescence computed tomography (XLCT) has been recently proposed as a new imaging modality by detecting the luminescent emission signals arising from the interaction between X-ray and the media. Compared to the clinically widely used X-ray CT (anatomical imaging), XLCT represents significant progress in X-ray-based imaging techniques, as X-ray-based molecular or functional imaging becomes achievable in XLCT. Moreover, compared to conventional pure optic-based molecular or functional imaging, XLCT offers two main advantages. First, autofluorescence, problematic for fluorescence imaging, can be avoided. Second, deep tissue in vivo imaging with high optical contrast and spatial resolution becomes achievable. However, progress in this area is significantly hindered by technological challenges posed by the fact that currently most XLCT systems take a long time to acquire whole-body images (low speed). Additionally, XLCT has been entirely reliant on conventional nanophosphors emitting light in the visible or near-infrared spectrum region (700-1000 nm) with high photon absorption and scattering in biological tissues, limiting XLCT for deeper tissue imaging (insufficient imaging penetration depth) and reducing spatial resolution (limited spatial resolution). This project has been focused on addressing these challenges with innovative concepts and strategic developments.

Publications

PUBLICATIONS

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- **Landmark tracking in liver US images using cascade convolutional neural networks with long short-term memory.** *Measurement science & technology*
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- **Deformable CT image registration via a dual feasible neural network.** *Medical physics*
  Lei, Y., Fu, Y., Tian, Z., Wang, T., Dai, X., Roper, J., Yu, D. S., McDonald, M., Bradley, J. D., Liu, T., Zhou, J., Yang, X.
  2022
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- **Deformable CT Image Registration Using Unsupervised Deep Learning Networks**
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- **Ultrasound-Based Motion Tracking Using Hybrid Learning Network**
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- **Liver Motion Tracking in Ultrasound images Using Attention Guided Mask R-CNN with Long-Short-Term-Memory Network**
  Zhang, Y., Dai, X., Tian, Z., Lei, Y., Chen, Y., Patel, P., Bradley, J. D., Liu, T., Yang, X., Bottenus, N., Ruiter, N. V.
  SPIE-INT SOC OPTICAL ENGINEERING.2022
- **Automated CT Segmentation for Rapid Assessment of Anatomical Variations in Head-and-Neck Radiation Therapy**
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  SPIE-INT SOC OPTICAL ENGINEERING.2022
- **Deep Learning-based Longitudinal CT Registration for Anatomy Variation Assessment during Radiotherapy**
  Fu, Y., Lei, Y., Tian, Z., Wang, T., Dai, X., Zhou, J., McDonald, M., Bradley, J. D., Liu, T., Yang, X., Drukker, K., Iftekharuddin, K. M.
  SPIE-INT SOC OPTICAL ENGINEERING.2022
- **Deep learning-based motion tracking using ultrasound images.** *Medical physics*
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- **Synthetic CT-aided multiorgan segmentation for CBCT-guided adaptive pancreatic radiotherapy.** *Medical physics*
  Dai, X., Lei, Y., Wynne, J., Janopaul-Naylor, J., Wang, T., Roper, J., Curran, W. J., Liu, T., Patel, P., Yang, X.
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- **Self-Supervised Learning-Based High-Resolution Ultrasound Imaging for Prostate Brachytherapy**
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- **Automated delineation of head and neck organs at risk using synthetic MRI-aided mask scoring regional convolutional neural network.** *Medical physics*
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- **Synthetic MRI-Aided Delineation of Organs at Risk in Head-And-Neck Radiotherapy**
  Dai, X., Lei, Y., Wang, T., Zhou, J., Roper, J., McDonald, M., Beitler, J., Bradley, J., Liu, T., Yang, X.
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- **Rapid Organ-At-Risk Delineation in Pancreatic CBCT for CBCT-Guided Adaptive Radiotherapy**
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- **Deep Learning-based Multi-catheter Reconstruction for MRI-guided HDR Prostate Brachytherapy**
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- **Region Proposal Network for Multi-Organ Segmentation in CT for Pancreatic Radiotherapy**
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  Dai, X., Lei, Y., Liu, Y., Wang, T., Jiang, X., Beitler, J., Curran, W., Liu, T., Yang, X.
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- **Deep Learning-Based Tomographic Image Reconstruction with Ultra-Sparse Projection Views**
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- **Single Snapshot X-Ray-Induced Luminescence Computed Tomography (SS-XLCT)**
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- **Deep Learning for High Spatial Resolution X-Ray Luminescence Computed Tomography**
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- **Reduced acquisition time for L-shell x-ray fluorescence Computed tomography using polycapillary x-ray optics.** *Medical physics*
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