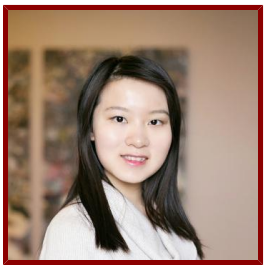
Stanford



Lianli Liu

Clinical Assistant Professor, Radiation Oncology - Radiation Physics

Bio

BIO

Dr. Liu is a clinical assistant professor and a board certified medical physicist in the Department of Radiation Oncology. She received her PhD in electrical engineering from the University of Michigan and completed her residency training at Michigan Medicine. At Stanford, she is involved with the radiosurgery program, the MR-guided radiotherapy program and the general external beam radiotherapy program. Her research has been focusing on optimizing radiotherapy workflow through AI, including sparse medical imaging, medical image synthesis and radiotherapy beam data modeling.

ACADEMIC APPOINTMENTS

- Clinical Assistant Professor, Radiation Oncology - Radiation Physics

ADMINISTRATIVE APPOINTMENTS

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

HONORS AND AWARDS

- Seed Grant, Stanford Institute for Human-Centered Artificial Intelligence (2021)
- Summa Cum Laude Merit Award, International Society for Magnetic Resonance in Medicine (ISMRM) (2018)
- Barbour Scholarship, University of Michigan (2017)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Women in Radiation Oncology Work Groups, ASTRO (American Society for Radiation Oncology) (2024 - present)
- Member, AAPM (American Association of Physicists in Medicine) (2018 - present)

PROFESSIONAL EDUCATION

- PhD, University of Michigan , Electrical Engineering (2018)
- Physics Resident, University of Michigan Health System , Therapeutic Medical Physics (2020)

PATENTS

- James Balter, Yue Cao, Lianli Liu, Adam Johansson. "United States Hierarchical Motion Modeling from Dynamic Magnetic Resonance Imaging"

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Dr. Liu's research has focused on optimizing radiotherapy workflow through AI. Specifically, she is interested in

1. Optimize medical imaging for image-guided radiotherapy, including:

Sparse imaging for real time monitoring of patient dynamics;

Accelerated longitudinal imaging for efficient post-treatment patient follow up;

High quality functional imaging for treatment response prediction and treatment plan adaptation;

Medical image synthesis for reduced imaging modalities and costs.

2. Optimize clinical workflow for radiation beam commissioning and quality assurance, including:

Sparse beam dosimetry through beam data modeling;

Model-based radiation measurement error detection;

Longitudinal prediction of radiation beam changes;

Monte Carlo phase space modeling for efficient data representation and fast dose calculation.

Teaching

COURSES

2023-24

- AI and Data Driven Methods in Biomedical Imaging and Physics: BMP 254 (Aut)

Publications

PUBLICATIONS

- **Parametric response mapping of co-registered intravoxel incoherent motion magnetic resonance imaging and positron emission tomography in locally advanced cervical cancer undergoing concurrent chemoradiation therapy** *PHYSICS & IMAGING IN RADIATION ONCOLOGY*
  Capaldi, D. P. I., Wang, J., Liu, L., Sheth, V. R., Kidd, E. A., Hristov, D. H.
  2024; 31

- **Where Does Auto-Segmentation for Brain Metastases Radiosurgery Stand Today?** *Bioengineering (Basel, Switzerland)*
  Kim, M., Wang, J. Y., Lu, W., Jiang, H., Stojadinovic, S., Wardak, Z., Dan, T., Timmerman, R., Wang, L., Chuang, C., Szalkowski, G., Liu, L., Pollom, et al
  2024; 11 (5)

- **Volumetric MRI with sparse sampling for MR-guided 3D motion tracking via sparse prior-augmented implicit neural representation learning.** *Medical physics*
  Liu, L., Shen, L., Johansson, A., Balter, J. M., Cao, Y., Vitzthum, L., Xing, L.
  2023

- **Adaptive Region-Specific Loss for Improved Medical Image Segmentation.** *IEEE transactions on pattern analysis and machine intelligence*
  Chen, Y., Yu, L., Wang, J., Panjwani, N., Obeid, J., Liu, W., Liu, L., Kovalchuk, N., Gensheimer, M. F., Vitzthum, L. K., Beadle, B. M., Chang, D. T., Le, et al
  2023; PP

- **Modeling linear accelerator (Linac) beam data by implicit neural representation learning for commissioning and quality assurance applications.** *Medical physics*
  Liu, L., Shen, L., Yang, Y., Schüler, E., Zhao, W., Wetzstein, G., Xing, L.
  2023

- **Real Time Volumetric MRI for 3D Motion Tracking via Geometry-Informed Deep Learning.** *Medical physics*
  Liu, L., Shen, L., Johansson, A., Balter, J. M., Cao, Y., Chang, D., Xing, L.
  2022

- **Volumetric prediction of breathing and slow drifting motion in the abdomen using radial MRI and multi-temporal resolution modeling.** *Physics in medicine and biology*
  Liu, L., Johansson, A., Cao, Y., Lawrence, T. S., Balter, J. M.

2021; 66 (17)

- **Modeling intra-fractional abdominal configuration changes using breathing motion-corrected radial MRI** *PHYSICS IN MEDICINE AND BIOLOGY*
  Liu, L., Johansson, A., Cao, Y., Kashani, R., Lawrence, T. S., Balter, J. M.
  2021; 66 (8)
- **Abdominal synthetic CT generation from MR Dixon images using a U-net trained with 'semi-synthetic' CT data** *PHYSICS IN MEDICINE AND BIOLOGY*
  Liu, L., Johansson, A., Cao, Y., Dow, J., Lawrence, T. S., Balter, J. M.
  2020; 65 (12): 125001
- **ACCELERATED HIGH B-VALUE DIFFUSION-WEIGHTED MR IMAGING VIA PHASE-CONSTRAINED LOW-RANK TENSOR MODEL**
  Liu, L., Johansson, A., Balter, J. M., Cao, Y., Fessler, J. A., IEEE
  IEEE.2018: 344-348
- **Female pelvic synthetic CT generation based on joint intensity and shape analysis** *PHYSICS IN MEDICINE AND BIOLOGY*
  Liu, L., Jolly, S., Cao, Y., Vineberg, K., Fessler, J. A., Balter, J. M.
  2017; 62 (8): 2935-2949
- **Female pelvic synthetic CT generation based on joint intensity and shape analysis.** *Physics in medicine and biology*
  Liu, L., Jolly, S., Cao, Y., Vineberg, K., Fessler, J. A., Balter, J. M.
  2017; 62 (8): 2935-2949
- **Synthetic CT for MRI-based liver stereotactic body radiotherapy treatment planning** *PHYSICS IN MEDICINE AND BIOLOGY*
  Bredfeldt, J. S., Liu, L., Feng, M., Cao, Y., Balter, J. M.
  2017; 62 (8): 2922-2934
- **A female pelvic bone shape model for air/bone separation in support of synthetic CT generation for radiation therapy** *PHYSICS IN MEDICINE AND BIOLOGY*
  Liu, L., Cao, Y., Fessler, J. A., Jolly, S., Balter, J. M.
  2016; 61 (1): 169-182