Department of Biomedical Engineering
UNIVERSITY OF WISCONSIN–MADISON

Spring 2024 Seminar Series

Pixels to Predictions: Designing Computational Imaging AI to enable Precision Medicine

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Developing artificial intelligence (AI) schemes to assist the clinician towards enabling precision medicine approaches requires development of objective markers that are predictive of disease response to treatment or prognostic of longer-term patient survival. The solutions being developed in my group in this regard involve designing computational imaging features together with histology or molecular data for detailed tissue and disease characterization in vivo as well as associated with patient outcomes. The key innovation in this approach lies in "handcrafting" unique tools that can capture biologically relevant and clinically intuitive measurements from routinely acquired imaging (MRI, CT, PET) or digitized images of tissue specimens. Further, by conducting cross-scale associations between imaging, pathology, and -omics, we can not only "unlock" and integrate the information captured by these different, disparate data modalities but also develop an interpretable and intuitive understanding of what drives their performance. Specific problems addressed via the new computerized imaging markers we have developed include: (a) predicting response to treatment to identify optimal therapeutic pathways, as well as (b) evaluating therapeutic response to guide follow-up procedures. We will further examine how to account for differences between sites, scanners, and acquisition parameters to ensure generalizable performance of AI tools and computational imaging features; crucial for wider clinical translation and widespread adoption. These will be discussed in the context of clinical applications in colorectal and renal cancers as well as digestive diseases.

ABOUT the SPEAKER

I am currently an Associate Professor (with tenure) in the Department of Biomedical Engineering and serve as Co-Director for Center for Computational Imaging & Personalized Diagnostics at Case Western Reserve University. The primary focus of my research has been developing new artificial intelligence (AI) approaches including image analytics, radiomics, and machine learning schemes; applied to problems in computer-aided diagnosis & detection, disease characterization, as well as quantitative evaluation of response to treatment; in gastrointestinal cancers and digestive diseases. I have authored nearly 50 peer-reviewed journal publications, over 110 conference papers & abstracts, 1 book chapter, as well as delivered over 60 invited talks and panel discussions both in the US and abroad. I have 10 issued patents in the areas of medical image analysis, computer-aided diagnosis, and pattern recognition. I am an Associate Editor for 3 leading medical imaging journals, serve on Program Committees for 3 major medical image analytics conferences, and have been elected to Senior Member in the National Academy of Inventors, the IEEE, and the SPIE. In 2023, I was selected for a Fulbright Specialist Award, as a Notable in Education Leadership by Crain's Cleveland, and for the SIIM Imaging Informatics Innovator Award. My lab's research in colorectal cancers and digestive diseases has been funded through the DOD/CDMRP, the NIH (NCI, NIDDK, NINR, NHLBI), as well as the State of Ohio.

Monday, January 29 at Noon
1003 Engineering Centers (Tong Auditorium)