

Cristian Badea, PhD Professor Radiology Deep Learning Approaches in Spectral CT

Dr. Cristian Badea is a Professor in the Department of Radiology and faculty in the Departments of Biomedical Engineering and Medical Physics at Duke University. His research interests are in the physics and biomedical applications of computed tomography (CT), micro-CT, tomosynthesis, and image reconstruction algorithms. Currently, Dr. Badea is the co-director of the Quantitative Imaging and Analysis Lab with a mission to develop, optimize and apply novel CT and MRI quantitative imaging at both preclinical and clinical levels.

Abstract: We are now at the cusp of major CT imaging advancements provided by the addition of spectral information. Spectral CT can be performed using either energy integrating detectors, as in dual energy CT, or with a photon counting detector (PCD). Our group has advanced preclinical spectral CT by building a few prototype systems and demonstrating their value in cancer and cardiac preclinical studies. However, the full potential of spectral CT has not yet been realized, especially when using photon counting technology. In this talk, we illustrate some of the challenges and the deep learning (DL)-based solutions to improve spectral CT both at preclinical and clinical levels. We present DL strategies applied to preclinical spectral CT for corrections of artifacts, noise reduction and material decomposition. Finally, we show a DL-based spectral extrapolation method for extending the field of view on clinical dual source CT systems. Even with a moderate amount of training data, DL methods are capable of improving spectral CT, leading to increased imaging performance.