

Maryellen Giger, PhD Professor Radiology Machine Intelligence in Medical Imaging: Breast Cancer and COVID-19

Maryellen Giger, Ph.D. is the A.N. Pritzker Professor of Radiology / Medical Physics at the University of Chicago. She has been working, for multiple decades, on computeraided diagnosis /machine learning/deep learning in medical imaging and cancer diagnosis / management. Her AI research in breast cancer for risk assessment, diagnosis, prognosis, and therapeutic response has yielded various translated components, and she is using these "virtual biopsies" in imaging-genomics association studies. She has now extended her AI in medical imaging research to include the analysis of COVID-19 on CT and chest radiographs, and is PI on the NIBIB-funded Medical Imaging and Data Resource Center (MIDRC). Giger is a former president of AAPM and of SPIE; and is the Editor-in-Chief of the Journal of Medical Imaging. She is a member of the National Academy of Engineering; Fellow of AAPM, AIMBE, SPIE, SBMR, IEEE, IAMBE; and was cofounder, equity holder, and scientific advisor of Quantitative Insights [now Qlarity Imaging], which produces QuantX, the first FDA-cleared, machine-learning driven CADx system.

Abstract: Artificial Intelligence in medical imaging involves research in task-based discovery, predictive modeling, and robust clinical translation. Quantitative radiomic analyses, an extension of computer-aided detection (CADe) and computer-aided diagnosis (CADx) methods, are yielding novel image-based tumor characteristics, i.e., signatures that may ultimately contribute to the design of patient-specific cancer diagnostics and treatments. Beyond human-engineered features, deep convolutional neural networks (CNN) are being investigated in the diagnosis of disease on radiography, ultrasound, and MRI. The method of extracting characteristic radiomic features of a lesion and/or background can be referred to as "virtual biopsies". Various AI methods are evolving as aids to radiologists as a second reader or a concurrent reader, or as a primary autonomous reader. This presentation will discuss the development, validation, database needs, and ultimate future implementation of AI in the clinical radiology workflow including examples from breast cancer and COVID-19.