ICFO COLLOQUIUM MARYELLEN L. GIGER 'Machine Learning in Breast Cancer Diagnosis and Management'

MARYELLEN L. GIGER

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Monday, July 2, 2018, 12:00. ICFO Auditorium

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A.N. Pritzker Professor of Radiology, Medical Physics, Univ of Chicago (USA). President of SPIE 2018.$$Maryellen L. Giger, Ph.D. is the A.N. Pritzker Professor of Radiology, Committee on Medical Physics, and the College at the University of Chicago. She is also the Vice-Chair of Radiology (Basic Science Research) and the immediate past Director of the CAMPEP-accredited Graduate Programs in Medical Physics/ Chair of the Committee on Medical Physics at the University. For 30 years, she has conducted research on computer-aided diagnosis (radiomics) and machine learning in the areas of breast cancer, lung cancer, prostate cancer, and bone diseases. She has also served on various NIH study sections, is a former president of the American Association of Physicists in Medicine, was the

inaugural Editor-in-Chief of the SPIE Journal of Medical Imaging, and is the current President of SPIE. She is a member of the National Academy of Engineering, a Fellow of AAPM, AIMBE, SPIE, and IEEE, a recipient of the AAPM William D. Coolidge Gold Medal and the EMBS Academic Career Achievement Award, and is a current Hagler Institute Fellow at Texas A&M University. She has more than 200 peer-reviewed publications (over 300 publications), has more than 30 patents and has mentored over 100 graduate students, residents, medical students, and undergraduate students. Her research in computational image-based analyses of breast cancer for risk assessment, diagnosis, prognosis, response to therapy, and biological discovery has yielded various translated components, and she is now using these image-based phenotypes in imaging genomics association studies.
Adapting the Precision Medicine Initiative into imaging research includes studies in both discovery and translation. Discovery is a multi-disciplinary data mining effort involving researchers such as radiologists, medical physicists, oncologists, computer scientists, engineers, and computational geneticists. Quantitative radiomic analyses and machine learning are yielding novel image-based tumor characteristics, i.e., signatures that may ultimately contribute to the design of patient-specific breast cancer diagnostics and treatments. The role of quantitative radiomics continues to grow beyond computer-aided detection, with AI methods being developed to (a) quantitatively characterize the radiomic features of a suspicious region or tumor, e.g., those describing tumor morphology or function, (b) merge the relevant features into diagnostic, prognostic, or predictive image-based signatures, (c) estimate the probability of a particular disease state, and (d) explore imaging genomics association studies between the image-based features/signatures and histological/genomic data. Advances in machine learning are allowing for these computer-extracted features (phenotypes), both from clinically-driven, hand-crafted feature extraction systems and deep learning methods, to characterize a patient?s tumor via "virtual digital biopsies". Ultimately translation of discovered relationships will include applications to the clinical assessments of cancer risk, prognosis, response to therapy, and risk of recurrence.

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Disclosures

MLG is a stockholder in R2 technology/Hologic and receives royalties from Hologic, GE Medical Systems, MEDIAN Technologies, Riverain Medical, Mitsubishi, and Toshiba. She is a cofounder, equity holder, and scientific advisor for Quantitative Insights, producers of QuantX, the first FDA-cleared, machine-learning driven system for cancer diagnosis (CADx). It is the University of Chicago Conflict of Interest Policy that investigators disclose publicly actual or potential significant financial interest that would reasonably appear to be directly and significantly affected by the research activities.

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