Biomedical Informatics Grand Rounds

Wednesday, Oct. 6, 2021 3:00 pm – 4:00 pm

Radiomics and Radiogenomics: The Role of Imaging, Machine Learning, and AI, as a Biomarker for Cancer Prognostication and Therapy Response Evaluation

Despina Kontos, PhD
Associate Professor, Associate Vice Chair for Research
Department of Radiology,
University of Pennsylvania
Philadelphia, PA

Remote Access

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Bio: Dr. Despina Kontos, Ph.D., is an Associate Professor of Radiology, Associate Vice-Chair for Research, and director of the Computational Biomarker Imaging Group (CBIG) in the Center for Biomedical Image Computing and Analytics (CBICA) at the Radiology Department of the University of Pennsylvania. Dr. Kontos received her C.Eng. Diploma in Computer Engineering and Informatics from the University of Patras in Greece and her MSc and Ph.D. degrees in Computer Science from Temple University in Philadelphia. She completed her postdoctoral training in radiologic physics and biostatistics at the University of Pennsylvania, and additional postgraduate training in Cancer Molecular Biology and Therapeutics from Harvard Medical School.

Her research interests focus on investigating the role of quantitative imaging as a predictive biomarker for guiding personalized clinical decisions in precision cancer screening, prognosis, and treatment. She is leading several research studies, funded both by the NIH/NCI and private foundations, to incorporate novel quantitative multi-modality imaging measures of tumor and normal tissue composition into cancer risk prediction models.

Abstract: Cancer is a heterogeneous disease, with known inter-tumor and intra-tumor heterogeneity in solid tumors. Established histopathologic prognostic biomarkers generally acquired from a tumor biopsy may be limited by sampling variation. Radiomics is an emerging field with the potential to leverage the whole tumor via non-invasive sampling afforded by medical imaging to extract high throughput, quantitative features for personalized tumor characterization. Identifying imaging phenotypes via radiomics analysis and understanding their relationship with prognostic markers and patient outcomes can allow for a non-invasive assessment of tumor heterogeneity. Recent studies have shown that intrinsic radiomic phenotypes of tumor heterogeneity for cancer may have independent prognostic value when predicting disease aggressiveness and recurrence. The independent prognostic value of imaging heterogeneity phenotypes suggests that radiogenomic phenotypes can provide a non-invasive characterization of tumor heterogeneity to augment genomic assays in precision prognosis and treatment.

Educational Objects: Upon completion, participants will be able to understand the state-of-the-art in this field, primarily with examples from breast and lung cancer research:

- Cancer is a heterogeneous disease, with substantial intra-tumor heterogeneity;
- Imaging can offer a novel approach via radiomics analysis to characterize tumor heterogeneity;
- Radiomics analysis is shown to elucidate intrinsic tumor phenotypes with independent prognostic and predictive value;
- Imaging phenotypes can be integrated with clinical information, EHR data, molecular profiling assays and pathology information to augment current approaches in precision cancer care.

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