Stony Brook University

Biomedical Informatics Grand Rounds

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Deep learning estimates cardiovascular disease risk from low-dose CT

Wednesday, Nov 11, 2020 3 pm - 4 pm

Abstract:
Cardiovascular diseases (CVDs) affect nearly half of American adults and result in more than 30% of all deaths. Studies demonstrate alarming statistics - patients at-risk of cancer have a ten-fold greater risk of CVD mortality than the general population. Low-dose computed tomography (LDCT) is an effective lung cancer screening technique, which can result in 20% reduction in the cancer-related mortality rate in at-risk subjects. Although subjects undergoing LDCT screening have an intermediate to high risk for CVDs, the current guidance and consensus is lacking in the best way for a simultaneous and quantitative evaluation of CVD risks due to a number of difficulties. Here we present an innovative deep learning model to address this challenge. Our deep model was trained with 30,286 LDCT volumes and achieved the state-of-the-art performance (area under the curve (AUC) of 0.869) on 2,085 National Lung Cancer Screening Trial subjects, and effectively identified patients with high CVD mortality risks (AUC of 0.768). Our deep model was further calibrated against the clinical gold standard CVD risk scores from ECG-gated dedicated cardiac CT. The promising results demonstrate that our deep learning model has the potential to convert LDCT for lung cancer screening into dual-screening quantitative tool for CVD risk estimation.

Bio:
Dr. Pingkun Yan is an Assistant Professor at the Department of Biomedical Engineering at Rensselaer Polytechnic Institute (RPI). He obtained his Ph.D. from National University of Singapore. Before he joined RPI in 2017, he was a senior scientist of Philips Research and deployed as an onsite clinical scientist at the NIH Clinical Center. His research interests include medical image computing and image-guided intervention using machine learning and computer vision techniques with the goal of bench-to-bedside translation. For instance, Dr. Yan was a core engineering team member of the world first FDA approved MR-TRUS fusion guided prostate biopsy device. Dr. Yan has published over 90 peer reviewed articles in well recognized journals including PNAS, IEEE TMI, and Medical Image Analysis. His publications have been cited for more than 4,900 times with H-index of 35. His research work has also been recognized by a number of best paper awards including MICCAI, SPIE Medical Imaging, IJCARS. He is currently serving as an associate editor of multiple international journals and a member of proposal study sections for NIH and NSF.

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Questions? Please call the Biomedical Informatics Department at 631-638-2590.