Stony Brook University

Biomedical Informatics Grand Rounds

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Deep Texture Analysis: A Shift of CT Colonography Paradigm from Detection to Diagnosis

Wednesday, October 2, 2019 3 pm—4 pm
Health Science Center L2-3B

Abstract:

Artificial intelligence (AI) research for medical diagnosis started soon after human began to use computer, initially called artificial neural network (ANN) and now convolutional neural network (CNN). ANN has been mainly explored to classify the experts' handcrafted features from the raw images, while CNN has been mainly explored directly on the raw images for both tasks of extracting abstract features and classifying the features. Experimental evidences have been shown that CNN can be trained by a large number of the raw images with experts' scores (or labels) to march or even surpass the experts' performance for both non-medical and medical diagnosis applications. However, the performances of the CNN models and the experts on medical diagnosis dropped dramatically when the labels of the raw images were replaced by the corresponding medical pathological reports. Accumulated medical knowledge reveals that the lesion heterogeneity is a footprint of lesion evolution and ecology, and the heterogeneity is also an indicator of lesion progress and response to intervention. The heterogeneity can be reflected by the image contrast distribution (or texture patterns) across the lesion volume. Image textures have been shown as an effective descriptor of the lesion heterogeneity for computer-aided diagnosis. Can we go into the raw images to map the image contrast distribution into texture images and train CNN to learn from the texture images? This question is the central theme of this presentation with application to CT Colonography or virtual colonoscopy.

Bio:

Jerome Zhengrong Liang gained a Ph.D. degree in Physics from City University of New York in 1987, followed by one year Research Fellow in Nuclear Medicine and Radiation Oncology at Albert Einstein College of Medicine. He had been a Research Associate and then Assistant Professor in Radiology at Duke University Medical Center. He joined State University of New York at Stony Brook (SUNY-SB) in 1992 and currently holds a Professorship in the Departments of Radiology, Biomedical Engineering, and Electrical & Computer Engineering. He was a co-founder of the Program in Biomedical Engineering at SUNY-SB. His primary research interests in medical imaging include data acquisition geometry, image formation and processing methodology, and feature-based visualization and computer-aided detection and diagnosis. He has authored more than 400 scientific publications, 20 US patents, 45 invited talks, and 170 conference presentations. He has supervised more than 25 postdoctoral researchers and more than 40 graduate students (PhD and MS degrees). He has been served principal investigator (PI) for 11 NIH projects and Co-PI for four NIH projects. He received the State University of New York Chancellor's Entrepreneur Award for "whose invention has led to the startup of a company to commercialize the product" in 2002. He was elected Fellow to the IEEE for "contributions to medical image reconstruction and virtual colonoscopy" in 2007.

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