

Colloquium Notice

Binlin Wu

Southern Connecticut State University

Optical Biopsy using Spectroscopy Techniques and Artificial Intelligence for Cancer Diagnosis

In this talk, I will discuss the optical biopsy (OB) techniques we have used for cancer diagnosis. Currently the gold-standard method for cancer diagnosis is needle biopsy along with histopathology. This process is invasive, time consuming, and subjective due to the judgment of pathologists. OB is a collection of alternative optical spectroscopy and imaging techniques that are used as diagnostic tools and have attracted enormous attention in the past decades. Native fluorescence spectroscopy (NFS) and Raman spectroscopy (RS) are two important OB techniques which can detect biochemical and morphological information in biological samples at the molecular level based on the excitation, emission, or vibrational properties of the molecules. Such techniques are label free and non-invasive, and can operate rapidly in vivo. We have used these techniques to diagnose different types of cancer, distinguish normal and cancerous tissues, identify cancer grades, detect metastatic ability of cancer cells, etc.

In particular, I will discuss a new Raman technique, visible resonance Raman (VRR) using 532nm for excitation. Most Raman-based cancer studies in the literature have used near-infrared (NIR) laser excitation, where Raman signal is very weak. Using high power (e.g. 300mW) or long exposure time (e.g. minutes) led to limitation of the technique for practical applications. In contrast, due to the resonance effect, VRR was shown to provide enhanced Raman peaks for key biomolecules which may be used as markers for cancer diagnosis.

In the meantime, I will discuss the application of artificial intelligence (AI) in the research. Often times, analyzing spectral or imaging data from biological samples is challenging due to the complexity of the data. Machine learning (ML) or deep learning (DL) for AI has been shown to be a promising approach to analyze the “big” data. AI can detect salient features from the high-dimension spectral data, reveal biochemical and morphological information, for accurate diagnosis and prognosis of cells/tissue.

Optical biopsy with AI techniques brings great opportunities to the field of healthcare. In particular, it provides promising novel techniques for accurate, noninvasive, early detection of cancers.

Monday

February 24, 2020

Starts at 12:15 PM

Coffee at 12:00 PM

Physics Conference Room, SB B326