Seminar Title:

Emerging Designs for Polymer-Based Optoelectronics and Wearables

Seminar Abstract:

Rapid, on-site assessment is highly desirable for timely diagnosis and treatment. To achieve this goal, my research aims to develop low-cost, flexible, large-area sensor devices for various healthcare needs. In this presentation, I will discuss case studies for two different point-of-use applications:

1) Optoelectronic measurement. Biomedical imaging monitors are being developed using organic photosensors responsive to the short wavelength infrared (SWIR) spectra. However, conventional SWIR sensors are limited by complex die transfer and bonding processing. Here we are advancing SWIR photodiodes by engineering a new generation of semiconducting polymers that are processed by solution processing techniques and allow simple direct deposition to significantly reduce fabrication costs and facilitate widespread deployment. Several demonstrations will show the various potential applications of organic SWIR photodiodes including blood pulse measurements, spectroscopic identification, and image reconstruction.

2) Mechanical measurement. There is no objective metric available for evaluating motor skill training progress, and current assessments rely on qualitative subjective surveys. To meet this need for objective diagnosis, we have designed an instrumented glove with polymeric pressure sensors and motion tracker for motor measurements. This sensor glove is being validated in clinical trials in a rehabilitation clinic for characterizing motor skills of people suffering from spasticity, and in the future it may be applicable to management of Parkinson's disease and other neurological motor disorders.

Lastly, the presentation will conclude by summarizing the key challenges and future opportunities of integrating polymer electronics in human-computer interfaces for healthcare applications.