סמינר מחלקתי– הנדסה ביורפואית

16.06.2019 יום ראשון בשעה 15:30, בנין 51, חדר 15

Biomedical Engineering Department Seminar

Sunday 16.06.2019 at 15:30, Building 51, Room 15

כיבוד קל יוגש בשעה 15:30, ההרצאה תתחיל ב-15:40

Refreshments will be served at 15:30, the lecture will begin at 15:40

Diffusion-based separation of complex signals originated by multiple redox molecules

Stav Biton Hayun

The Department of Biomedical Engineering, Ben Gurion University of the Negev

Continuous monitoring of multiple biomarkers (such as proteins, metabolites, and medications) in the body provides better diagnosis and treatment outcomes and can enables personalized health management. As many of these biomarkers are redox-active, electrochemical sensors have shown promising in situ analytical capabilities to measure multiple redox-active. Yet, the analytical performance of electrochemical sensors rapidly decreases in the presence of multicomponent biofluids, due to the limited capability to separate overlapping electrochemical signals generated by multiple molecules. Manipulation on the electrochemical signal can improve the separation of the molecules. Such manipulation can be achieved by affecting on the diffusion coefficient of the molecule in the vicinity of the electrode. The goal of this work is to show a novel approach to alter the diffusion coefficient of molecules with different molecular charges and molecular weights by modifying the electrode surface with chitosan. We hypothesize that by varying the parameters of the chitosan film, thickness and pore sizes, can be tuned and affect the redox molecules' diffusion coefficient. Electrochemical technique was used to measure the electrochemical signal generated from the redox-active molecules ferricyanide, uric acid, ascorbic acid, homocysteine, and clozapine. These signals were used to calculate the diffusion coefficient of each molecule corresponding to chitosan thickness.

In order to differentiate the molecules in mixtures, an array of 24 modified and unmodified micro-fabricated gold electrodes were developed to simultaneously measure the electrochemical signals from four components mixtures (uric acid, ascorbic acid, homocysteine, and clozapine). These signals were used to train a partial least-squares model and to quantify the molecules. This approach led to success in quantifying of three components with Pearson correlation coefficient of 0.95 to ascorbic acid, 0.88 to uric acid and 0.9 to homocysteine between the known and the estimated concentration. While there was no success for clozapine. By further improving our understanding of the diffusion of redox-active molecules in the chitosan-modified micro-systems, the in situ separation of multiple molecules can be enabled, that will establish guidelines for the effective separation of biomarkers.

About the speaker:

Stav Biton Hayun is a MSc. Student in the department of Biomedical engineering at Ben Gurion University, under the supervision of Dr. Hadar Ben-Yoav.

A Deep Learning Approach for the Analysis of Masses in Mammograms

Mor Sinai Yemini

The Department of Biomedical Engineering, Ben Gurion University of the Negev

Breast cancer is the most common invasive cancer in women, and the second main cause of cancer death in women, after lung cancer. The most common screening and diagnosis tool for the detection of breast cancer is mammograms. It has long ago been shown that computer-aided diagnosis (CAD) schemes can be used to help radiologists with the interpretation of mammograms and improve diagnosis performance.

In recent years, the use of Deep Learning (DL) and Convolutional Neural Networks (CNN) methodologies for various computer vision applications has been grown rapidly. DL models have also shown success in medical images tasks, and specifically in masses detection. In this talk, I will briefly present our unilateral CAD scheme for the detection of masses in mammograms by utilizing the DL methodology. I will show how we coped with the major challenges when facing medical data, i.e., imbalance, in means of positive and negative cases, and small dataset and present the results. Next, I will talk about our image similarity model, using Siamese Neural Network (SNN) and explain the way we constructed the dataset, the model's architecture, the optimization parameters and the assessment results.

About the speaker:
Mor is a master's student, doing her thesis under the supervision of Dr. Yaniv Zigel and Dr. Dror Lederman.