Biomedical Optics Group

Project Title: *Wireless Biopotentials*

Electrocardiography, Electromyography, and Electrocorticography are all examples of biomedical techniques to characterize physiological events by measuring electrical potential on the body. Integrated with RFID technology, we can design low-power wireless medical devices that are more accessible than their wired counterparts and have longer usage time than bluetooth and wifi powered devices. Students interested will need prior knowledge of Circuits 1, Circuits 2 experience (op-amps, transistors, filters) encouraged. Programming experience encouraged but the primary language will be C. Basic understanding of the Heart, Muscles, and Brain are necessary. All circuit designs will start from scratch "on the bench" (microprocessors, discrete components) with the intent to transition into integrated components.

Mentors: Teshaun Francis (PhD student) and Dr. Wei-Chiang Lin

Project Title: Digital Anatomy of Cortex

In the Digital Cortical Anatomy Lab (D-CAL) here at FIU, we produce high-resolution, detailed 3D models of the intricate network architecture of neurons, astrocytes and vasculatures in the cerebral cortex of the brain. While these 3D models are essential for visualizing how different regions of the brain (i.e. visual cortex, motor cortex, somatosensory cortex, etc.) are physically composed of these primarily cell types, the project is now at the stage where software packages must be written to extract specific quantitative parameters in order to compare different regions of the brain or normal from diseased tissue.

This project will require you to utilize Matlab, a programming interface, to import the 3D models generated and develop algorithms to quantify particular aspects of connectivity, such as a tripartite synapse.

An example of the 3D modeling, provided in the link below, demonstrates the complex interplay between vasculature and astrocytes in the brain in the development of the blood-brain barrier. (https://postimg.org/image/ncgy54dg3/)

Mentors: Jared Leichner (PhD student) and Dr. Wei-Chiang Lin

Project Title: Touch-Screen based Scanner

The objective of this project is to develop an App that utilizes the touch screen of a smartphone or a tablet to scan contents printed with conductive materials. This is a part of the project aiming to create a user-friendly record keeping and reminder system. It is suitable for someone who is highly interested in advancing his/her programming skill and developing apps.

Mentor: Dr. Wei-Chiang Lin