THE PHILIPPINE-AMERICAN Academy of Science & Engineering

PAASE Webinars: Lecture #9

Decoding the Computing Power of Neurons

May 29, 2020
Friday
08:00—09:00
Philippine Standard Time

The webinar will be held on Friday, 29th of May at 8 AM (Philippine Time) or Thursday, 28th of May at 8 PM (Eastern Time)

To register please go to:
https://bit.ly/VDaria

Vincent Daria earned his PhD in Applied Physics from Osaka University, Japan. He did his postdoc at the Risø National Laboratory (Denmark) where their group pioneered the use of multiple foci arrays to produce dynamic multi-beam optical tweezers for manipulating microscopic objects and cells. In 2004, he established a research group at the University of the Philippines to work on ultrafast lasers and holography for applications in laser nanosurgery, manipulation of cells and 3D microfabrication. In 2007, he joined the Australian National University (ANU) to set up a holographic multi-photon microscope for applications in neuroscience. He established the Neurophotonics group within the Eccles Institute of Neuroscience and jointly affiliated with Research School of Physics at the ANU.

About this webinar

Our brain consists of billions of neurons and decoding the computing power of a single neuron is important to understand how the entire brain works. Our aim is to identify the input/output transfer function of neurons and how they function as fundamental computing units in the brain. To achieve this aim, we developed a holographic two-photon laser microscope to visualise and analyse neurons from the cortex of rat brains. The microscope allows us to render 3D images of the neurons. On the other hand, the hologram transforms an incident laser into spatially distributed multiple foci where each focus can be used to trigger a synaptic input onto the neuron. Each focus can also act an optical probe to monitor the activity of the neuron. Using our microscope, we have identified a unique function of a specific set of dendrites that can play a role in the brain's capacity to learn and memorize. We were able to observe unique properties that allow these dendrites to be more receptive to inputs whenever the neuron fires a series of outputs. Understanding the computational role of the neuron can provide bottom-up approach to understand how our brain works.