1st Annual

ASU/BNI Neuro-Engineering & Computational Neuroscience Symposium

Friday, March 15, 2024

In-Person or Virtual
Goldman Auditorium
Barrow Neurological Institute, Phoenix, AZ

Barrow Neurological Institute

ASU Arizona State University

Goal

The first annual ASU-Barrow Neuro-Engineering and Computational Neuroscience Symposium will recognize and promote research within engineering, life sciences, and physical sciences with a core focus on the development and use of inter-disciplinary, quantitative approaches to:

1. Understanding the workings of the human brain and mind
2. Translating findings to repair and augment brain function

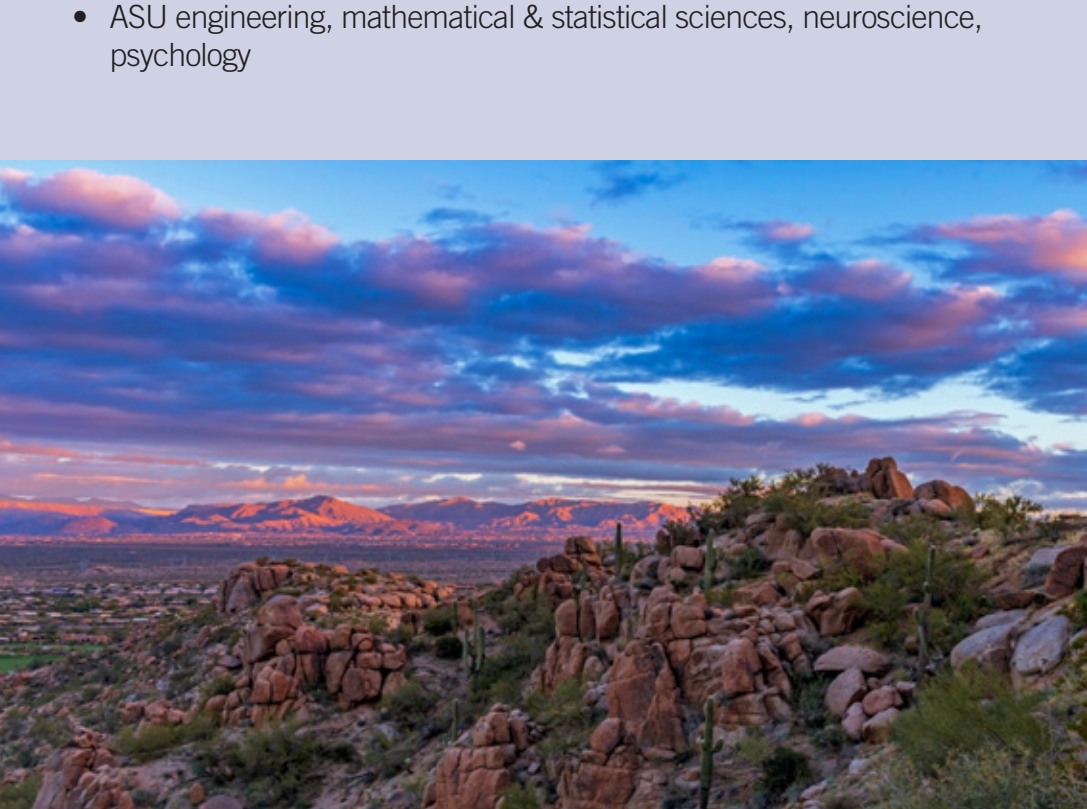
The symposium will offer ample opportunity to showcase original research through investigator-led presentations and student and postdoc-led posters. Attendees will get a chance to network with researchers from Barrow Neurological Institute and Arizona State University while identifying possibilities for collaboration between the two institutions to bridge the gap between research and medical practice.

Learning Objectives

- Exposure to the depth and breadth of research at ASU and Barrow in neuro-engineering and computational neuroscience via data blitz presentations from principal investigators and posters from lab members
- Assessment of available mechanisms to support interinstitutional research collaborations while discussing a collaborative framework to streamline partnerships

Target Audience

- Members of Barrow neurosurgery, neurology, and translational neuroscience departments
- ASU engineering, mathematical & statistical sciences, neuroscience, psychology



AGENDA

Friday | MARCH 15, 2024

7:15 a.m **Registration | Light Breakfast**

7:30 a.m. Participants welcome to attend closing events from "West-East Vascular Neurosurgery Course: The Last Samurai"

9:30 a.m. Welcome Remarks and Overview of Research at Barrow
Michael T. Lawton, MD

9:45 a.m. Welcome Remarks & Overview of Research at ASU
Kyle Squires, PhD

10 a.m. PI-Led Data Blitz (Session 1)

11 a.m. **Coffee, Networking, Posters**

11:30 a.m. PI-Led Data Blitz (Session 2)

12:30 p.m. **Lunch, Industry Talks, Networking, Posters**

1 p.m. Industry Talk: Vagus Nerve Stimulation for Post-Stroke Upper Extremity Impairment
Navzer Engineer, MD, PhD, MicroTransponder, Chief Scientific Officer & VP of Medical Affairs

1:30 p.m. Industry Talk: Deep Brain Stimulation
Robert Raike, PhD, Director of Neuromodulation Research & Technology, Medtronic Neuromodulation

2 p.m. Plenary Talk: Distributed Models of Motor Cortical Activity
Andrew Schwartz, PhD, University of Pittsburgh

3w p.m. **Coffee, Networking, Posters**

3:15 p.m. Roadmap for Building ASU-Barrow Research Collaborations

ASU: Visar Berisha, PhD, Associate Dean for Research Commercialization

Barrow: Shwetal Mehta, PhD, Deputy Director & Chief Operating Officer, Ivy Brain Tumor Center

ASU: Zachary Holman, PhD, Vice Dean for Research & Innovation

Barrow: Brad Racette, MD, FAAN, Chair of Neurology

4:15 p.m. **Panel Q&A**

4:45 p.m. **Conclusion: Action Items and Next Steps; Presentation of Poster Awards**

Course Directors

Leon Iasemidis, PhD
Professor of Neurology
Translational Neuroscience & Neurosurgery
PI, Brain Dynamics Lab
Barrow Neurological Institute

Marco Santello, PhD
Fulton Professor of Neural Engineering, School of Biological and Health Systems Engineering, ASU
Senior Global Futures Scientist, School of Life Sciences, ASU

Andrew Yang, MD, MS
Assistant Professor of Neurosurgery, Translational Neuroscience
Director of Epilepsy Surgery
PI, Human Neurophysiology & Neuromodulation (HNN) Lab
Barrow Neurological Institute

Guest Speakers

Navzer Engineer, MD, PhD
MicroTransponder, Chief Scientific Officer & VP of Medical Affairs

Robert Raike, PhD
Director of Neuromodulation Research & Technology, Medtronic Neuromodulation

Andrew Schwartz, PhD
Professor of Neurobiology, University of Pittsburgh

Barrow Faculty

Michael T. Lawton, MD
President and CEO
Professor and Chair, Neurosurgery
Chief, Neurovascular Surgery

Shwetal Mehta, PhD
Deputy Director & Chief Operating Officer, Ivy Brain Tumor Center

Brad Racette, MD, FAAN
Chair of Neurology

ASU Faculty

Visar Berisha, PhD
Associate Dean for Research Commercialization

Zachary Holman, PhD
Vice Dean for Research & Innovation

Kyle Squires, PhD
Senior Vice Provost of Engineering, Computing and Technology; Dean and Professor, Fulton Schools of Engineering

PI-Led Data Blitz

Biomedical & Health Data Science

Antonia Papandreou-Suppappola, PhD
Barbara Smith, PhD
Leon Iasemidis, PhD
Pavan Turaga, PhD
Wonsuk Yoo, PhD

Biosensors, Bioinstrumentation & Medical Devices

Andreas Spanias, PhD
Hamidreza Marvi, PhD
Jitendran Muthuswamy, PhD
Jonathon Parker, MD, PhD
Mark Preul, MD
Rosalind Sadleir, PhD
Shaopeng Wang, PhD

Neuroimaging

Ashley Stokes PhD
Kevin King, MD, MSCS
Richard Dortch, PhD
Stephen Foldes, PhD
William McCuddy, PhD

Systems, Computational + Cognitive Neuroscience

Andrew Yang, MD, MS
Bradley Greger, PhD
Brian Smith, PhD
Gene Brewer, PhD
Marco Santello, PhD
Sharon Crook, PhD
Visar Berisha, PhD

Plenary Talk

Distributed Models of Motor Cortical Activity

The usual way to describe brain function is by analogy to electronic circuits. Individual brain circuit components are depicted as boxes to represent discrete brain structures. Like parts in a machine, each structure has a different purpose. A connected set of boxes forms a circuit. Arrows, depicting fiber pathways, connect these boxes to show information routing between them. An arrow into a box is input, with exiting arrows signifying output. As in an elementary circuit analysis, the box transforms input to output. Positive signs represent excitatory input and vice versa for inhibition.

This entrenched modular framework has some descriptive value, especially for clinical disorders, and is attractive because causality is straightforward. However, this circuit-centric "boxology" has limited explanatory value and continues to impede progress toward understanding brain function. Neurons in the CNS receive synaptic input from widespread sources; how this input is integrated to propagate signals and perform functional operations is an unsolved and fundamental problem in neuroscience. This issue cannot be resolved anatomically, since each CNS neuron receives thousands of inputs, most of which are silent at any instant. Neurons in different structures can be driven by the same combination of inputs and are observed to fire in much the same way during behavioral tasks, essentially removing the boundaries between different structures. Even though assigning causal roles to different structures may have clinical relevance, it has limited scientific merit.

The motor cortex is a prime example of this problem. Neurons in this part of the primate brain are commonly labeled as "upper motoneurons" because they are thought to cause muscle contraction directly. Indeed, a portion of these neurons have direct anatomical connectivity to alpha motoneurons in the spinal cord. A cerebral stroke in this brain region can lead to paralysis. However, these seemingly straightforward construct is not well-supported by careful scientific studies. Instead of assumed modularity, recent studies recognize widespread collective patterns of correlated neural activiry during active behavior. These network-based studies do not rely on a priori assumptions of causality and provide a new way to describe functioning in neural systems. I will describe recent work using this approach to show how widespread common input can drive neurons in the motor cortex during reaching.

Registration Information

There is no cost to attend.

REGISTER NOW:

Attendees

https://register.dignityhealth.org/profile/form/index.cfm?PKformID=0x8795242f3

Abstract Submission

https://register.dignityhealth.org/profile/form/index.cfm?PKformID=0x8829414e4

For more information, please contact the Barrow Continuing Medical Education Office at CME@BarrowNeuro.org.