Interdisciplinary training in Computational Neuroscience for students, post-docs and faculty

A longstanding goal of neuroscience research is to understand how activity of individual neurons and within neural circuits gives rise to outputs ranging from movement to thought. Integrative and interdisciplinary training in neuroscience is necessary to help develop scientists who can work together to address this goal by using approaches from diverse fields including biology, psychology, computer science, electrical engineering, and physics.

Our training course is designed to introduce and strengthen the quantitative skills of researchers with biological and medical backgrounds and increase the knowledge of neuroscience concepts for those from quantitative backgrounds. No previous experience with modeling is expected.

All participant costs will be covered for expenses including travel, accommodation at University dorms, and meals.

July 14-20, 2019

http://engineering.missouri.edu/academics/eecs/neuro/neuro-outreach/neuro-brain

Contact the Course Coordinator at: NairS@missouri.edu

All Expenses covered by NIH grant funds

Application Deadline
Feb 15, 2019

Educational
The workshop will introduce neuroscience concepts from an advanced perspective using wet-lab and software ('virtual') experiments using a biology to model and back again approach;

Hands-On
Neuro-modeling via hands-on coding and development using the software package NEURON, and, in parallel provide exposure to electrophysiology from a mathematical and systems perspective.

Custom Projects
We will work individually with each attendee to develop a computational research project based on their own specific research interests.

Support
The faculty will provide follow-up support to participants for one year on all aspects of the short course, including their individual research project.

For further information contact Drs. Satish S. Nair (573-882-2964; nairs@missouri.edu) or David J. Schulz (573-882-4067; Schulzd@missouri.edu)

Tentative Schedule on back side
### TENTATIVE SCHEDULE (Sunday, 14 July to Saturday, 20 July, 2018; with travel days of Sun 14 July and Sun, 21 July)

Table 1. Seven color-coded parallel tracks of the short course; Track 1: Relevant Mathematics; Track 2: Neurons and Circuits; Track 3: Projects at cellular (#1) and network (#s 2&3) levels; Track 5: Neuro-/electro-physiology from an engineering systems perspective

Prior to arrival on campus – On-line boot-camp focusing on learning software (NEURON), and ‘Basics of Neurobiology’ starts a month prior to Course. Participants are also provided access to a Canvas site that has all the course materials.

- **Starts on Sunday, 14 July: 7 p.m. - 9 p.m.** Introductions; Knowledge & Instructional Surveys.

<table>
<thead>
<tr>
<th>Morning (9 am – 12 noon)</th>
<th>Afternoon (1 pm - 5 pm)</th>
<th>Evening (6:30-9 pm)</th>
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<tbody>
<tr>
<td>Mon. Basics of neurobiology; Biology: Resting potential and GHK-equation from a systems viewpoint</td>
<td>What is Computational Neuroscience? Software Expt. 1 Modeling a passive membrane; Derivatives, integration &amp; ODEs; How does a software package solve ODEs?</td>
<td>Running NEURON programs; Submitting jobs to NSG via automated interface</td>
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<tr>
<td>Tue. Biology: Voltage-gated channels and AP; Software Expt. 2 – Action potential</td>
<td>Mathematics of AP; Software Expt. 2 – contd.; Complete HWs</td>
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<tr>
<td>Wed. Wet Lab 1 - Membrane Potential; Resting potential of leech neurons; Principles of neurophysiology</td>
<td>Wet Lab Expt. 2 – Membrane Conductances; Action potential in leech neurons; Principles of neurophysiology</td>
<td>Complete Wet Lab HWs; Instruction in RCR</td>
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<tr>
<td>Thurs. Biology: Bursting; Software Expt. 3 – Bursting</td>
<td>Project 1-A (match passive and in vitro firing properties of a FS interneuron); 1-B: Detailed single cell model from Neuromorpho.org</td>
<td>Complete pending work</td>
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<tr>
<td>Sat. Soft. Expt. 6: Modeling networks - short term memory, half-center oscillator, etc. Complete Projects 2 and 3</td>
<td>Complete Projects 2 and 3</td>
<td>Discussion of Projects 2 and 3; complete all pending work</td>
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<tr>
<td>Sun. Travel back home</td>
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