**Computational Neuroscience and Modeling**

**Instructor:** Sevgi Ozturk, PhD (Hull lab)

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**Course schedule:** Every Wednesday from 1:00 pm - 4:00 pm in room 301

**Course description:**

This course is aimed for students who would like to learn computational techniques for their research. First, theoretical neuroscience concepts will be shortly introduced. Then, you will be exposed more into data-driven analyses approach by hands-on training. The course will be conducted more similar to a workshop than traditional lecture. Each participant is expected to bring a notebook computer with Matlab/Python compiler. This course will provide participants a collaborative coding environment to try sample codes and develop new solutions for neural data analyses. The organization of the course will be in the following manner:

Week 1 (6/7/2023): Model Types, Neural Data Analysis: Encoding

Week 2 (6/14/2023): Model Types, Modeling Practices

Week 3 (6/21/2023): Model Fitting (Linear regression)

Week 4 (6/28/2023): Dimensionality Reduction (PCA)

Week 5 (7/5/2023): Dimensionality Reduction (t-SNE)

Week 6 (7/12/2023): Neural Data Analysis: Decoding

Week 7 (7/19/2023): (Optional) Suggested topic by students

**Prerequisite:**

Basic knowledge of Linear Algebra, Probability Distributions and Statistics, some previous coding experience (not mandatory).

**Tools:**

Matlab (2019b or higher versions) and Colab notebooks for Python

**Resources:**

1. Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems, P.Dayan and L.F. Abbott, MIT Press, 2001.

2. MATLAB for Neuroscientists: An Introduction to Scientific Computing in MATLAB, P. Wallisch et al., Academic Press, 2009.

3. Neuromatch computational neuroscience course (<https://compneuro.neuromatch.io/tutorials/intro.html>)

4. Python Data Science Handbook (<https://jakevdp.github.io/PythonDataScienceHandbook/>)