Note to students: Below provides a summary of each of the NEUR602 sections to be held in the Fall of 2023. The general syllabus for the course, includes the structure of classes, grading, and the mock grant proposal can be found here:

General syllabus:
https://www.dropbox.com/s/hgg2lsghncmd9g6/Syllabus_2022.pdf?dl=0

Example Mock Grant:
https://www.dropbox.com/s/7ujgpdt9sazoa58/Example_MockGrant.pdf?dl=0

Please contact section leaders for the syllabus for a specific section (papers to be covered in class each week).

Section #1. Classic and Cutting-Edge Techniques in Neuroscience

Section leaders: Brian Chen, brian.chen@mcgill.ca, and Prof. Wei-Hsiang Huang, wei-hsiang.huang@mcgill.ca

Summary: "*Progress in science depends on new techniques, new discoveries, and new ideas, probably in that order.*" - Sydney Brenner. Most of the greatest discoveries in neuroscience have come from the development of novel techniques. This section will introduce students to a small sampling of the cutting-edge techniques that have been or are being developed to answer the intractable problems of neuroscience. Our goal is to demonstrate how novel techniques in neuroscience have not only advanced our fundamental understanding of how the brain works, but have also revolutionized other fields in biology.

Location and Time: Montreal General Hospital; TBD

Section #2. Neuronal growth and plasticity

Section leader: Yong Rao (section leader; email: yong.rao@mcgill.ca)

Section instructors: Keith Murai (email: keith.murai@mcgill.ca), David Stellwagen (email: david.stellwagen@mcgill.ca)

Summary: This section covers the key issues relating to the establishment and remodeling of neuronal circuitry in the nervous system. The emphasis will be on the critical discussion of recent findings that address the fundamental questions at both cellular and molecular levels. The first half of the unit will discuss the mechanisms underlying the initial wiring of neural networks during development, including the topics of neuronal polarity, axon guidance, neuronal target recognition, axon pruning and dendritic growth. The second half of the unit will explore mechanisms that regulate synapse formation and plasticity in vertebrate model systems. This portion will include such topics as mechanisms that govern pre- and postsynaptic development, regulation of physiological plasticity, morphological plasticity of dendritic spines, and glial modulation of synaptic function.

Location and time of your section: Montreal General Hospital, TBD

Section #3. Next generation treatments for neurological disorders

Section leader: Carl Ernst, PhD. CARL.ERNST@MCGILL.CA

Summary: This class will discuss the latest research attempting to develop or test treatments for neurological and neurodevelopmental disorders, with a focus on human models. We will cover biologicals, nucleic acid-based, and small molecule therapies. Examples include dopaminergic cell replacement therapy for parkinsons disease, anti-sense oligonuclotide treatment for spinal muscular atrophy/als/alexander's disease, and anti-beta-amyloid treatment in alzheimers disease. The purpose of the class is to evaluate the pros and cons of different targeted treatments and to discuss design ideas for student's own projects.

Location and time. TBD.

Section #4. Computational Neuroanatomy and Neuroimaging

Section Leader: Mallar Chakravarty PhD (mallar@cobralab.ca)

Summary: The goal of the unit is to introduce neuroimaging principles and their applications and their relationship to the understanding of basic principles of neuroscience and investigations of neuropsychiatric disorders. The students will be

evaluated on their ability to critically appraise the articles that they are tasked to read and on their ability to integrate novel techniques into a novel grant application that is removed from their primary area of research. Technical knowledge on the basis of magnetic resonance imaging or imaging in general is not considered to be required for this course, but would be beneficial.

Time and Location: TBD

Section #5. Neuroinformatics for Advancing Precision Medicine in Neurology

Section leader: Yasser Iturria-Medina, PhD.

Invited Teaching Assistants/Presenters: Sue-Jing Lin, Nikhil Bhagwat, Quadri Adewale, Ahmed F. Khan, Lazaro Rodriguez Sanchez, Robert Tobias Baumeister.

Summary: Progressive diseases (e.g., neurodegenerative conditions) often start with non-detectable clinical symptoms and may take years (or even decades) to develop. Predicting the distinctive individual course of a progressive disorder is of crucial importance for accurate diagnosis and personalized therapeutic intervention. However, in practice, there are multiple challenges associated to this problem, such as a high inter-subject variability within the same disorder and the lack of robust disease biomarkers. A growing number of studies have attempted to overcome this gap by using Big-Data and sophisticated statistical and computational models, including novel Artificial Intelligence techniques. In this section, we are going to focus on state-of-the-art models using multi-omics molecular, multi-modal brain imaging and/or clinical data to characterize disease evolution and heterogeneity in neurology, as well as discuss implications for Precision Medicine.

Location: MNI, TBD

Time (to be modified if needed by students): TBD