Image Processing in MATLAB

Workshop Lead: Megan Ng

Registration link: https://involvement.mcgill.ca/event/308524

Approximate duration: 3 hours

Prerequisites:

1. Students must have MATLAB installed and functioning on their laptop.
2. Students are expected to have a basic level of understanding of programming concepts in MATLAB (ex. syntax, writing and running a script, variables, for loops, if/else statements, creating and calling functions, etc.).

Summary:

This workshop is designed for participants who have a foundational understanding of programming and are interested in learning about image processing in MATLAB. The workshop will cover working with image data, segmenting and performing structural analyses on features of interest, and visualizing analysis results. By the end of this hands-on experience, participants will have a strong understanding of manipulating image data, executing image processing pipelines, and designing impactful result plots.

Learning Objectives:

1. Feel comfortable with working with image data in MATLAB
    a. What is an image and how is it represented as a variable in MATLAB
    b. Use common built-in functions for loading, manipulating, and saving image data

2. Pre-process and analyze image data
    a. Be able to segment a feature of interest from an image
    b. Perform structural analyses on acquired feature of interest

3. Produce interpretable result figures
    a. Learn how to create and customize plots
    b. Create informative figures by overlaying analysis results on an image

Content:

1. **Module I: Intro to Image Data in MATLAB (30min)**
    a. What is an image?
        i. Understand how images are represented in MATLAB

b. Image programming basics
    i. Reading in, viewing, and saving image data
c. Activity I – Read in, format, and view an image (20min)

2. **Module II: Pre-processing and Segmenting Image Data (1hr 15min)**
    a. What is pre-processing?
        i. Importance and techniques
    b. What is segmentation?
        i. Importance and techniques
    c. Activity II – Segment a feature of interest (1hr)

3. **Module III: Performing Image Analyses (30min)**
    a. What is structural image analysis?
        i. Different types of analyses to perform on a segmented feature
        ii. Combining functions to perform a desired structural analysis
    b. Activity III - Perform structural analysis on a feature of interest (20min)

4. **Module IV: Visualize Image Analysis Results (45min)**
    a. Plotting basics
        i. Plotting syntax
        ii. Common built-in plotting functions
        iii. Customizing plots to best display results
    b. Activity IV – Visualize image analysis results (35min)