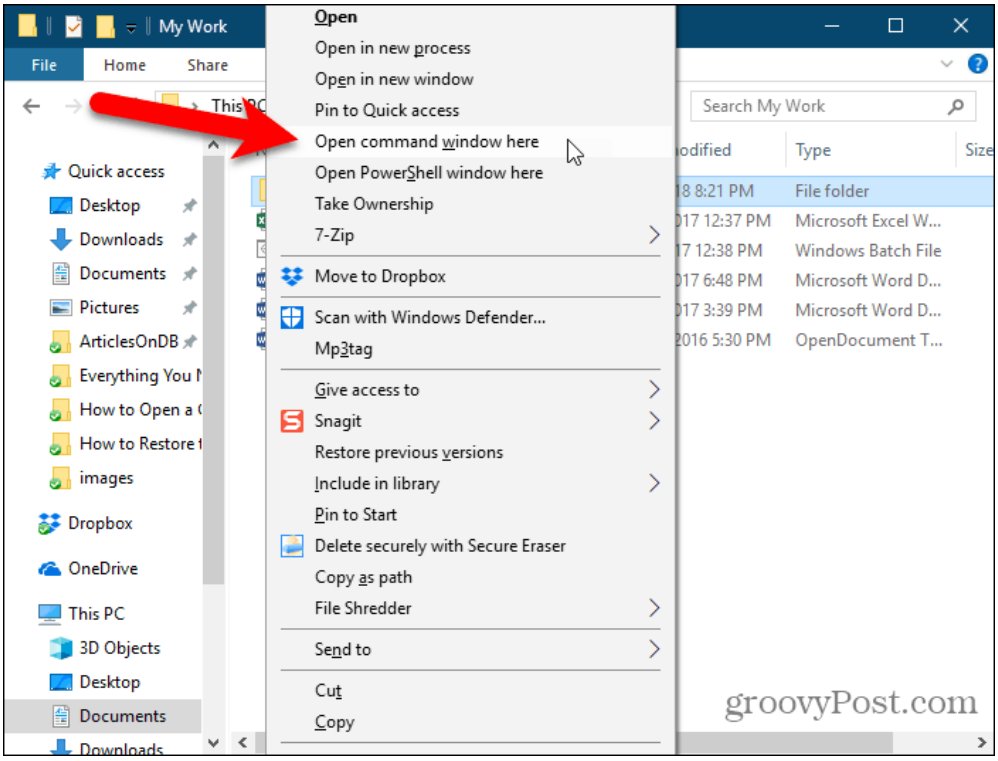
How to run vidProcessing.py on chromatophore videos

Note: If you've done this before on this computer, skip steps 1-3 and 7; those are just for setting things up on the first time

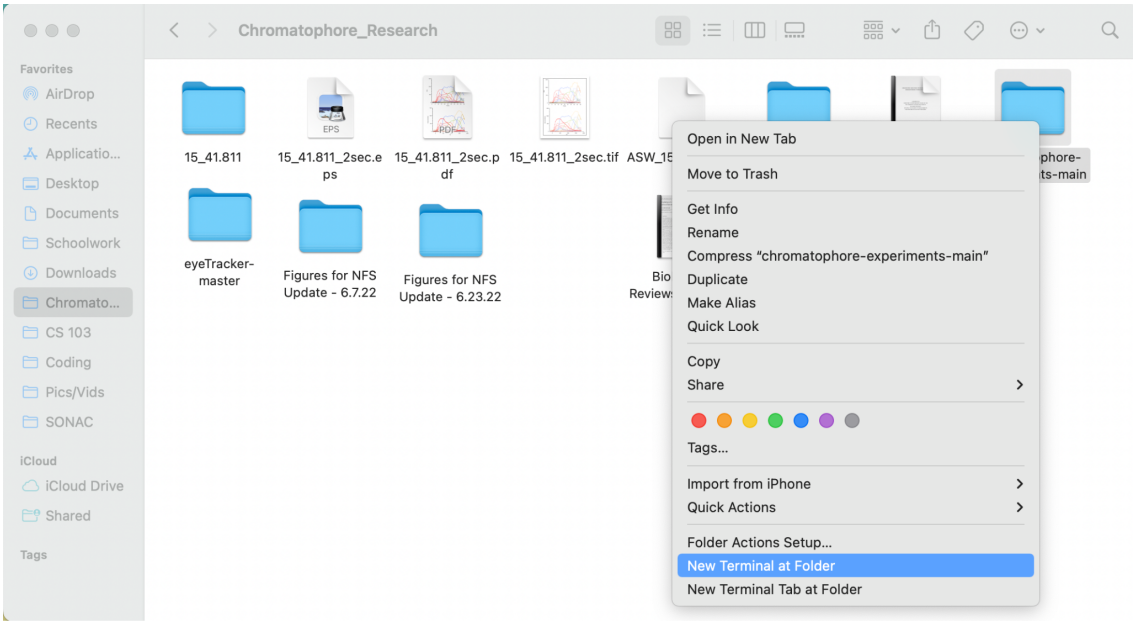
1. **Download the code/folder**
    a. Go here https://github.com/ElisabethHolm/chromatophore-experiments
    b. Click the green "Code" button and click on "Download Zip". This will download the folder to your computer. You can move the zipped folder to wherever you want it in your directory on your computer.
2. **Unzip the folder**
    a. If you're on Windows: https://support.microsoft.com/en-us/windows/zip-and-unzip-files-8d28fa72-f2f9-712f-67df-f80cf89fd4e5
    b. If you're on Mac: https://www.parallels.com/tips/zip-unzip/mac/unzip/how-to/#:~:text=Double%2Dclick%20on%20the%20zipped%20file%20to%20unzip%20any%20zipped,to%20access%20the%20extracted%20files.
    c. Note: You can change the folder name if you'd like, but just replace "chromatophore-experiments-main" with your folder name in the next steps
3. **Download Python**
    a. Download Python 3.10.4 using the instructions here. Be sure to check the box "add to PATH" in the installation wizard and restart the terminal after installation.
4. **Open the terminal**
    a. If you're on Windows:
        i. Either do this and skip steps 5-6 (might require changing some settings): https://www.groovypost.com/howto/open-command-window-terminal-window-specific-folder-windows-mac-linux/



ii. Or this (and don't skip steps 5-6): https://www.digitalcitizen.life/open-windows-terminal/# or https://www.wikihow.com/Open-Terminal-in-Windows

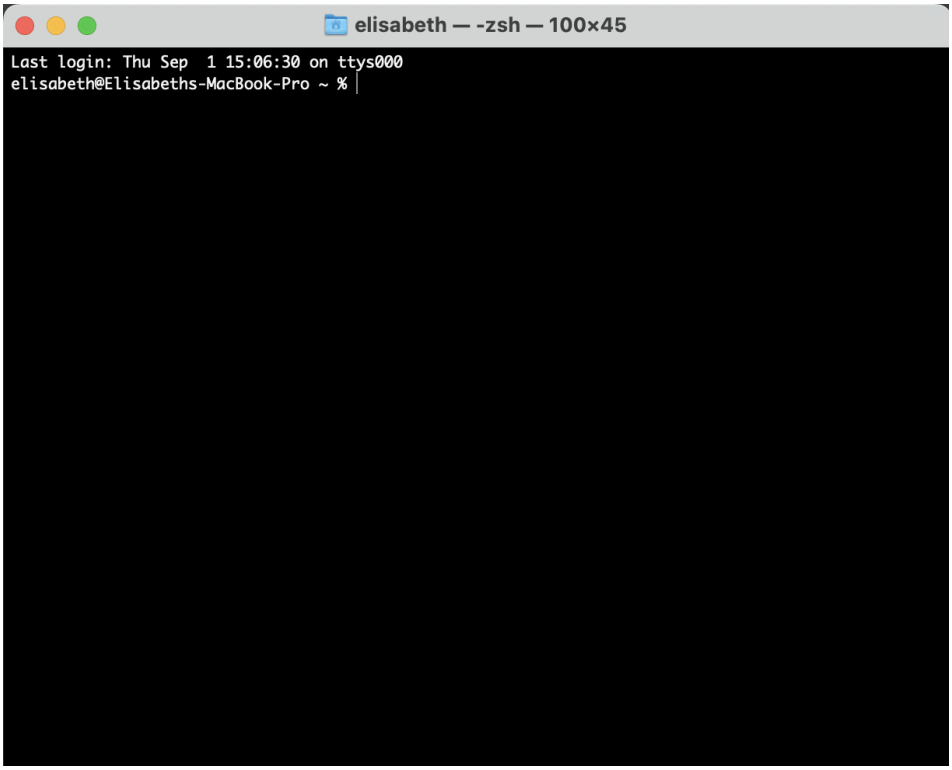
b. If you're on Mac:

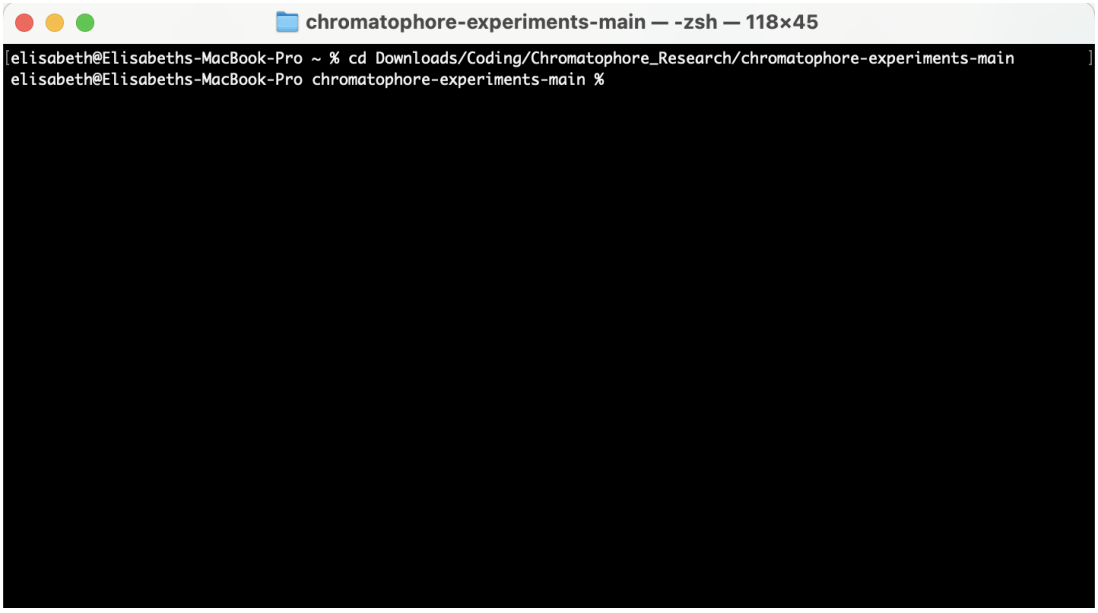
i. Either do this and skip steps 5-6



ii.

iii. Or this (and don't skip steps 5-6): https://www.howtogeek.com/682770/how-to-open-the-terminal-on-a-mac/

iv. 

5. **Find the directory** (file path) that you unzipped the chromatophore-experiments-main folder to
6. **Go into that directory** by typing the line below in the terminal and pressing enter
    a. `cd whatever/filepath/you/used/chromatophore-experiments-main`
    b. 

    c. Now you should be in the correct directory (inside the folder with the code file in it). To double check, you can type `ls` (Mac) or `dir` (Windows) and press

enter – you should see vidProcessing.py listed as one of the files. If you don't, you might be in the wrong directory. Just close the terminal and repeat steps 3-5.

7. **Install the necessary libraries**
    a. Type this in the command line (and press enter): `pip install -r requirements.txt`
    b. https://note.nkmk.me/en/python-pip-install-requirements/
8. **Run the program**
    a. This can be done in a number of ways (for different settings). These command add-ons are called flags and you can add as many or as little as you'd like to the base command.
    b. The base command is `python3 vidProcessing.py` but if you get something like "Python is not recognized as an internal or external command," you might need to install python or try `python vidProcessing.py`
    c. If you don't specify with flags, they will default to the following values:
        i. Zoom level: x7
        ii. Desired full window pixel width: 1000 pixels
        iii. Original video resolution: 1920x1080
        iv. ROI: Manually selected (click and drag on video)
        v. Video file path: New_Vids/Sept_2022_Tests/TS-20220801155100769.mp4
        vi. Waiting for a spacebar at every frame (`-s`): off
        vii. Computer system: Mac
    d. `-z` or `--zoom`
        i. Zoom level of the microscope (ex: 7, 10, 12.5, 16, 20, 25, 32, 40, 50, 63, 90) when the video was taken
        ii. Ex for zoom x12.5: `python3 vidProcessing.py -z 12.5`
    e. `-w` or `--window_width`
        i. Desired pixel width of frame (how wide you want the full window to display as, NOT the original pixel size – it assumes 1920x1080) This will resize the frame and keep the aspect ratio.
        ii. Ex to make the window width 500 pixels: `python3 vidProcessing.py -w 500`
    f. `-x` or `--original_width` AND `-y` or `--original_height`
        i. The original pixel dimensions of the frame (based on the camera's resolution)
        ii. Ex for a camera that captures in 3840 x 2160: `python3 vidProcessing.py -x 3840 -y 2160`
    g. `-r` or `--ROI`
        i. x, y, w, h of region of interest formatted as a string with spaces between the numbers. Use this if you want to see the exact same ROI as a previously manually selected one. Beware all yee who enter: If you change the window width (`-w`), original width (`-x`) or original height (`-y`),

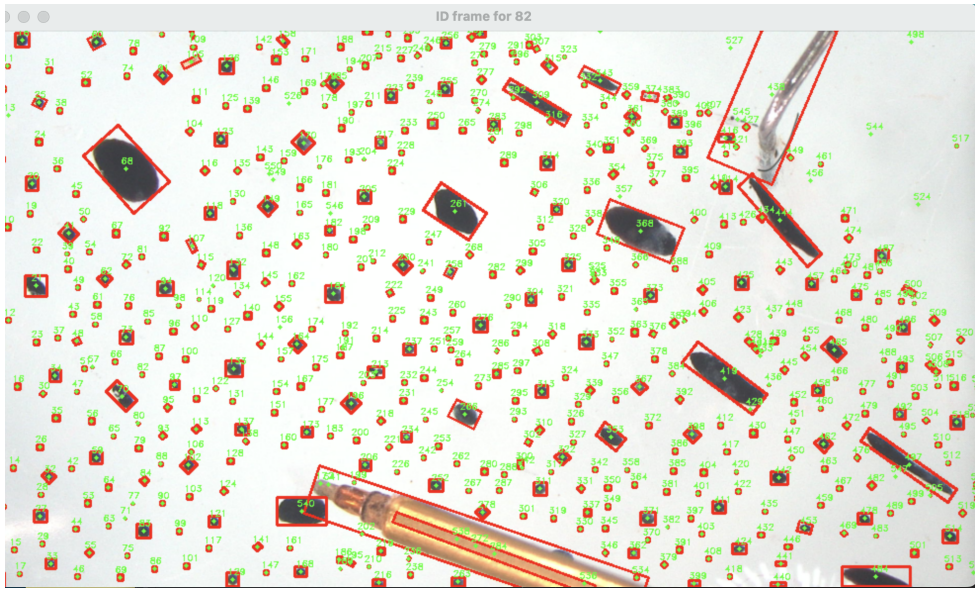
your ROI numbers will change too; so don't change those settings from the first time you chose your ROI if you want the exact same ROI again.
    1. Note: x and y are pixel coordinates of top left corner of ROI. The origin of a pixel grid is at the top left corner (see here for visual guide to pixel coordinate system).
  ii. Ex: `python3 vidProcessing.py -r "470 90 283 241"`

h. `-v` or `--vid`
  i. File path of the video you want to run the program on. If you have spaces anywhere in your directory, you have to type the space as "\ "
    1. ex: `Sept\ 22\ Tests/TS-20220630153941965.avi`
  ii. Ex: `python3 -v New_Vids/April_22/45_4-20-22.AVI`

i. `-s` or `--stop`
  i. If you want the video to stop and wait for a spacebar at every frame
  ii. Ex: `python3 vidProcessing.py -s "on"`

j. Some examples:
  i. For a certain video with 12.5 zoom: `python3 -z 12.5 -v New_Vids/June_22/TS-20220630153941965.avi`
  ii. For a certain video with 12.5 zoom that I want to see bigger: `python3 -z 12.5 -w 1500 -v New_Vids/April_22/45_4-20-22.AVI`
  iii. For a certain video that I want a specific pre-chosen ROI from: `python3 vidProcessing.py -v New_Vids/Sept_2022_Tests/TS-20220801155100769.mp4 -r "470 90 283 241"`
  iv. For a certain video and ROI + I want to stop on every frame: `python3 vidProcessing.py -v "New_Vids/Sept_2022_Tests/TS-20220801155100769.mp4" -r "388 51 412 378" -s "on"`

k. Press the enter key once you've typed out your command. Select your region of interest (ROI) and press space or enter. You should then see the video playing and the chromatophores being identified. Once the video stops playing, the program has finished and you'll find two .xls files in the same folder as the original video. The file name will be the same as the video name + the ROI coordinates (ex: TS-20220801155100769_388_51_412_378.xls). The uncleaned version – which will include the full raw dataset – will end in "uncleaned".

i. 

Tip #1: once you're on the command line, you can press the up arrow key to go back to previous commands. This avoids retyping things if you're doing the same or similar commands over and over :)

Tip #2: To stop the program in the middle of it running, click on the terminal window and press ctrl+c