**Social Mouse Protocol (Ver\_2.3.5)**

**Pre-Label the social mouse videos**

1. Currently taking the video, placing it in PowerPoint, using an “x” as markers of where I want labels to be

* Making the “x” as small as possible while also making it the lightest gray that can still be distinguishable
* Take a screen record of the video running while in PowerPoint to have the video completely labeled.
* Then use Cropping video tool (clideo) to crop the video so that only the original video is shown

**DeepLabCut Use**

1. Open Anaconda Prompt by searching for it in the bottom left search bar.

* Type “activate DLC-GPU-2.3.5”, press enter, and type “python -m deeplabcut”

A screen shot of a computer code

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1. DeepLabCut welcome page will open

* Click on manage projectA computer screen shot of a mouse

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* 2-1) After writing the project name and experimenter name, check the project folder checkbox below.
  + When selecting a video in Browse Videos, there is a bug in which the selection is not activated, so move the video by drag & drop.
  + There is a bug that does not recognize MPEG files in the latter half of the process, so convert the video and use the MP4 file.
  + Make sure that you do not change the file location of the videos once you have imported them
  + Press create once all fields are filled.

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1. Edit Configuration File

* Find the Config.yaml file in your path and open it
* **The blue box** is predetermined by the information imported in the last step and cannot be changed in the file
* The information in the **red box** needs to be changed for each project. These are the names of the desired labels you would like to use
* The **start and stop** portion do not need to be altered
* The **numframes2pick** represents the number of frames being extracted. For accurate analysis, a couple hundred frames should be picked.
* The **green box** represents the skeleton. It is basically the connection between each label and can be displayed in the final video.
* Make sure to save the file (Ctrl+S)

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- - : Start point

- : End point

* A screenshot of a computer

  Description automatically generatedClick the Edit Config.yaml button to verify

that the list has been replaced correctly.

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1. Extract Frames

* Click on the tab in the top called “Extract Frames”
* All the settings are set to default and are fine to use in this setting
* The green box represents the cropping parameters. For better analysis, it is good to crop the frame by GUI. A different interface will pop up with a frame of the video, draw a box around the area the mouse is in, and then press the crop button.
* Once done press Extract Frames in the bottom, Right

A screenshot of a computer

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- Click the Crop button after specifying the desired area by drag & drop method

A mouse in a wheel

Description automatically generated

- When the system below is displayed, click OK and go to the next step.

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1. Label Frames

* Click the tab on the top that it called “Label Frames”
* Click on the bottom left corner Top that is called “Label Frames”

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* A different interface will appear. Load the file that has the extracted frames

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* 1. Arrow buttons are used to reposition an already selected point.

+ button is used to mark a point, and both left and right mouse clicks are possible.

* 2. You can check the color of the set body points.
* 3. This is the space where the image is displayed.

3-1) In + mode, you can change the position on the image by dragging and dropping the mouse. You can zoom by using the wheel of the mouse.

3-2) Multiple selection of points is possible in arrow mode

* 4. You can go to the next image or view the previous image, and it can also be

operated with the keyboard arrow buttons.

* 5. When proceeding in the lock state, points can be taken in order

If you press the lock button to proceed to the unlocked state, you can select a point you want and take a point.

* 6. Save (Ctrl+S)

A mouse running through a yellow cage

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A screenshot of a computer

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* 7. Check if the Collected Data CSV, h5 file has been created in the (labeled-data - video name) path.

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1. Create a training set

* Click the tab in the top that says “Create Training Set”
* All parameters are default and do not need to be changed
* Click “Create Training Dataset” in the bottom right of the interface

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Description automatically generated

1. Train the network

* Click “train network” tab at the top
* Three things need to be changed here: display iterations, save iterations, and maximum iterations.
* The following values should be changed to:
  + display iterations=20,000
  + save iterations=50,000
  + maximum iterations= 1,000,000
* Then press Train Network. This can take a variety of time and is all dependent on the labeling and video length. The anaconda prompt will provide an update of how many iterations it has completed every 20,000 iterations

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Description automatically generated

* You can check the progress with a prompt, and when the completion notification window appears, you can click OK to move on to the next

(A large number of display iterations will take a long time to output to the prompt.)

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1. Evaluate Network

* Click the tab in the top that says “Evaluate network”
* Check both items in the middle
* Then press Evaluate Network in the bottom right

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* If successful, the prompt will be filled with all progress.



1. Analyze Videos

* Click “analyze video” tab in the top
* Press the “select video” tab and import the videos that you would like analyzed
* Make sure to press “yes” when asked if you want the results saved as a csv (this is the important excel file)
* Click “Analyze Videos” in the bottom right

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* If successful, the prompt will be filled with all progress.



* 3 files will be created inside the video folder

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Description automatically generated

1. Create Video

* Click “create video” tab in the top tab
* Upload the videos that you have previously uploaded for the analyze video step
  + Normally, the video will be selected automatically, otherwise add the video in the same way as in step 9.
* Check the plot all bodyparts and Draw skeleton checkboxes

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* Press the build skeleton button to confirm that the points are well connected, and then close the pop-up window.
* Press the Create videos

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* If successful, the prompt will be filled with all progress.



* If successful, a video like the one below will be created.

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1. OPTIONAL/Dependent on analysis

* If the analysis is good based off of looking at the excel file and visually at the video, these steps are not needed
* If the analysis is not good go to the “extract outlier frames” tab at the top and select the videos that need to be analyzed. Then specify the algorithm. I use manual which opens up a different interface and I am able to go through each frame of the video and determine which frames need to be relabeled. Then press Extract frames.

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* In the 0th image, I changed the 4 dots to random positions

A mouse on a yellow spiral wheel

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* You can see that the position data of the points in the SCV file has changed.
* Before data

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* After data

A white grid with black text

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Post Processing

1. MATLAB

* Open up MATLAB social code
* Import the excel file generated from DeepLabCut
* Make sure the variables are named properly according to the name of the file
* Alter the social distance that is wanted for the specific simulation
* Run the program

This is not a permanent solution and will be easier to explain in person based off of experience with matlab.

bodyparts:

- nose

- one

- two

- three

- four

- five

- six

- seven

- eight

- tail

start: 0

stop: 1

numframes2pick: 100

skeleton:

- - nose

- one

- - nose

- two

- - nose

- three

- - nose

- four

- - nose

- five

- - nose

- six

- - nose

- seven

- - nose

- eight