Reading Material: JAABA Documentation Notes.pdf (can also be found in the local github repo: rat-behavior-classifier, accessible via Finder or VS Code - I wasn't able to push any changes due to lack of permission)

Project Operations:

Preparing data for JAABA:

- Input files:
    - **movie.mov***:* video file (mp4, avi, seq, mov, ufmf, fmf, mmf, or sbfmf)
    - **trx.mat**: the file containing the tracks of the animals
        - Use a Python program to convert DeepLabCut outputted tracks into JAABA-compatible format
- JAABA terms all data associated with a given video an *experiment*. All data associated with a single video (the video, the trajectories file, and other data used within JAABA) must be stored in a single, separate directory, called an *experiment directory*. JAABA uses the directory's name to refer to this experiment.

Creating a project:

All data associated with a given behavior classifier is stored in a JAABA project file with the extension **.jab**.

For each behavior, you need a separate JAABA project. This includes the:

- Project parameters, such as the behavior name and what type of animal is being labeled.
- Trained behavior classifier, which inputs information from the animals' trajectories and predicts the behavior class. Stored in the JAABA project file
- Training data labels and locations.

Project parameters(specified in GUI upon creating a new project)**:**

Field name	Example value	Description
Target Type	flies	Type of animal whose behavior is being analyzed. This really refers to the type of tracking data which is being input. In our work, we use "flies" for both flies and mice and "larvae" for larvae. Other options, e.g. "larvae_mwt" correspond to larvae as well, but tracking using the MWT. This affects what per-frame and window features are used and how the animal's current position is plotted.
Behavior Name	Chase	Name of the behavior, used in the GUI for referring to the behavior.
Movie File Name	movie.ufmf	Name of the movie file. For each experiment, JAABA reads and shows this file from the experiment directory.
Tracking Data File Name	trx.mat	Name of the MATLAB mat file within each experiment directory in which the animals' trajectories are stored.
Output/Score File Name	scoresChase.mat	Name of the MATLAB mat file within the experiment directory where the automatic behavior classifications will be output.

After creating a project, go to **File->Change Experiment List** to add new experiments to the project.

Training a classifier:

Instructional video: https://www.youtube.com/watch?v=6hdyVwNKepQ

1. Use GUI to scroll through video
2. Indicate the start and end of an occurrence of the behavior by clicking the top right button: ex “Mount”
3. Do the same a few times for frames where the behavior is **not** occurring.
4. Once you have labeled several of each, click “Train”
5. View the predictions and check if they are correct. If not, correct them and train again.
6. Repeat until satisfied. (Check the “Evaluating a classifier” section for more)

   Important points:

   - Only label when you are confident that the behavior is occurring. Inconsistent labeling will confuse the classifier.
   - “As you review the predictions, you should label frames whose class is incorrectly predicted and for which you are confident of the true class. It's likely

that the classifier's predictions are wrong on these frames because there were few similar frames in the training set. Adding such frames to the training set will improve the classifier's prediction on similar frames.”

Evaluating a classifier:

Ground truthing: The classifier's performance is measured by its accuracy at predicting the behavior class for frames it was not trained on. To do this, the user manually labels a random selection of frames without looking at the classifier's predictions on these frames. These labels are used as the ground truth against which the classifier's predictions are compared.

Viewing Scores:

After Ground truthing and confirm that the classifiers behave to a satisfactory level, perform (File → Export Scores… → For Current Experiment to Different Location) into the folder here: (Users → neurostudent → rat-behavior-classifier → JaabaScoreConversion → mat_files) to obtain a binary .mat file in the mat_files folder.

When there are at least two .mat files in the folder, run (JaabaScoreConversion → score_conerter.py) to obtain a behavior_occurences.csv file, containing one column for each .mat file in the mat_files folder.

Copy paste the columns to the left side of the black column in Formatting CSV for behavior. Rename them into exactly one of “IN”, “OUT”, “Mount”, “Intro”, or “Ejac” based on its purpose so that the right side can pick up on the details and process the data.

Read the colored cells on top of the black column and their notes (by hovering the mouse over them) for more detailed instructions about how the Google Sheet works.