**Instructions for Running NEDE VR-Online Version**

**Running a New Subject**

1. **Set Up Biosmi** - Turn on the Biosemi and make sure everything is plugged in.
   1. Gel subject in.
   2. Open Actiview from desktop and confirm that signal quality is good.
   3. On the desktop, open the application BioSemi.exe – Shortcut. Set ‘EEG Channel Subset’ to 64 and click ‘link’.
2. **Set Up Eye Tracker** - Turn on the Oculus. Make sure the power cable is plugged in to the oculus (Oculus will still turn on if the power cable is not plugged in). On the desktop, open the application iViewNG-HMD-LSL.exe – Shortcut.
   1. Click into the iViewNG-HMD-LSL application and enter “9” to run the 9 point calibration. (can do 3 or 5 instead)
   2. In the bottom right corner on the windows task bar, click on the oculus icon and then click “Configuration Utility”. Confirm that the oculus is on and the tracker is connected.
   3. Click “Show Demo Scene” and center the oculus to the subject’s natural center.
3. **Run Matlab**
   1. Open matlab and open:
      1. NEDE\_VR > Data\_Analysis > Scripts > NEDE\_Online.m
   2. Set all the settings on the top of the script including the subject number and the number of blocks you wish to run
   3. Make sure the folders you are saving the files to exist:
   4. The continuous raw data will be saved to:
      1. Dropbox > NEDE\_Dropbox > Data > raw\_mat > subject\_X
   5. The processed epoched data will be saved to:
      1. Dropbox > NEDE\_Dropbox > Data > epoched\_vY > subject\_X
4. **Run EEGNET Classifier** – two options:
   1. Via Spyder
      1. Open Anaconda Prompt on Desktop
      2. Type “activate NEDE\_VR”
      3. Type “spyder”
      4. Open the file classifier.py
      5. Adjust the settings at the top of the script
      6. Run it by clicking the green play button at the top
      7. If error’s occur or kernel dies, under IPython console, x-out of the Console you are in and a new one will appear.
   2. Via command line
      1. Open Anaconda Prompt on Desktop
      2. Type “activate NEDE\_VR”
      3. Type “cd NEDE\_VR/Data\_Analysis/Scripts”
      4. Type “python classifier.py”
5. **Run Unity**
   1. Open Unity (version 5.3.1f I believe, definitely in the top right corner of the desktop)
   2. Select NEDE\_VR from the list of projects
   3. In the project window in unity, select “Scenes”, then select “Startup”
   4. Select three distractors and a target from the top four categories listed.
   5. Inform the subject what the target will be.
   6. On the right side, under “Presentation Type”, select “Follow” (This sets it so that there is a second car that you are following).
   7. Press “Start Now” at the bottom of the screen

**Data Storage**

All data is stored in Dropbox > NEDE\_Dropbox > Data.

The continuous raw data is stored in: Dropbox > NEDE\_Dropbox > Data > raw\_mat. This is used in ‘simulator mode’ to rerun past blocks without having to actually set up the subject again.

The epoched data is stored in: Dropbox > NEDE\_Dropbox > Data > epoched\_vX. This is the epoched data after going through the pipeline defined by epoched\_version x. The different versions are documented in Dropbox > NEDE\_Dropbox > Data > ReadMe.

The training data is stored in: Dropbox > NEDE\_Dropbox > Data > training\_vX. This is simply the data from epoched\_vX aggregated into a single storage file.

**Collecting Epoched Data into a Dataset**

Use the script: NEDE\_VR > Data\_Analysis > Scripts > aggregateEpochedData.m

**Create a New Data Processing Pipeline and Run Past Subjects Through it**

If you want to change the data processing pipeline in any way, you can change it and then run previously collected subjects through your new pipeline.

The details of the different data versions are documented in: Dropbox > NEDE\_Dropbox > Data > ReadMe. Document your new pipeline there.

First, implement your changes to the pipeline in NEDE\_Online.m or Classifier.py. Then, in NEDE\_Online.m, set your new Epoched\_Version to the new version you are creating. Finally, run NEDE\_Online.m through ‘simulator mode’ by setting EEG\_connected = false, EYE\_connected = false, Unity = false, Simulate\_data = true.

**To Include PCA and ICA in the Data Cleaning Pipeline**

Running PCA on the EEG data allows you to clean the EEG data by retaining only the top 20 principle components. Running ICA allows you to isolate components and remove unwanted components from the EEG. This may still need some work, in particular, in selecting which ICA components to remove.

To obtain the coefficients for the PCA and ICA from a subject, run NEDE\_VR > Data\_Analysis > Scripts > extractDimRedCoeffs.m. This will save the relevant coefficients to: Dropbox > NEDE\_Dropbox > Data > Dim\_Red\_Params > sX\_dimredparams.mat

To then use those coefficients to clean new data, when running NEDE\_Online.m, in the settings, set PCA\_ICA to true.

**Data Visualization**

The main data visualization script is: NEDE\_VR > Data\_Analysis > Scripts > visualizeTrainingData.mat

**Toggle on and off interest spheres**

* In unity, in placeAll.js, set the variable: interest\_spheres\_on
* In matlab, in NEDE\_Online, set the variable: UPDATE\_INTEREST\_SPHERES
* To remove python from the loop, so that unity doesn’t wait for a stream from python, comment out the inlet creation in LSL\_BCI\_Input.cs

**Toggle on and off TSP update to carpath**

* In matlab, in NEDE\_Online, set the variable: UPDATE\_CAR\_PATH
* In unity, in placeAll.js, set the variable: update\_car\_path\_on

**Toggle on and off First Person Car Frame**

* To toggle on and off the car frame for the first-person perspective, go to the grid scene. Under cams, find CarFrameFloor and check/uncheck it.

**Switch from split-screen with birds-eye-view to just first person view**

Demo version has the split screen display with the overhead camera. However, it creates jitter in the first-person, oculus view that can cause nausea in subjects. For data collection, turn off the overhead view:

* go to the grid scene in unity
* In the hierarchy, go to cams > VRCamera
* uncheck the box next to “No Mirror (script)”
* In the hierarchy, go to Birds-Eye Camera Parent, uncheck the box for Birds-Eye Camera Parent