**Source Data**

As our photometry data consists of a substantial number of point traces for a large number of mice, we have shared the data underlying our graphical representations in a repository and provided instructions for analysis as follows:

All original photometry and behavior data can be found in the following Dropbox link: <https://www.dropbox.com/sh/fb1wg3l8s22x57j/AADW1Ytd-hHOPZ1xqnO8VSOra?dl=0>

The mice and associated sessions used for this study are specified in this spreadsheet:

Source data\_manuscript.xlsx

The code for photometry analysis can be found here: <https://github.com/lchantran/AchDA_manuscript_photometry>

The code for behavior analysis can be found here:

<https://github.com/lchantran/AchDA_manuscript_behavior>

The workflow to plot and analyze the photometry data is as follows:

* **ProcessNew.m**
  + Extract and align photometry and behavior data to generate a Matlab structure from which one can extract and plot ∆F/F0 and Z-scored signals aligned to a chosen behavior event (center port in, center port out, side port entry, side port exit, first lick), cross-correlation of trial-averaged signal and noise, and the covariance matrices.
* **sumAll\_v3.m**
  + Combines data from multiple mice and/or sessions
* **processCeliaWord.m**
  + Extract choice and reward history information from behavior sessions
* **pGraph\_lc.m**
  + Plots ∆F/F0 or Z-scored signals created in ProcessNew.m

The workflow to extract and plot the behavior data is as follows:

## extractTrials\_multiMice\_lynne\_v2.m

## Extract trial information from behavior session

## ****behavior-data-pipeline\_v3.ipynb****

* + Generates a table from extracted behavior data in which each row contains key information about a trial (i.e., ITI, trial duration, port chosen, reward outcome, block position)

## ****papermill.ipynb****

* + Calculates and plots behavioral stats (i.e., mean ITI, decision time, mean reward rate, mean left choice, lose-switch rate, win-switch rate)

## ****block\_transition\_stats.ipynb****

* + Calculates and plots p(switch) and p(highport) vs block position and maximum p(switch) and tauhighport metrics

## ****demo\_models\_Lynne.ipynb****

* + Calculates and plots RFLR coefficients and determines statistical significance across experimental groups
* **Opto analysis treatments.ipynb**
  + Calculates and plots conditional switch probabilities associated with the specified choice and reward outcome histories and determines statistical significance across experimental groups