Using 2-photon calcium imaging, we imaged the activity of V1 excitatory neurons in awake mice as the mice were shown 2 types of static images: natural scenes and sinusoidal gratings. Stimuli are presented for 1s with 2s gray screens interleaved. There are a total of 20 natural scenes and 60 gratings (grating stimulus set also include one gray screen control, so you will notice 61 stimuli in the grating data). One trial consists of the randomized presentation of each natural scene *or* the randomized presentation of each grating. Each mouse has its own Matlab file which contains two data structures, one for natural scenes and one for gratings.

Natural\_Scenes\_data

.raw\_trace: *trials x 1 matrix*

This variable provides the **raw calcium signal** of each cell. For a trial, each row contains a vector (neurons x frames) with the raw fluorescence value for a given neuron for a given frame.

.deconv\_trace: *trials x 1 matrix*

This variable provides the **deconvolved signal (estimate of spike count)** of each cell. For a trial, each row contains a vector (neurons x frames) with the deconvolved signal value for a given neuron for a given frame.

.stimulus\_frame\_index : *trials x 1 matrix*

This variable provides which frames correspond to a stimulus vs a gray screen *and* the **stimulus order**. For a trial, each row contains a vector (1 x number of frames) indicating which frames correspond to gray screen and which correspond to stimuli. Frames are marked with either a zero (indicating gray screen) or a non-zero number (indicating a stimulus). The value of the non-zero number indicates which stimulus was shown.

.isRemovedBlock: *trials x stimuli matrix*

This variable provides **which stimulus blocks should be removed** due to contamination from external variables (too much motion when imaging, the mouse was covering its eye, running, etc.). For each trial, each stimulus receives a 0 or a 1. A 1 indicates that the stimulus block should be removed.

.stimulus\_shown: *1 x stimuli matrix*

This variable provides the **natural scene images**. Each cell contains the pixel value of each screen pixel.

Gratings\_data

This data structure follows the same setup as above. The only difference involves the stimulus shown.

.stimulus\_shown\_ori: *1 x stimuli matrix*

This variable provides the **orientation** of each grating stimulus. NaN indicates the gray screen.

.stimulus\_shown\_sf: *1 x stimuli matrix*

This variable provides the **spatial frequency** of each grating stimulus. NaN indicates the gray screen.