**This data set contains:**

1. **Behavioural of Experiment 8 (behave\_exp8.mat)**
2. **Eye tracking data of Experiment 8 (eye\_exp8.mat)**
3. **Matlab codes for running the decision models (ddm\_predictions.m, fim3d\_dyn.m, fim3d\_dyn\_dual\_ind.m)**

**Behavioural data of Experiments 1, 3 and 7 can be found at:**

<https://datadryad.org/stash/dataset/doi:10.5061/dryad.040h9t7>

**Behavioural data of Experiments 2, 4-6 can be found from a link provided by Gluth and colleagues (2018) at:**

<https://osf.io/8r4fh/>

**1. Behavioural of Experiment 8 (behave\_exp8.mat)**

Behavioral data of Experiment 8 (matlab data). This contains data from 35 participants. The first 25 participants were those with eye tracking data collected simultaneously.

The variable ‘behavior’ contains the following fields. Each field contains n cells of data from n participants.

* 'response\_pos'
  + The corresponding quadrant of the response. 1: top-left; 2: top-right; 3: bottom-left; 4: bottom-right
* 'gain'
  + The probabilistic gain associated with the choice.
* 'trial\_type'
  + 1: two-option trials
  + 2: distractor trials
  + 3: three-option trials (where all three options were chooseable)
* 'RT'
  + Reaction time in ms
* 'rews'
  + The reward magnitude of the HV LV and D options respectively (column) on each trial (row)
* 'probs'
  + The reward probability of the HV LV and D options respectively (column) on each trial (row)
* 'vals'
  + The expected value (i.e. magnitude × probability) of the HV LV and D options respectively (column) on each trial (row)
* 'response\_invalid'
  + 1: invalid response; 0: valid response
* 'response\_invalid\_slow'
  + 1: invalid response due to no response; 0: other kinds of response
* 'response\_invalid\_distractor'
  + 1: invalid response due to the choice of a distractor; 0: other kinds of response
* 'response\_invalid\_empty'
  + 1: invalid response due to the choice of an empty quadrant; 0: other kinds of response
* 'pos'
  + The positions of the HV LV and D options respectively (column) on each trial (row). 1: top-left; 2: top-right; 3: bottom-left; 4: bottom-right
* 'HV'
  + Value of the HV option. Identical to the first column of ‘vals’
* 'LV'
  + Value of the LV option. Identical to the second column of ‘vals’
* 'D'
  + Value of the D option. Identical to the third column of ‘vals’
* 'accuracy'
  + Choice accuracy. 1: chosen the HV option; 0: chosen the LV option.

**2. Eye tracking data of Experiment 8 (eye\_exp8.mat)**

Eye tracking data of Experiment 8 (matlab data).

The variable ‘eye\_data’ contains the following fields.

* dominant\_eye
  + 1=left; 2=right
* eye  
  contains moment-by-moment eye gaze data from the decision phase of the task.
  + decision  
    contains eye gaze data from the decision phase
    - pos\_x
      * Moment-by-moment gaze position (x-coordinate)
    - pos\_y
      * Moment-by-moment gaze position (y-coordinate)
    - pos\_time
      * Time stamp of each data point
    - pos\_trial
      * Trial number of each data point
    - pup\_size
      * Pupil size of each data point
    - validity
      * A validity index of each sample (determined by the Tobii Pro SDK software package)
    - valid\_proportion
      * The proportion of valid data of each trial
* fix  
  contains fixation data from the decision phase of the task.
  + fix\_aoi
    - Position of each fixation. 1-6 represents area of interest (i.e. stimuli) related to the reward magnitude of HV, reward probability of HV, reward magnitude of LV, reward probability of LV, reward magnitude of D and reward probability of D respectively.
  + fix\_dur
    - Duration of each fixation
  + fix\_dur\_mat
    - Duration of each fixation in each area of interest. Columns are the stimuli related to the reward magnitude of HV, reward probability of HV, reward magnitude of LV, reward probability of LV, reward magnitude of D and reward probability of D.
  + fix\_on\_off
    - Onset and offset time stamps of each fixation
  + fix\_aoi\_mat
    - Accumulative fixation count of each area of interest within each trial (i.e. stimuli). Columns are the stimuli related to the reward magnitude of HV, reward probability of HV, reward magnitude of LV, reward probability of LV, reward magnitude of D and reward probability of D.
  + fix\_trial
    - Trial number of each fixation

**Matlab codes for running the decision models (ddm\_predictions.m, fim3d\_dyn.m, fim3d\_dyn\_dual\_ind.m)**

* ddm\_predictions.m
  + The main script for running the four models: null model, mutual inhibition model, divisive normalization model and dual route model. The variable *run\_model* controls which model to run.
* fim3d\_dyn.m
  + The function used by the main script for running the null model, mutual inhibition model and divisive normalization model.
* fim3d\_dyn\_dual\_ind.m
  + The function used by the main script for running the dual route model.