Data analysis processing for HCP gambling test:

1- Partition Data Using Spectral Clustering

2- Grouping participants in the 3 or 5 groups, which is dependent on the similarity of features in the mean of reaction-time and probability of x>5 & x<5 in both Run #1 & Run #2 – the process causes to reduce the complexity of calculation, in addition to finding attributions

3- Groping data-set of 339 participants (Run #1 and Run #2) based on the brain activities – for instance: Subject #1, Subject #45, Subject #n and etc. are set in the cluster #1 (The clustering is result of sequence of number 1 and 2).

4- The differential means of areas, dorsal and ventral area of the striatum, basal ganglia complex, and prefrontal cortex compares to each other's in 2 groups, Run #1 and Run #2, to find the mean activities of these four areas for each cluster.

5- Plotting the correlation of the actives for the brain's spotlighted areas in each cluster.

❶ Partition Data Using Spectral Clustering:

❷ Grouping participants in the 3 or 5 groups, which is dependent on the similarity of features in the mean of reaction-time and probability of x>5 & x<5 in both Run #1 & Run #2 – the process causes to reduce the complexity of calculation, in addition to finding attributions
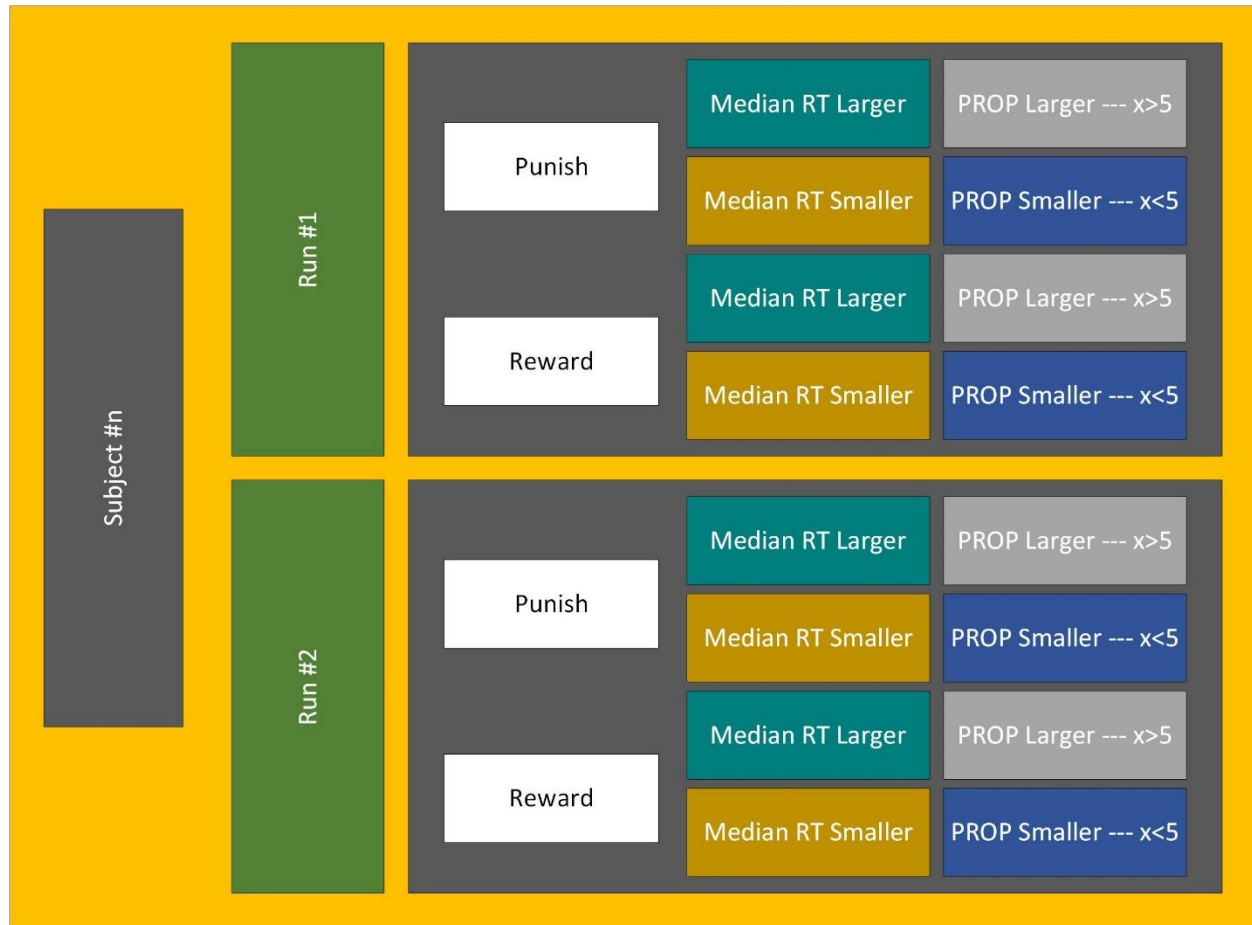
The clustering is based on these factors:

- Median RT larger / Reward
- Median RT smaller / Reward
- PROB – Larger / Reward
- PROB – Smaller / Reward
- Median RT larger / Punish
- Median RT smaller / Punish
- PROB – Larger / Punish
- PROB – Smaller / Punish

There are 16 scaler factors (the mean of reaction-time and result of gambling) for each subject – in both runs. Therefore, we can find the maximum similarity of subjects – based on these 16 factors.

To find more information about how programmer can solve clustering, please check the links being mentioned below:

- https://towardsdatascience.com/unsupervised-machine-learning-spectral-clustering-algorithm-implemented-from-scratch-in-python-205c87271045
- https://people.csail.mit.edu/dsontag/courses/ml14/notes/Luxburg07_tutorial_spectral_clustering.pdf
- https://www.stat.berkeley.edu/users/hhuang/STAT141/SpectralClustering.pdf

❸ Groping data-set of 339 participants (Run #1 and Run #2) based on the brain activities – for instance: Subject #1, Subject #45, Subject #n and etc. are set in the cluster #1 (The clustering is result of sequence of number 1 and 2).

❹ The differential means of areas, dorsal and ventral area of the striatum, basal ganglia complex, and prefrontal cortex compares to each other's in 2 groups, Run #1 and Run #2, to find the mean activities of these four areas for each cluster.

Here we can find correlation of activity of the brain during the both run (Run #1 and Run #2). It is to make clear difference among the participants based on the brain's activity that we do here using a classified data analysis using GLM.
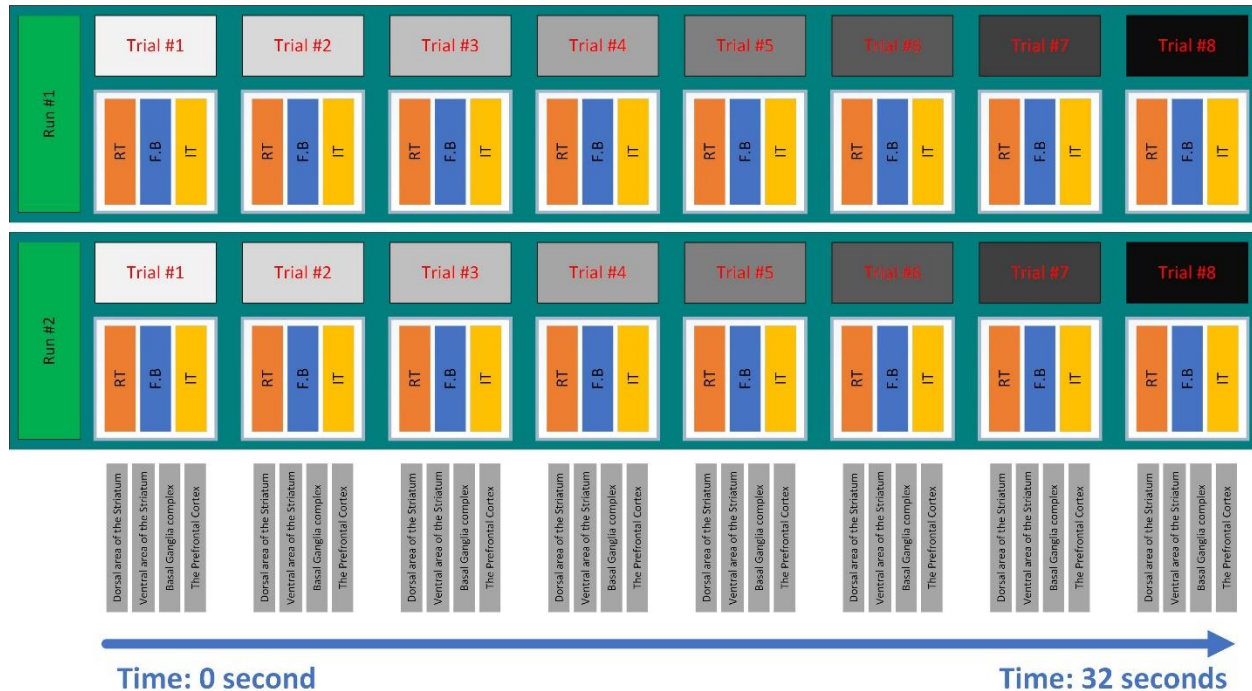
❺ Plotting the correlation of the actives for the brain's spotlighted areas in each cluster.

Having analyzed data, right now, we plot the discovery of the correlation of the brain's activity a turning into the gambling results. In other words, we found a basement for prediction of behavior of a person depended on the brain activity.

❻ In this step, we design a computational model to predict result of gambling based on the brain activities.

❼ To test our model we set a random subject in the model, so we will have compered the result of model and real result to confirm model or reject it.