Clustering ROIs

PFE - exp 2

Methods

A cluster analysis was performed for the purpose of grouping ROIs with similar behavior across conditions and subjects. A two-level hierarchical clustering (see Hastie et al., 2009) was implemented in MATLAB through the following scheme:

- A hierarchical cluster analysis was performed for every subject (31 = number of subjects). For every ROI (18 = number of ROIs) a vector was computed considering the activation level on 6 conditions obtained as a combination of position (VP or FP) and emotion (Positive, Negative or Scrambled). An agglomerative clustering algorithm was implemented using euclidean metric and average linkage. Before clustering, the data matrix was normalized, in order to consider the variation of activation across conditions.
- At the second step, 31 clusterizations have to be combined. A distance between two regions was defined as the number of subjects for which the regions were not in the same cluster. This metric is usable, because it is symmetric and respects the triangle inequality. A 18×18 similarity matrix is defined, and clustering is still performed using average linkage.

Results

The following ones are the parameters selected for the implemention:

- **Level 1** : linkage "average", method "Agglomerative with cutoff = 1". Mean number of clusters = 6.19.
- **Level 2** : linkage "average", method "Agglomerative with cutoff = $\frac{1}{\sqrt{2}} + 10^{-14} \simeq 0.7071$". Number of clusters = 5. Figure 1 shows the tree obtained at the second level.

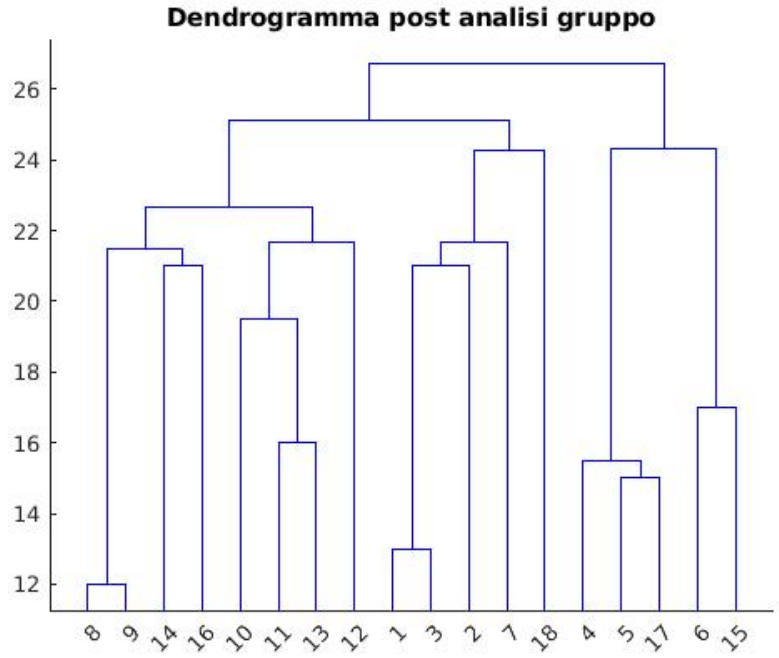

Figure 1: Dendrogram obtained in the group analysis

Clusters turn out to be the following ones:

- 1 (dorsal area 24d), 2 (area 6 Fef), 3 (area 23c), 7 (V6), 18 (putamen);
- 4 (ventral intraparietal), 5 (intraparietal sulcus), 17 (lingual gyrus);
- 6 (parieto-occipital sulcus), 15 (PCC);
- 8 (temporo-parieto-occipital junction), 9 (superior temporal visual area), 14 (IFJ), 16 (anterior insula);
- 10 (cluster temporale), 11 (V1), 12 (ventral visual complex), 13 (fusiform complex).

Comparing cited results with the dendrogram, we can saay with a high level of certainity that the following groups of regions have a very similar behaviour among themselves, so they could be included in the same cluster:

- 1 (dorsal area 24d), 3 (area 23c). If one want cluster with a bigger size, following areas could be added to the previous: area 2 (area 6 Fef), area 7 (V6);

- 4 (ventral intraparietal), 5 (intraparietal sulcus), 17 (lingual gyrus);
- 6 (parieto-occipital sulcus), 15 (PCC);
- 8 (temporo-parieto-occipital junction), 9 (superior temporal visual area);
- 14 (IFJ), 16 (anterior insula);
- 11 (V1), 13 (fusiform complex). If one want cluster with a bigger size, following areas could be added to the previous: area 10 (cluster temporale), area 12 (ventral visual complex).