

## Clustering Assignment

In the assignment, you are required to cluster words belonging to four categories: animals, countries, fruits and veggies. The words are arranged into four different files. The first entry in each line is a word followed by 300 features (word embedding) describing the meaning of that word.

1) Train a K-means model with Euclidean distance to cluster the instances into  $k$  clusters.

2) Vary the value of  $k$  from 1 to 10 and compute the precision, recall, and F-score for each set of clusters. Plot  $k$  in the horizontal axis and precision, recall and F-score in the vertical axis in the same plot.

3) Now re-run the k-means clustering algorithm you implemented in part (1) but normalise each feature vector to unit  $\ell_2$  length before computing Euclidean distances. Vary the value of  $k$  from 1 to 10 and compute the precision, recall, and F-score for each set of clusters. Plot  $k$  in the horizontal axis and precision, recall and F-score in the vertical axis in the same plot

4) Now re-run the k-means clustering algorithm you implemented in part (1) but this time use Manhattan distance over the unnormalised feature vectors. Vary the value of  $k$  from 1 to 10 and compute the precision, recall, and F-score for each set of clusters. Plot  $k$  in the horizontal axis and precision, recall and F-score in the vertical axis in the same plot.

5) Now re-run the k-means clustering algorithm you implemented in part but this time use cosine similarity as the distance (similarity) measure. Vary the value of  $k$  from 1 to 10 and compute the precision, recall, and F-score for each set of clusters. Plot  $k$  in the horizontal axis and precision, recall and F-score in the vertical axis in the same plot.

6) Comparing the different clusterings you obtained in (2)-(5), discuss what is the best setting for k-means clustering for this dataset.