FaceNet Clustering Analysis

Rodrigo Castiel
Center for Informatics
Federal University of Pernambuco
Recife, Brazil
rcrs2@cin.ufpe.br

***Abstract*—In the last decade, deep-learning based techniques brought us a remarkable breakthrough in face recognition. Recently, Google Researchers proposed *FaceNet*, a novel face recognition system that learns a mapping from face pictures to a feature-space where similarities are well described by simple euclidean distances [?]. FaceNet may be combined with different clustering methods and classifiers; on famous face recognition databases, it currently achieves the best accuracy. In this paper, we use FaceNet as a feature extractor to perform a clustering analysis on three different databases: a small personal dataset, Labeled Faces in the Wild (LFW) and MUCT. We run k-means, agglomerative clustering, spectral clustering, DBSCAN and mean-shift with different parameters on all datasets. Experiments show that both DBSCAN and mean-shift achieve the best adjusted rand scores without even knowing the number of clusters in advance.**

***Index Terms*—clustering, deep-learning, face recognition, facenet**

I. Introduction

II. Related Work

III. Clustering Analysis

A. Databases

Describe the purpose of each database.

Describe each database - number of points, clusters, and filters.

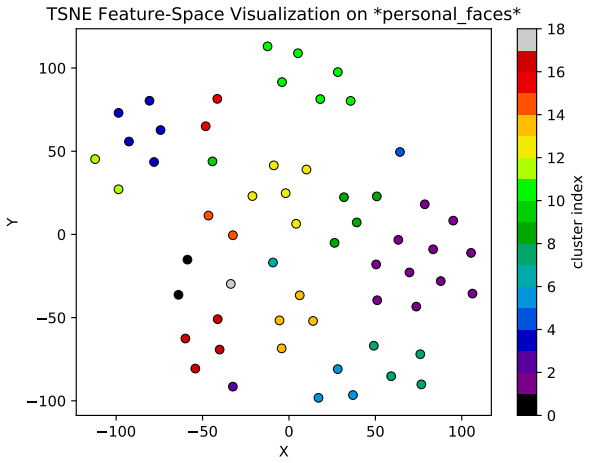

Fig. 1: TSNE visualization in feature-space on personal_faces database.

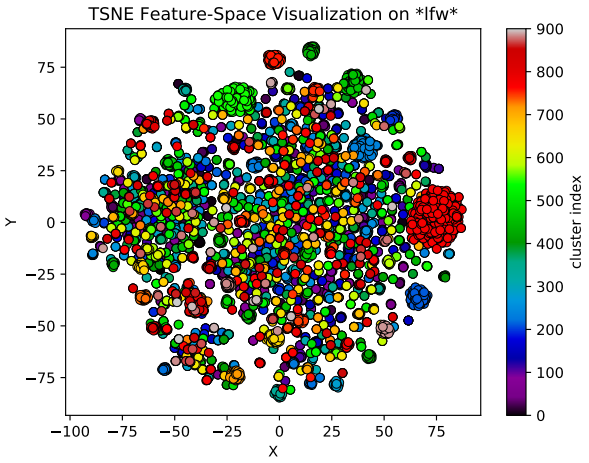

Fig. 2: TSNE visualization in feature-space on LFW database.

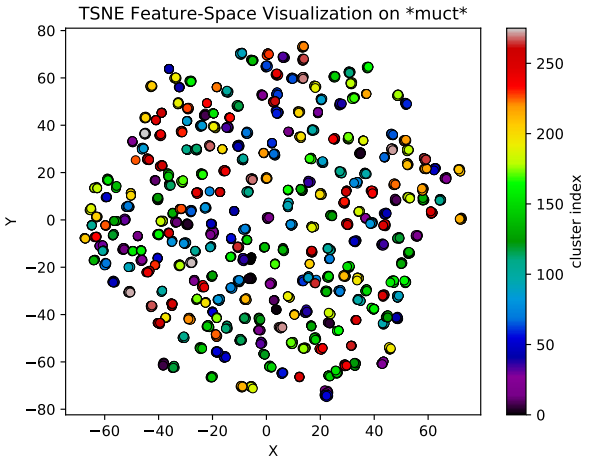

Fig. 3: TSNE visualization in feature-space on MUCT database.

B. Experiments

Add picture of the experiments pipeline.

Explain how each clustering method was validated (fraction of dataset and number of times).

Explain two groups of methods: K-based (how K is automatically computed) and the other two.

Define metrics (adjusted rand score).

C. Results

1) Score Analysis: Add table of all average scores (method vs. dataset).

Briefly explain table results.

Explain why DBSCAN and mean-shift are the best options.

2) DBSCAN and Mean-shift parameter analysis: Add plot of score vs eps and score vs bandwidth.

Explain plots.

3) Semantics Analysis: Explain secondary tool that groups photos.

Write about problems with sunglasses, ethnical groups, etc.

Write that agglomerative clustering finds the best grouping when K is known.

IV. Conclusion

Write about the advantages of DBSCAN and mean-shift.

Write about downsides of facenet (sunglasses, for example). Explain why classification can be better than clustering.

References

[1] Francisco de A.T. de Carvalho, Eduardo C. Simes, Lucas V.C. Santana, Marcelo R.P. Ferreira, Gaussian kernel c-means hard clustering algorithms with automated computation of the width hyper-parameters, Pattern Recognition, Volume 79, 2018, Pages 370-386, ISSN 0031-3203, https://doi.org/10.1016/j.patcog.2018.02.018.

[2] Vision Group, University of Massachusetts, Image Segmentation Data, http://archive.ics.uci.edu/ml/machine-learning-databases/image/.