

Combining graph edit distance and triplet networks for offline signature verification

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POINTERS –

- 1) Convolutional Neural Network is used in different approaches. Various approaches are –
 - a) Structural Graph Based Approach –
 - 1) Graph Edit Distance (GED) - It can compare any labelled graph with appropriate loss function.
 - 2) The node substitution cost was set to the euclidean distance between the two node labels.
 - 3) Graph based dissimilarity score is obtained by dividing actual GED by maximum GED.
 - b) Statistical Neural Network Approach –
 - 1) ResNet 18 and DenseNet 121 are used by transfer Learning. The NN was first trained for classification for cross entropy loss on the training set before training for similarity. Then Triplet based training was also performed where a tuple of 3 signatures anchor, positive sample and negative sample were chosen. - Euclidean distance of the embedding vectors was used to calculate the dissimilarity of two signature images.
- 1) The problem of graph dissimilarity is solved by graph matching algorithms.
- 2) Combined signature verification System - Dissimilarity score between reference signatures and given signature is calculated. A Multiple Classifier System is used to combine graph-based approach and Neural Network based approach. Z score is computed on signature images to normalize each dissimilarity scores.
- 3) GDP Synthetic Offline dataset , UT Sig dataset, MCYT-75 , CEDAR dataset are used.
- 4) Stochastic Gradient descent optimizer used with a learning rate of 0.01 and a momentum of 0.9.

PERFORMANCE –

- 1) Performance is improved by combining structural and statistical models.
- 2) The statistical model learns more accurately and general space embedding when synthetic data augmentation is also applied here.
- 3) The approaches achieve remarkable results on four different datasets without any further adaptations.
- 4) The system generalized well to new data and users that have not been used for any model training or parameter tuning.

PROSPECTS –

- 1) Using a large multiple scale classifier system which combines more structural and statistical classifier.
- 2) When looking at the differences between the global EER versus user-specific EER, it becomes clear that the optimal decision threshold differs significantly between users. While a certain difference is expected, the difference in results is quite significant on most datasets. This indicates that user-based normalization is not sufficient. Improving the alignment between different users with a better user-adaptation could improve the proposed approach. Other approaches train support vector machines (SVM) for each user based on the user's reference signatures.