Recognizing arabic handwritten characters (RAHC) using deep learning

* *Paper details:-*

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* *Architecture used in the Paper:-*

The Architecture that we used to implement this problem is convolutional neural networks but first we will talk about that problem and what it is. Automatic handwriting recognition is an important component of many applications in various fields. It is a difficult problem that has received much attention. The research focused on handwriting recognition for Latin languages, and fewer studies were conducted for Arabic.

Initially, in order to solve this problem, we propose an automated handwriting recognition model based on Convolutional Neural Networks (CNN). We train our model on a huge number of characters, in addition to the Handwritten Arabic Characters Dataset (AHCD). The main difficulties around handwriting recognition are distortions and diversity of patterns, so extracting features is of great importance and selecting features manually may result in not enough information to accurately predict character class and this problem arises due to increased dimensions.

* **CNN:-**The reason we use CNN is because it can learn features by analyzing the data set, which alleviates the need for hard manual coding of features. At the end of the training process, the neural network learns the parameters, making it more flexible when changing handwriting patterns. The Convolutional Neural Network (CNN) uses a deep learning approach, in the recognition stage. Using CNN leads to significant improvements across various machine learning classification algorithms and facilitates automatic image extraction feature. One reason to use CNN is that it has a relatively smaller set of weights and is easier to train. It is a multi-layer feed-forward neural network that extracts salient features from the input data automatically. It uses the neural network backpropagation algorithm in its training. Another major advantage of **CNN** is the use of shared weights in convolutional layers. This means that the same filter is used for every entry in the layer. Shared weights reduce parameter numbers and improve overall performance. Recently, CNN has been found to be more efficient in **recognizing handwritten characters.**
* *Dataset details:-*

The data-set is composed of 16,800 characters written by 60 participants, the age range is between 19 to 40 years, and 90% of participants are right-hand. Each participant wrote each character (from ’alef’ to ’yeh’) ten times on two forms as shown in Fig. 7(a) & 7(b). The forms were scanned at the resolution of 300 dpi. Each block is segmented automatically using Matlab 2016a to determining the coordinates for each block. The database is partitioned into two sets: a training set (13,440 characters to 480 images per class) and a test set (3,360 characters to 120 images per class). Writers of training set and test set are exclusive. Ordering of including writers to test set are randomized to make sure that writers of test set are not from a single institution (to ensure variability of the test set).

* *Implementation details:-*
* *Results and visualizations:-*