Machine Learning Engineer Nanodegree

Capstone Proposal

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Proposal

Abstract

My project's aim is to program the computer to identify hand-written alphabets via matrix operations. Each alphabet image contains 28*28 pixels, and we create a matrix using these pixels. By multiply the matrix to several sample matrixes, the pixels are converted into a three-layer 1024x512x128 fully-connected deep neural network. And finally, we employ gradient decent method so that the computer can predict the highest possibility of the alphabet written.

Keyword: deep learning, ANN, Feature Extraction, CNN, English, Machine Recognition, natural and physical sciences, image data, image processing

Domain Background

Character recognition is one of the most important research fields of image processing and pattern recognition. Character recognition is generally known as Optical Character Recognition (OCR).OCR is the process of electronic translation of handwritten images or typewritten text into machine editable text. It becomes very difficult if there are lots of paper based information on companies and offices. Because they want to manage a huge volume of documents and records. Computers can work much faster and more efficiently than human. It is used to perform many of the tasks required for efficient document and content management. But computer knows only alphanumeric characters as ASCII code. So computer cannot distinguish character or a word from a scanned image. In order to use the computer for document management, it is required to retrieve alphanumeric information from a scanned image. There are so many methods which are currently used for OCR and are based on different languages. The existing method like Artificial Neural Network (ANN) based on English Handwritten character recognition needs the features to be extracted and also the performance level is low. So a Convolutional Neural Network (CNN) based English handwritten character recognition method is used. It's a deep machine learning method for which it doesn't want to extract the features and also a fast method for character

recognition.

My personal motivation isthat i Have faced a problem, where i wanted to transform a paper document into a digital one, but i had to type it character by character. i have been trying to find an easy way to solve the problem,simply The purpose of our project is to recognize hand-written alphabets, so the computer can automatically identify the characters without any manual input.

The link to my datasource is:

https://www.kaggle.com/sachinpatel21/az-handwritten-alphabets-in-csv-format

Problem Statement

The main objective of this research is to find a new solution for handwritten text recognition of different fonts and styles by improving the design structure of the traditional Artificial Neural Network (ANN). ANNs have been successfully applied to pattern recognition, association and classification, forecast studies, and control applications, to name a few. The recognition results of such text or handwritten materials are then fed into Optical Character Recognition (OCR) as an electronic translation of images of handwritten, typewritten or printed text into machine-editable text. OCR is a field of research that is fully developed and has been quite useful in pattern recognition, artificial intelligence and machine vision. Consequently, typewritten text recognition that is void of any distortions is now considered largely a solved problem. However, the direct use of OCR on handwritten characters remains a very difficult problem to resolve, yielding extremely low reading accuracy. handwritten document recognition is currently a difficult problem; as different people have different handwriting styles. Scanning, segmentation and classification are the general processes that are being used to recognize handwritten documents. ANNs have proven to be excellent recognizers of printed characters and handwritten characters.

Datasets and Inputs

The A_Z Handwritten Data contains capitalized handwritten alphabet images (A-Z) in size of 28x28 pixels. Each alphabet in the image is centered at 20x20 pixel box. There are 372451 images in total, or approximately 14325 images for each of the alphabet, in the data file.

The dataset contains 2 .csv files with information necessary to make a prediction.

The images are taken from NIST(https://www.nist.gov/srd/nist-special-database-19)

Solution Statement

A Convolutional Neural Network (CNN) is a special type of feed-forward multilayer trained in supervised mode. The CNN trained and tested our database that contains 372451 of

handwritten english characters.

Benchmark Model

As a kaggle data set, my bechmark model showed that the results were promising with a 98% classification accuracy rate on testing images. I plan to work on improving the performance of handwritten character recognition.

https://www.kaggle.com/chandanshinde/character-recognition-using-keras

Evaluation Metrics

Generating a confusion matrix,for summarizing the performance of a classification algorithm. Classification accuracy alone can be misleading if you have an unequal number of observations in each class or if you have more than two classes in your dataset. Calculating a confusion matrix can give you a better idea of what your classification model is getting right and what types of errors it is making.

Project Design

1. Importing the necessary libraries such as Keras to build CNN, Visualizing tools and metric tools I will use latin Handwritten Characters Dataset, and it's split to the training set and testing set I will make the needed preprocessing for the data and Visualizing it
2. Preprocessing the data.
3. Building the network.
   by building the CNN and make Optimization algorithms for the CNN
   To helps us to minimize (or maximize) an Objective function (another name for Error function) E(x) which is simply a mathematical function dependent on the Model's internal learnable parameters which are used in computing the target values(Y) from the set of predictors(X) used in the model
4. Training of the model .
5. Evaluation

CNN architecture model :

When the CNN is Ready its time to Fitting the CNN to the training data and Make the predictions, Generating a confusion matrix and Calculating the accuracy