

# Report Machine Learning Third Assignment

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## Abstract

The report for the third assignment of Machine Learning. The aim of this assignment is to create a basic Neural Network for the task of the OCR (Optical Character Recognition). For the implementation I used Python 3, numpy and tensorflow.

## 1 Dataset

The structure of the OCR dataset is the following one:

- **train-data.csv**  
Training data set is composed by 41721 records, each record is the list of 0/1 bits composing a 16x8 image
- **train-target.csv**  
Training target set is a list of character that each training data line references
- **test-data.csv**  
It's composed by 10431 records and it has the same structure of the train data set
- **test-target.csv**  
It has the same structure of the train target set

### 1.1 Pre-processing

Numpy arrays are create for each dataset without any cleaning step, then targets are encoded in the one-hot format. In this way the algorithm can take numerical data instead of categorical one that, in this case is alphabetical.

## 2 Neural Network Structure

The architecture of the Neural Network is the same as the one used in the laboratory class, so it has the architecture of the ReLu network proposed by the MNIST. The architecture is shown in Figure 1

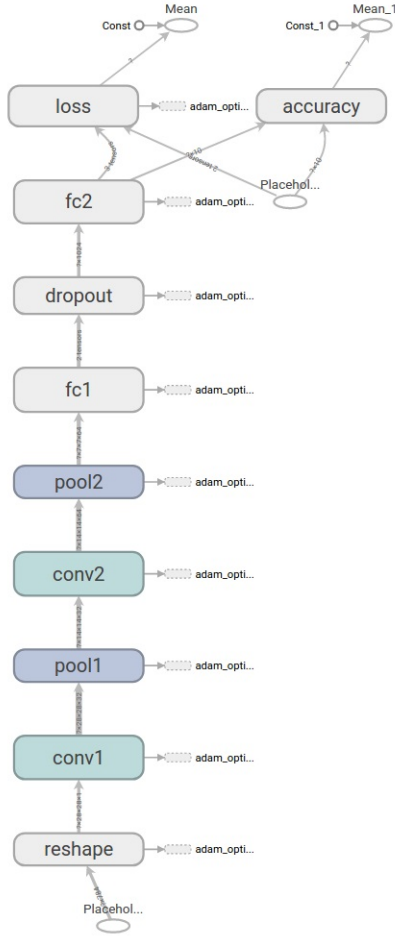


Figure 1: Architecture of the Neural Network

## 3 Final Results

After the training and the validation of the Neural Network it achieves an accuracy of 75.40% that is not a good result, but is above the baseline accuracy. To achieve better results it's possible to work on the architecture of the network to

make possible a better feature extraction. Training and testing results can be found in Figure 2

```
Epochs 0: training accuracy 0.019999999552965164
Epochs 100: training accuracy 0.46000000834465027
Epochs 200: training accuracy 0.4000000059604645
Epochs 300: training accuracy 0.6200000047683716
Epochs 400: training accuracy 0.6399999856948853
Epochs 500: training accuracy 0.6600000262260437
Epochs 600: training accuracy 0.699999988079071
Epochs 700: training accuracy 0.7599999904632568
Epochs 800: training accuracy 0.7799999713897705
Epochs 834: training accuracy 0.761904776096344

Test accuracy 0.753966212272644
```

Figure 2: Epochs and final result of the Network