

MACHINE LEARNING
LABORATORY SESSION 3: NEURAL NETWORKS

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INTRODUCTION

The provided dataset is already divided into two subsets: the training set and the testing one. The target of the current assignment is designing a neural network to classify the examples in the test.

The samples used for the classification are handwritten characters formatted as bitmap images.

The initial neural network designed has only two convolutional layers. Convolutional neural networks are very useful in image recognition problems since they are based on bidimensional matrixes, this means, 2D objects, just like an image.

Between the convolutional layers, pooling layers are added in order to provide invariance to local variations. Finally, the model counts with a dropout regularization technique that removes those nodes that might provoke overfitting.

The process has three main phases:

1. First training phase and initial testing
2. Cross Validation for optimizing parameters
3. Final training phase and testing on the testing set

1.-FIRST TRAINING PHASE AND INITIAL TESTING

Since the initial dataset is extremely large, it will be divided into batches that must be fed with data. Actually, the model is trained with a number of epochs equal to the integer division of 41721 divided by 20. Each of the epochs contains 20 examples. For testing, 171 epochs will be used with 61 examples batches. With a learning rate of 0.0001, the accuracy obtained is 0.78.

2.-CROSS VALIDATION

The main steps to be followed in order to perform the evaluation of the chosen algorithm with K-fold cross validation are:

- Split the dataset into k equal-sized subsets
- For each subset
 - Train the Predictor
 - Compute the score of the parameter (in the given case, the learning rate, which is the one to be optimized)
- Return the average score computed over all the subsets

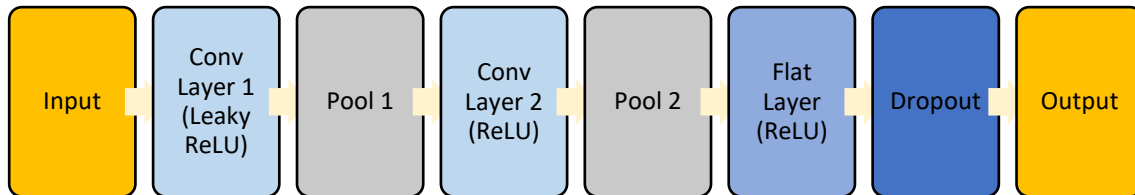
With the previously explained methodology, every subset is used for training, as well as for computing the score (testing).

In this assignment, the evaluation method applied is 4-Fold cross validation and the target variable is accuracy. After computing the algorithm, the best learning rate obtained is 0.001, since it provides an accuracy, higher than the previous one, of 0.85.

3.-FINAL TRAINING PHASE AND TESTING ON THE TESTING SET

Given the optimized learning rate, the last training and testing phases are accomplished. The accuracy obtained is much higher, reaching a value of 0.89.

DIAGRAM OF THE NETWORK ARCHITECTURE



CONCLUSION

The designed neural network was able to perform the recognition of the input characters. However, I was not able to implement the third convolutional layer, although it was not necessary to achieve the defined task.