

TP08-MNIST-CNN

September 18, 2019

1 Convolutional Neural Networks on MNIST

We will use the same MNIST dataset but each example is reshaped as a (28,28,1) array, in order to be fed to a convolutional layer.

```
[1]: import numpy as np
import tensorflow as tf
from tensorflow import keras

import matplotlib.pyplot as plt
%matplotlib inline
import datetime as dt

from pathlib import Path

from sklearn.datasets import fetch_openml
from sklearn import preprocessing

data_home = '/tmp/scikit_learn_data/'
datafile = '/tmp/mnist.npz'

datapath = Path(datafile)
if not(datapath.exists()):
    print("Data File not found... downloading it")
    Xmnist, ymnist = fetch_openml('mnist_784',
                                version=1,
                                return_X_y=True,
                                data_home=data_home)

    np.savez(datapath.as_posix(),
             X=np.array(Xmnist, dtype='u8'),
             y=np.array(ymnist, dtype='u8'))
    print("Data File downloaded and saved")
    del Xmnist, ymnist

print("Data File found... loading it into memory")
data = np.load(datapath.as_posix())
Xmnist = data['X']/255.
ymnist = keras.utils.to_categorical(data['y'])
```

```
print("Data File loaded")

Xtrain, Ytrain = Xmnist[:50000], ymnist[:50000]
Xvalid, Yvalid = Xmnist[50000:60000], ymnist[50000:60000]
Xtest, Ytest = Xmnist[-10000:], ymnist[-10000:]

Xtrain = Xtrain.reshape((Xtrain.shape[0], 28, 28, 1))
Xvalid = Xvalid.reshape((Xvalid.shape[0], 28, 28, 1))
Xtest = Xtest.reshape((Xtest.shape[0], 28, 28, 1))
```

Data File found... loading it into memory
Data File loaded

2 Exercises

Let's build a 5 layer MLP with:

- 3 convolutional blocks with a number of features of respectively 16 32 64, each block containing:
 - Batch Normalization at input,
 - Conv layer
 - Leaky Relu activation
 - Max Pooling (2,2 pool size)
- 2 dense layers with 28 hidden units.

- 1) What operation should be added in between convolutional and dense layers ?
- 2) Let's try to add dropout and regularization on dense layer.

2.1 MNIST Competition

Do the best you can on the MNIST dataset !