README

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In this exercise hand-written digits are recognised with the help a neural network. The network is trained by gradient descent with the gradients computed using backpropagation. Ridge regularisation has been used and gradient checking has been performed to make sure that backpropagation has been implemented correctly. The details of the architecture of the neural network trained and the benchmarks can be found in ex4.pdf. We begin with an evaluation of cost function for the neural network we are going to use using forward propagation with a pre-trained network for benchmarking.

[1]:
```
import ex4_1
```

```
The cost obtained without regularisation for the pre-trained network is
0.28762916516131887
The cost obtained with regularisation with the pre-trained network is
0.3837698590909236
```

[2]:
```
%matplotlib inline
```

A plot of hundred random images from the data set

[3]:
```
import ex4_plt
```

The training has been performed in ex4_bp.py. The regularisation parameter λ has been set to 1 and the maximum number of interations for the optimizer(using BFGS) has been set to 400. The optimal weights obtained has been saved in Theta1f-400it.npy and Theta2f-400it.npy. These are loaded in ex4bp_predict.py to make a prediction. An accuracy of 99.4 percent has been achieved.

[1]:
```
import ex4bp_predict
```

```
The accuracy obtained for identification is 99.4
```