Neural Network from scratch

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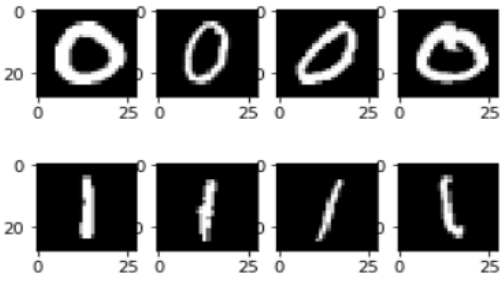
1. Digit Recognizer Objective

Goal is to correctly identify digits from a dataset of thousands of handwritten grayscale images of 28X28 pixel size. Since it was a very well known dataset we haven't given the dataset feature description a lot.

2. Grayscale and Binary images

The training dataset contains 42000 examples with each example containing 28X28 grayscale image with each pixel value from 0-255. The test dataset contains 28000 examples.



The images above are the grayscale images in the dataset.

3. Train test split

In the original dataset we have 42000 train examples and 28000 examples but the labels aren't given for test data. So we split the train data in 32000 examples for training data and 10000 examples for test data.

4. Neural Network parameters

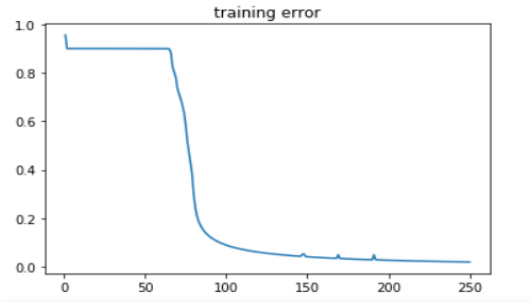
Though each and every parameter can be tuned and changed accordingly since the code is written in modular form, we have written below the parameters and their value which we have used further for accuracy analysis.

- Batch Size : 1000
- Activation function : sigmoid or relu
- learning rate : 0.01
- hidden layers : 2 layers with 32, 16 neurons
- Maximum iterations or epochs
- Threshold for error

5. Accuracy

Below are the number of iterations and test accuracy correspondingly. For the training accuracy we have given the plot of error vs number of epochs.

- 100 - 94.37 %
- 150 - 95.25 %
- 200 - 95.49 %
- 250 - 95.56 %
- 300 - 95.88 %



Accuracy curve: Training error vs number of epochs

6. References

- https://towardsdatascience.com/gaussian-mixture-models-explained-6986aaf5a95
- https://www.kaggle.com/c/digit-recognizer/data
- https://www.kaggle.com/sabasiddiqi/svm-classification-parameter-selection-0-968
- https://github.com/Maestro100
- https://www.geeksforgeeks.org/multiclass-classification-using-scikit-learn/
- https://www.kaggle.com/s00100624/digit-image-clustering-via-autoencoder-kmeans