Selected Topics from Comp. Science Assignment - 2 (REPORT)

Assignment submitted by the group comprising of:

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Introduction

- The assignment comprised of 4 stages - design, implementation, documentation and testing.
- All team members contributed equally to each stage.
- Programming language used was C++ 11.
- The dataset came form uci repository's "Optical Recognition of Handwritten Digits".
- The aim of the assignment is to implement a neural network to classify handwritten digits from 0-9.

Deliverables

The directory for the Selected Topics of Comp. Science Assignment 1 consists of the following files:

1. Report.pdf (This Report)
2. Neural_network.cpp
3. helper.h
4. main.cpp (the main runner file)
3. data/
    - train.csv
    - validation.txt
    - test.txt
    - ML2- Assignment 2.pdf

Code Execution

Since the assignment has been coded in C++

On a Linux machine, navigate to this code folder of the directory and simply type

g++ main.cpp

Followed by

./a.out

Details

- Weights have been randomly initialized between -1 and 1.
- For error calculation, softmax function has been used.
- Mini-batch gradient descent is used with momentum update and adaptive learning. The parameters are as follows:
    - Batch_size = 100
    - Beta1 = 0.9, Beta2 = 0.999, epsilon = 10e-8, alpha = 0.01
- Number of input units = 64, hidden units vary b/w 5 to 10 and, output units = 10.

Results obtained

Number of Hidden Units	Accuracy	Number of Iterations
5	0.852695	1285
6	0.867665	1059
7	0.872455	1263
8	0.905988	1107
9	0.936527	1306
10	0.937126	1267

NOTE: The results vary from run to run as the weights are initialized randomly. Gradient descent is stopped after the error on the validation set increases. Max number of iterations = 3000.