Machine Learning Assignment 2
Neural Network

Group Members

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Dataset description and Train-Test Split

The dataset has information about house prediction dataset, there are 1460 labelled examples with the labels being either 0 or 1 (below the median price or above the median price). There are 10 input features all have real valued numeric data.
From the entire data 80% examples were randomly selected to make the training set, and the remaining 20 % was used to test the model.

Feature Scaling

Before building the model the features were scaled using mean normalisation.

X = (X-mu) / sigma
Each training example X is transformed using the above formula where mu is the mean vector and sigma is the standard deviation vector of the training dataset.
Each testing example is also scaled using the mean and standard deviation of the training data

We also tried Min-Max Scalar Normalisation for each data point which does not affect the accuracy of the model as compared to Normarlisation based on mean and sigma of each feature.

Approach :

Our approach was to build generic Neural Network Model

1. Created Generic Neural Network Model
2. Initialised weights using ‘uniform’ or ‘gaussian’ distribution
3. Take the dot product of weight with input vector
4. Activated the previous output
5. Computed the cost function for each epoch
6. Did the backpropagationx based on that
7. Evaluated the model using testing set
8. Plotted the relevant graphs

We experimented different learning rate ranging from [0.001, .. ,0.1] , differnet weight initialisation method like ‘guassian’ or ‘uniform’ also tried changing the architecuture of neural network layer and computed all the metrics corresponding to each changes.
Below is the some data captured while doing the experiment.

Layer Arch	mode	learning_rate	Training Acc	Testing Acc	Precision	Recall	F-Score
[10, 8, 1]	uniform	0.01	0.88	0.91	0.91	0.92	0.92
[10, 8, 1	gaussian	0.01	0.88	0.91	0.91	0.93	0.92
[10, 8, 4, 1]	uniform	0.01	0.88	0.9	0.89	0.93	0.91
[10, 8, 4, 1]	gaussian	0.01	0.88	0.9	0.89	0.93	0.91
[10, 8, 1]	gaussian	0.01	0.88	0.91	0.91	0.93	0.92

Inference :

After doing multiple set of experiments we found that more complex nueral network overfitting the dataset and one which was giving good accuracy and having less parameters to train was

[10,8,1] which is input neurons equals 10 hidden layer neurons equal to 8 and output neurons equal to 1. By changing the weight initialization vector method to ‘guassian’ to ‘uniform’ does not affect the model that much. We have shuffled the dataset and splitted by 80 percent training and 20 percent testing data.s