UC San Diego Extension
Deep Learning Using TensorFlow
Winter 2019
Homework#4

Date Given: Feb 5, 2019   Due Date: Feb 11, 2019
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Problem#1

The 'Admission.csv' data file has the following information about 400 students.

	A	B	C	D
1	admit	gre	gpa	rank
2	0	380	3.61	3
3	1	660	3.67	3
4	1	800	4	1
5	1	640	3.19	4
6	0	520	2.93	4
7	1	760	3	2
8	1	560	2.98	1
9	0	400	3.08	2
10	1	540	3.39	3

The feature 'gre' represents the GRE examination results of students. The 'gpa' feature represents the GPA of students. The 'rank' represents the rank of the university (4 is the best, 1 is the lowest). The 'admit' feature is a categorical variable which indicates if that student was admitted into college (0 means not admitted, 1 means admitted).

Build a Neural Network using TensorFlow software to predict if a student will be admitted to college given the 'gre', 'gpa', and 'rank' values.

Neural Network Specification
- Number of input node = 3 (gre, gpa, rank)
- Number of hidden nodes = 5 (vary this number from 1 to 10 to get highest accuracy of prediction)
- Number of output node = 1 (categorical: 0 means not admitted, 1 means admitted)
- Cost Function: Cross Entropy Cost Function
- Optimization Function: Gradient Descent
  - Feed "Learning Rate" as a parameter to the optimization function

Before building the Neural Network, scale the predictor variables values between 0 and 1. Otherwise Neural Network may not converge. Since there are 400 observations, split the dataset into training (70%) and testing (30%).

Train the Neural Network model using the training data. Predict the outcome using the testing dataset. Measure the accuracy of your predictions. In the end, print the accuracy, values of weights and bias of all the nodes of your Neural Network.

Problem#2

The 'Advertising.csv' contains the following information.

	A	B	C	D	E
1		TV	Radio	Newspaper	Sales
2	1	230.1	37.8	69.2	22.1
3	2	44.5	39.3	45.1	10.4
4	3	17.2	45.9	69.3	9.3
5	4	151.5	41.3	58.5	18.5
6	5	180.8	10.8	58.4	12.9
7	6	8.7	48.9	75	7.2
8	7	57.5	32.8	23.5	11.8
9	8	120.2	19.6	11.6	13.2
10	9	8.6	2.1	1	4.8
11	10	199.8	2.6	21.2	10.6

A company spends money on advertising their products on 3 media channels - TV, Radio and Newspapers. The above table shows the relationship between amount of money spent in advertising and sales. There are 200 observations in the 'Advertising.csv' file.

Build a Neural Network using TensorFlow software to predict the sales given the amount of money spent on all 3 the media channels.

The only difference between problem#1 and problem#2 is the type of the response variable. In problem#1 the response variable is categorical (with 2 levels). In problem#2 the response variable is numerical.

Neural Network Specification:
- Number of input node = 3 (TV, Radio, Newspaper)
- Number of hidden nodes = 5 (vary this number from 1 to 10 to get highest accuracy of prediction)
- Number of output node = 1 (Sales - numerical)
- Cost Function: (Observed output value – Computed output value^2
- Optimization Function: Gradient Descent
  - Feed "Learning Rate" as a parameter to the optimization function

Before building the Neural Network, scale the predictor variables values between 0 and 1. Otherwise Neural Network may not converge. Since there are 200 observations, split the dataset into training (70%) and testing (30%).

Train the Neural Network model using the training data. Predict the outcome using the testing dataset. Measure the accuracy of your predictions by computing RMSE (Root Mean Square Error). In the end, print the RMSE, values of weights and bias of all the nodes of your Neural Network.