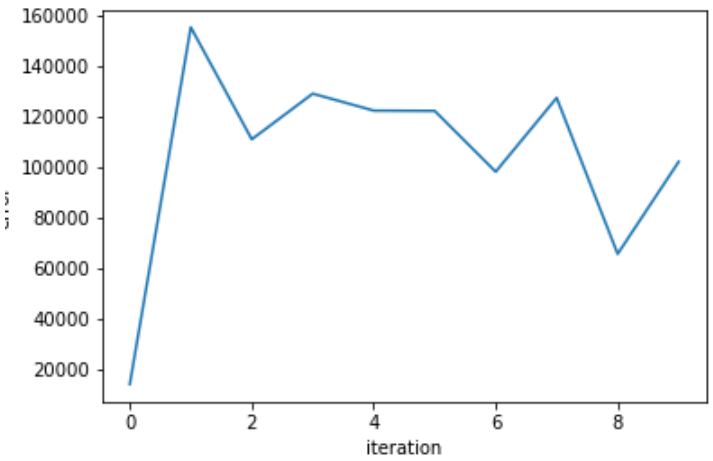
1. **Convolution NN :**

Using big learning rate causes the error to fluctuate at high values in the given number of iterations.

a. For learning rate 0.1

Output :

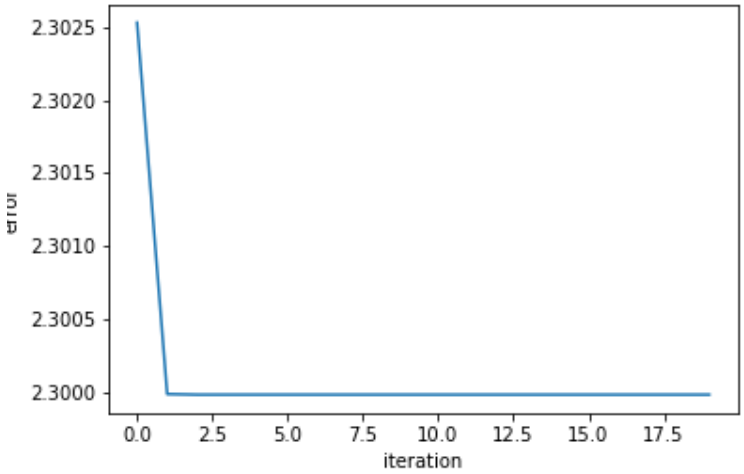
Cost at iteration 0 is: 13815.69266, learning rate: 0.01000
Cost at iteration 10 is: 80272.03661, learning rate: 0.01000
Cost at iteration 20 is: 109426.99970, learning rate: 0.01000
Cost at iteration 30 is: 106306.68043, learning rate: 0.01000
Cost at iteration 40 is: 104097.09031, learning rate: 0.01000
Cost at iteration 50 is: 83917.02408, learning rate: 0.01000
Cost at iteration 60 is: 105974.36960, learning rate: 0.01000
Cost at iteration 70 is: 114420.53983, learning rate: 0.01000
Cost at iteration 80 is: 105221.79053, learning rate: 0.01000
Cost at iteration 90 is: 131068.75144, learning rate: 0.01000
Accuracy for training set is 9.867 %
Accuracy for testing set is 8.500 %



b. For learning rate 0.001

Cost at iteration 0 is: 2.30253, learning rate: 0.00100
Cost at iteration 10 is: 2.29999, learning rate: 0.00100
Cost at iteration 20 is: 2.29999, learning rate: 0.00100
Cost at iteration 30 is: 2.29999, learning rate: 0.00100
Cost at iteration 40 is: 2.29999, learning rate: 0.00100
Cost at iteration 50 is: 2.29999, learning rate: 0.00100
Cost at iteration 60 is: 2.29999, learning rate: 0.00099
Cost at iteration 70 is: 2.29999, learning rate: 0.00099
Cost at iteration 80 is: 2.29999, learning rate: 0.00099
Cost at iteration 90 is: 2.29999, learning rate: 0.00099
Cost at iteration 100 is: 2.29999, learning rate: 0.00099
Cost at iteration 110 is: 2.29999, learning rate: 0.00099

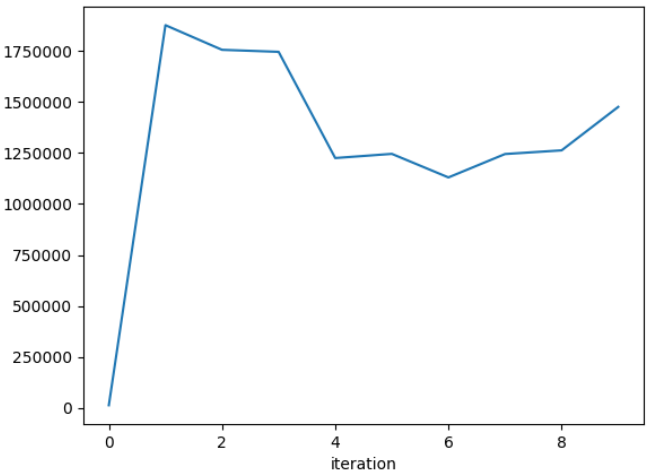
Cost at iteration 120 is: 2.29999, learning rate: 0.00099
Cost at iteration 130 is: 2.29999, learning rate: 0.00099
Cost at iteration 140 is: 2.29999, learning rate: 0.00099
Cost at iteration 150 is: 2.29999, learning rate: 0.00099
Cost at iteration 160 is: 2.29999, learning rate: 0.00098
Cost at iteration 170 is: 2.29999, learning rate: 0.00098
Cost at iteration 180 is: 2.29999, learning rate: 0.00098
Cost at iteration 190 is: 2.29999, learning rate: 0.00098
Accuracy for training set is 11.183 %
Accuracy for testing set is 12.600 %



2. <u>Using MAXPOOL Layer</u>

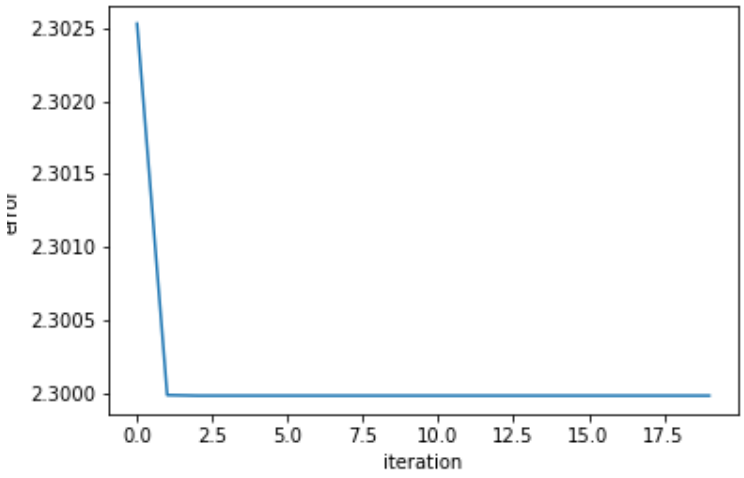
To avoid fluctuations are higher values, learning rate was set to 0.001, but not improvements were seen.

a. For learning rate 0.1:



b. For learning rate = 0.001

Cost at iteration 0 is: 2.30253, learning rate: 0.00100
Cost at iteration 10 is: 2.29999, learning rate: 0.00100
Cost at iteration 20 is: 2.29999, learning rate: 0.00100
Cost at iteration 30 is: 2.29999, learning rate: 0.00100
Cost at iteration 40 is: 2.29999, learning rate: 0.00100
Cost at iteration 50 is: 2.29999, learning rate: 0.00100
Cost at iteration 60 is: 2.29999, learning rate: 0.00099
Cost at iteration 70 is: 2.29999, learning rate: 0.00099
Cost at iteration 80 is: 2.29999, learning rate: 0.00099
Cost at iteration 90 is: 2.29999, learning rate: 0.00099
Cost at iteration 100 is: 2.29999, learning rate: 0.00099
Cost at iteration 110 is: 2.29999, learning rate: 0.00099
Cost at iteration 120 is: 2.29999, learning rate: 0.00099
Cost at iteration 130 is: 2.29999, learning rate: 0.00099
Cost at iteration 140 is: 2.29999, learning rate: 0.00099
Cost at iteration 150 is: 2.29999, learning rate: 0.00099
Cost at iteration 160 is: 2.29999, learning rate: 0.00098
Cost at iteration 170 is: 2.29999, learning rate: 0.00098
Cost at iteration 180 is: 2.29999, learning rate: 0.00098
Cost at iteration 190 is: 2.29999, learning rate: 0.00098
Accuracy for training set is 11.183 %
Accuracy for testing set is 12.600 %



c. **Using Dropout:**

Slight fluctuations were seen when the cost function seems to converge
Setting learning rate to 0.001
Cost at iteration 0 is: 2.30254, learning rate: 0.00100
Cost at iteration 10 is: 2.29998, learning rate: 0.00100
Cost at iteration 20 is: 2.29999, learning rate: 0.00100
Cost at iteration 30 is: 2.29999, learning rate: 0.00100
Cost at iteration 40 is: 2.29999, learning rate: 0.00100
Cost at iteration 50 is: 2.29999, learning rate: 0.00100
Cost at iteration 60 is: 2.29999, learning rate: 0.00099
Cost at iteration 70 is: 2.29999, learning rate: 0.00099
Cost at iteration 80 is: 2.29998, learning rate: 0.00099
Cost at iteration 90 is: 2.29998, learning rate: 0.00099
Cost at iteration 100 is: 2.29998, learning rate: 0.00099
Cost at iteration 110 is: 2.29999, learning rate: 0.00099
Cost at iteration 120 is: 2.29998, learning rate: 0.00099
Cost at iteration 130 is: 2.29999, learning rate: 0.00099
Cost at iteration 140 is: 2.29999, learning rate: 0.00099
Cost at iteration 150 is: 2.29998, learning rate: 0.00099
Cost at iteration 160 is: 2.29999, learning rate: 0.00098
Cost at iteration 170 is: 2.29999, learning rate: 0.00098
Cost at iteration 180 is: 2.29998, learning rate: 0.00098
Cost at iteration 190 is: 2.29999, learning rate: 0.00098
Accuracy for training set is 11.183 %
Accuracy for testing set is 12.600 %