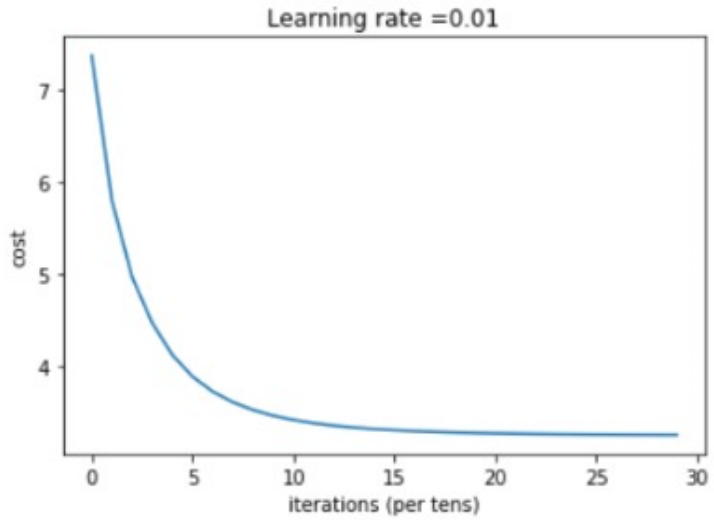
Results

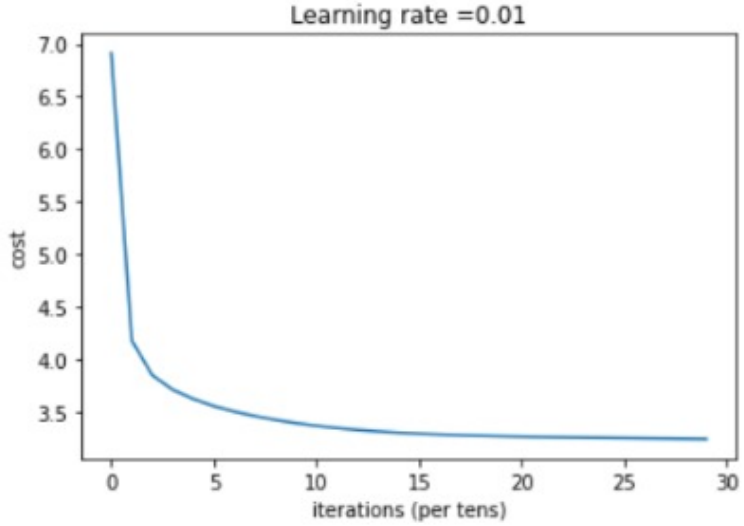
3 Layer Neural Network (1 Input Layer, 1 Hidden Layer, 1 Output Layer)

```
Cost after iteration 0: 7.378401089580732
Cost after iteration 100: 5.801331799733384
Cost after iteration 200: 4.970452700940409
Cost after iteration 300: 4.468991682825478
Cost after iteration 400: 4.120135994379721
Cost after iteration 500: 3.8852698036732267
Cost after iteration 600: 3.722351154117741
Cost after iteration 700: 3.606506312907003
Cost after iteration 800: 3.5224385196036767
Cost after iteration 900: 3.4604565762840998
Cost after iteration 1000: 3.4141577184766
Cost after iteration 1100: 3.3791593533263486
Cost after iteration 1200: 3.352428579953159
Cost after iteration 1300: 3.3317815813349965
Cost after iteration 1400: 3.3156706828312226
Cost after iteration 1500: 3.302975937062201
Cost after iteration 1600: 3.292884168546456
Cost after iteration 1700: 3.2848052667966066
Cost after iteration 1800: 3.2782953454908026
Cost after iteration 1900: 3.273019831981561
Cost after iteration 2000: 3.268721139894433
Cost after iteration 2100: 3.265200434594006
Cost after iteration 2200: 3.2623015651094516
Cost after iteration 2300: 3.259904706667072
Cost after iteration 2400: 3.2579104076678327
Cost after iteration 2500: 3.2562427386360278
Cost after iteration 2600: 3.254839431268856
Cost after iteration 2700: 3.2536471020488347
Cost after iteration 2800: 3.252629793395043
Cost after iteration 2900: 3.251748618502309
```



4 Layer Neural Network (1 Input Layer, 2 Hidden Layers, 1 Output Layer)

```
Cost after iteration 0: 6.912560928845301
Cost after iteration 100: 4.181004883802118
Cost after iteration 200: 3.851132309076568
Cost after iteration 300: 3.713174847883988
Cost after iteration 400: 3.6256205473090275
Cost after iteration 500: 3.557893499340517
Cost after iteration 600: 3.5058213952045807
Cost after iteration 700: 3.463203600146856
Cost after iteration 800: 3.4268289269380245
Cost after iteration 900: 3.3963089360862213
Cost after iteration 1000: 3.3707469722335763
Cost after iteration 1100: 3.349336306336967
Cost after iteration 1200: 3.331442741879249
Cost after iteration 1300: 3.316842701051246
Cost after iteration 1400: 3.3051072307247913
Cost after iteration 1500: 3.295385340161511
Cost after iteration 1600: 3.287475773316799
Cost after iteration 1700: 3.2809441793606093
Cost after iteration 1800: 3.275529449721162
Cost after iteration 1900: 3.2709734835749646
Cost after iteration 2000: 3.267163950162235
Cost after iteration 2100: 3.2639644593324073
Cost after iteration 2200: 3.2611338901845537
Cost after iteration 2300: 3.2585926861259105
Cost after iteration 2400: 3.256162505878938
Cost after iteration 2500: 3.2539488708989492
Cost after iteration 2600: 3.251618844859276
Cost after iteration 2700: 3.249428072021279
Cost after iteration 2800: 3.247050107391583
Cost after iteration 2900: 3.2446335915004645
```



4 Layer Neural Network

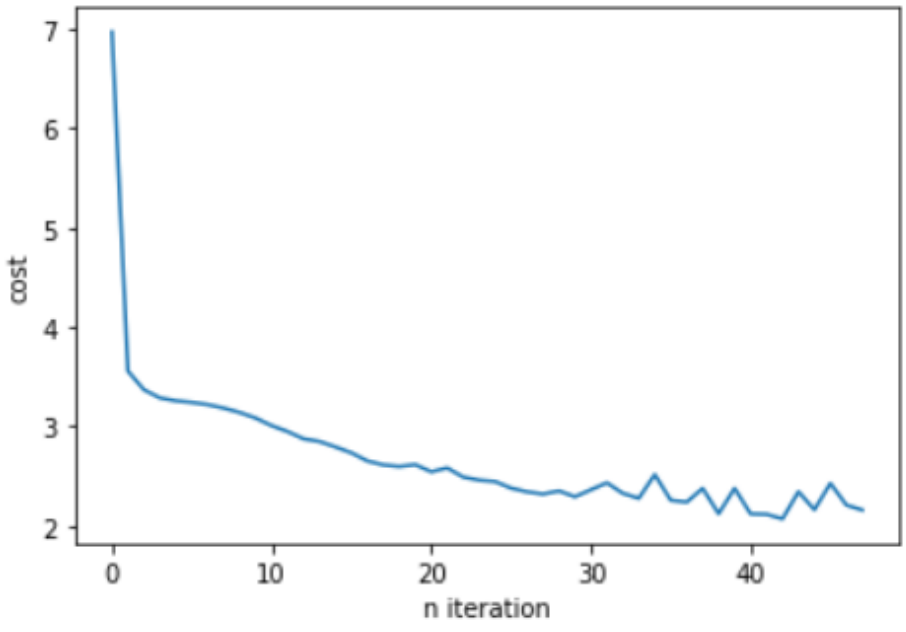
Training dataset: 42,000
Testing dataset: 28,000

# Model Configuration
# len(layer_dims), will be no. of layers with Input & Output layers
layer_dims = [784, 60, 10, 10]
learning_rate = 0.005

# No. of Gradient Descent Iterations
num_itr = 50000

```
cost 0: 6.97213465781873
cost 1000: 3.5585869922759947
cost 2000: 3.3713027430828384
cost 3000: 3.288780327289594
cost 4000: 3.2593186007993715
cost 5000: 3.243352976268761
cost 6000: 3.220964819530884
cost 7000: 3.186061581587427
cost 8000: 3.14199734022133
cost 9000: 3.0857385191758673
cost 10000: 3.0094213335880915
cost 11000: 2.950074465880814
cost 12000: 2.8768059039666065
cost 13000: 2.8499726971624124
cost 14000: 2.795004270034195
cost 15000: 2.735657850130973
cost 16000: 2.6538041179323972
cost 17000: 2.614183655346823
cost 18000: 2.598335535616949
cost 19000: 2.616787759699142
cost 20000: 2.545244145950653
cost 21000: 2.583680080759941
cost 22000: 2.4918383846303165
cost 23000: 2.46067629489561
cost 24000: 2.4468500078379756
cost 25000: 2.380352609900745
```

```
cost 25000: 2.380352609900745
cost 26000: 2.343387478843689
cost 27000: 2.320887132138146
cost 28000: 2.3522845240755665
cost 29000: 2.2936044020648683
cost 30000: 2.3644453939457644
cost 31000: 2.4342855473268106
cost 32000: 2.3281220446397652
cost 33000: 2.2777797588430073
cost 34000: 2.5175334291076292
cost 35000: 2.258240974325841
cost 36000: 2.240048923246002
cost 37000: 2.3774528074589543
cost 38000: 2.122882501600806
cost 39000: 2.3785284497929844
cost 40000: 2.121636858778842
cost 41000: 2.1170841389295583
cost 42000: 2.0716099126315215
cost 43000: 2.3444038022659996
cost 44000: 2.1633234064318994
cost 45000: 2.4285334107290146
cost 46000: 2.2101761562952533
cost 47000: 2.159887769143966
```



5 Layer Neural Network (1 Input Layer, 3 Hidden Layers, 1 Output Layer)

Training dataset: 60,000
Testing dataset: 10,000

# Model Configuration
# len(layer_dims), will be no. of layers with Input & Output layers
layer_dims = [784, 300, 60, 15, 10]
learning_rate = 0.005

# No. of Gradient Descent Iterations
num_itr = 5000

```
cost 0: 6.93148099055854
cost 1000: 3.785812102795132
cost 2000: 3.270557689005262
cost 3000: 3.249453994383529
cost 4000: 3.249246776754219
cost 5000: 3.2492442855213217
```