

CS 6375

ASSIGNMENT \_\_\_\_\_3\_\_\_\_\_

Names of students in your group: 2

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Number of free late days used: \_\_\_\_\_0\_\_\_\_\_

Note: You are allowed a **total** of 4 free late days for the **entire semester**. You can use at most 2 for each assignment. After that, there will be a penalty of 10% for each late day.

Please list clearly all the sources/references that you have used in this assignment.

The screenshots have been attached below:

### **Step 1: Preprocessing Step**



```
Command Prompt
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\deepa>cd Desktop

C:\Users\deepa\Desktop>cd Assignment 3

C:\Users\deepa\Desktop\Assignment 3>python Preprocessor.py "cars.csv" "C:\Users\deepa\Desktop\Assignment 3\preprocessedcars.csv"

C:\Users\deepa\Desktop\Assignment 3>python Preprocessor.py "iris.csv" "C:\Users\deepa\Desktop\Assignment 3\preprocessediris.csv"

C:\Users\deepa\Desktop\Assignment 3>python Preprocessor.py "adult.csv" "C:\Users\deepa\Desktop\Assignment 3\preprocessedadult.csv"

C:\Users\deepa\Desktop\Assignment 3>
```

## Step 2: Neural Network Algorithm

Preprocessedcars.csv:

```
Command Prompt
Microsoft Windows [Version 10.0.10586]
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C:\Users\deepa>cd Deskt
The system cannot find the path specified.

C:\Users\deepa>cd Desktop

C:\Users\deepa\Desktop>cd "Assignment 3"

C:\Users\deepa\Desktop\Assignment 3>python NeuralNetwork.py "preprocessedcars.csv" 80 200 2 4 2

Hidden Layer 1
Neuron1 weights -0.33611778293 -0.154768503423 -0.133327609172 0.0476046323233 -0.0411047332921 0.339839801955 2.20247741458
Neuron2 weights -0.584746591534 -0.335003447211 -0.475825128859 0.0577435577702 -0.0149225471736 0.895284545578 3.20240692897
Neuron3 weights 2.88644304121 -0.659153358569 -0.682504832938 -0.0137137235539 -0.057159320435 -0.355805131702 0.167916532862
Neuron4 weights -1.27625544418 0.836239562388 0.36724151731 -0.195100459149 -0.0663506181943 -0.668180575723 0.13419865451

Hidden Layer 2
Neuron1 weights 1.03093598635 -1.47966298952 -2.60109795319 3.69598515964 -0.826766724719
Neuron2 weights -0.624605911373 0.171902813262 -1.36250350287 -0.145955955351 -0.467107484347

Input Layer
Neuron1 weights -0.264133903383 -5.1323408774 -1.09448927715

Total Training Error: 0.00659049791262
Total Test Error: 0.00612268404228

C:\Users\deepa\Desktop\Assignment 3>
```

## Preprocessediris.csv

```
Command Prompt
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\deepa>cd Desktop

C:\Users\deepa\Desktop>cd "Assignment 3"

C:\Users\deepa\Desktop\Assignment 3>python NeuralNetwork.py "preprocessediris.csv" 80 200 2 4 2

Hidden Layer 1
Neuron1 weights -0.0808553836684 0.0819474243323 0.927173209565 -0.895671034043 -1.40383742491
Neuron2 weights -0.14396293521 0.0317355443024 0.134086474247 0.501214831254 1.13845366953
Neuron3 weights -0.66381026662 0.0460021789617 -0.624173592889 -0.164618395556 -0.564863505295
Neuron4 weights 0.836645281618 0.152280080077 -0.640328054464 0.723625281035 -0.0361468703992

Hidden Layer 2
Neuron1 weights 0.396380444989 1.97110668102 -2.1688295446 0.139505671996 0.305818328036
Neuron2 weights -0.0538244007582 -2.4614381773 0.570319674496 -0.435998720407 1.25840564119

Input Layer
Neuron1 weights -0.667099137625 -3.35209646437 2.88043077793

Total Training Error: 0.00225132262197
Total Test Error: 0.00200168608249

C:\Users\deepa\Desktop\Assignment 3>
```

## Preprocessedadult.csv

```
C:\Users\deepa\Desktop\Assignment 3>python NeuralNetwork.py "preprocessedadult.csv" 80 20 2 4 2

Hidden Layer 1
Neuron1 weights -2.28043346267 -1.57822979329 -0.0881340574655 -0.154032807456 -0.00507293433619 -1.10177904871 1.61786278561 -0.0891550923447 0.511759539684 0.150441834096 -0.113232507251 -2.58765619022 -0.0969076987144 -0.832463842752 0.0193397608182
Neuron2 weights -1.15323861724 0.173206763249 -0.137612568924 -0.0997514922928 -0.0485411829163 -0.709771443378 0.525733961856 0.259851255169 0.358357625615 0.266210531612 0.160071463709 -2.01076357847 -0.459075148425 0.295679954201 0.0398793412822
Neuron3 weights 0.106429667948 -1.1300052432 0.0644061330263 -0.0184610664912 0.00794952660891 -0.553448305877 -4.75819384546 -0.0627341303575 0.235851060801 -0.0283730608981 0.227036601183 -1.68129621545 -0.0488856220696 -0.131937656569 0.0214277764905
Neuron4 weights 0.487017040484 -1.18460665653 0.0346684545393 -0.0210483623405 0.0255724568159 0.516419985558 -0.386674416277 0.0816776799294 2.78169959894 0.0205336595894 -0.352106503301 1.89436962021 0.00612756930073 0.768459047601 0.0787710918225

Hidden Layer 2
Neuron1 weights -0.948144238689 1.60857270261 1.61495444381 3.55795682339 -1.54303502626
Neuron2 weights -0.27529323465 1.4360410614 -0.0270463211863 0.621032546766 -0.654329476551

Input Layer
Neuron1 weights 0.636478180524 -5.18135699816 -1.13826839089

Total Training Error: 0.0138081953482
Total Test Error: 0.0136806862149

C:\Users\deepa\Desktop\Assignment 3>
```

## References:

1. <https://visualstudiomagazine.com/articles/2014/01/01/how-to-standardize-data-for-neuralnetworks.aspx>
2. <https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/>
3. Data pre-processing  
<https://www.mimuw.edu.pl/~son/datamining/DM/4-preprocess.pdf>
4. <http://neuralnetworksanddeeplearning.com/chap2.html>