**BİM470-PROJECT (Due Date: 11th of January, 2020)**

* You will be given gray scale data of 60 images (for training) in file “images.mat”. Each image contains one of the following shapes:
* horizantal rectangle (class-1)
* vertical rectangle (class-2)
* circle (class-3)
* The desired classes (1,2 or 3) of each image is given in “DesiredVaulesVector.mat”.
* After you download the “images.mat” and the “DesiredVaulesVector.mat”, put these files into the working directory of MATLAB. Then you can load them by using “load” function of MATLAB. (Write load images.mat and load DesiredValuesVector.mat and press enter)
* Then the inpM (image matrices) and desV (desired values) can be seen in working directory of MATLAB.
* inpM is a 51x51x60 matrix where first two values (51x51) are the height and width of the images and last one (60) is the index of the images of the training set. If you need you can resize the images by deleting the columns or rows. This means that you can delete outer most columns or rows to get for example 50x50 pixels images.
* desV is a 60x1 vector where the desired values of the images are given in the same order with the inpM matrix. So, first element of desV is the desired value of the first image inpM(:,:,1).
* Each image has 51x51 pixels which have values between 0 and 1. The elements of desV is 1,2 or 3 defining the class number.
* The aim of the Project is to construct a Convolutional Neural Network (CNN) and write the code in order to classify the 3 group of images.
* The code must be written by using MATLAB
* Each project must be done at most 3 persons. If you like you can do it by yourself only. See the table at the end of this document.
* Due Date: 11th of January, 2020, (23:00).
* You can either write a report about the project or put comments (by % in m-file) into the file to explain the blocks or functions of your code. Send your project (m-file) and report (if exists) by the Neural Network class website.
* The CNN code should contain at least one convolution layer, one maxpooling layer, a flattening layer and one fully connected layer. The transfer function of the output layer is better to be a softmax function.
* The test data of images will be uploaded later. Therefore, check the website regularly and read this document. I will add the changes in red sentences, if any.
* *I would like to see each group spend time and write at least the functions of the CNN algorithm. So, try to write some code even you cannot totally finish the project.*
* *Please DO NOT cheat…*
* I have changed the size of the inpM matrix. The shapes in the images or the data of each image are not changed.

The size of inpM matrix was 51x51x1x60. But now the size is 51x51x60. So change your code for the new size.

* The test data has been added. When you write load test\_images.mat and press enter, you can obtain the test images data in the test matrix which has 8 shapes and the size is being equal to 51x51x8

**Important Note 1**: The ideal number of group members is 2. But if somebody likes to do it by him/herself I will grade the project over 110 points. If the number of group member is 3 then the project will be graded over 90 points. So the number of group members can be 1,2 or 3. Yo can see the examples of grading system in the table below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of Group Members | Project Grade | Scaled Project Grade | Student 1 Grade | Student 2 Grade | Student 3 Grade |
| 1 | 100 | 110 | 100 |  |  |
| 1 | 80 | 88 | 88 |  |  |
| 1 | 50 | 55 | 55 |  |  |
| **2** | **100** | **100** | **100** | **100** |  |
| **2** | **80** | **80** | **80** | **80** |  |
| **2** | **50** | **50** | **50** | **50** |  |
| 3 | 100 | 90 | 90 | 90 | 90 |
| 3 | 80 | 72 | 72 | 72 | 72 |
| 3 | 50 | 45 | 45 | 45 | 45 |

**Important Note 2**: If you use MATLAB functions for convolution, maxpooling, flattening and fully connected parts of CNN your grade will be scaled by multiplying the grade with 0.8. See the table below for examples:

|  |  |  |
| --- | --- | --- |
| Student 1,2,3 Grade | FINAL Projecct Grade  with MATLAB functions | FINAL Projecct Grade  without MATLAB functions |
| 100 | 80 | 100 |
| 90 | 72 | 90 |
| 70 | 56 | 70 |
| 60 | 48 | 60 |
| 50 | 40 | 50 |
| 30 | 24 | 30 |