

# Deep Learning

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## ASSIGNMENT 2

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### Problem Statement

The Faces have been automatically registered so that the face is centered and occupies about the same amount of space in each image. The task is to categorize each face based on the emotion shown in the facial expression into one of seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral)



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### Dataset Description

#### Dataset: Fer.csv

**Total Images:** The Dataset consists of 28,709 examples

Fer.csv contains two columns, **emotion** and **pixels**. The **emotion** column contains a numeric code ranging from 0 to 6, inclusive, for the emotion present in the image. The **pixels** column contains a string surrounded in quotes for each image

Classes: 0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral

## Tasks to be performed

Hint: Refer to In-Class Module 3 Demo: **Classifying Dog and Cat using CNN on Tensorflow 2.x** file

**.docx file 1:** Create a Word File and answer the following tasks

**Marks: 10**

- Do you get the same results if you run the Notebook multiple times without changing any parameters?
- What is the effect of adding more neurons to each Conv2D layer?
- What happens if we manipulate the value of Dropout?
- What is the effect of adding more activation layers to the network?
- What is the accuracy score if we use more Dense layers in the model?
- Does manipulating the learning rate affect the model? Justify your answer.

**.ipynb file 2:** Create a Notebook File and perform the following tasks

**Marks: 15**

- Try improving the model and re-code the program from scratch without looking too much at this source code
- Add more Dense and Conv2D layers in the network
- Try to use different activation functions
- Increase the number of epochs to achieve high accuracy
- Try to play with the learning rate to understand the concept
- Write up a summary explaining how your program works

.ipynb file 3

Marks: 25

As a part of this assignment, you will be performing the following tasks:

- Prepare a detailed python notebook (similar to this one) using Convolutional Neural Network for classifying the images from Fer.csv with the best accuracy
- Prepare the dataset for the model
- Reshape and Normalize the data:

Hint:

Split pixels by space to get columns

Reshape the Input Image (48, 48, 1)

Change the type of data to float32

- Normalize and Split the dataset using train\_test\_split from sklearn

Hint:

Normalize the data by dividing with 255

Split data into train and test (90, 10)

## Define CNN Model

### Layer 1

- 2 Conv2D with 64 filters of 5,5 filter
- BatchNormalization layer
- Max Pooling layer with 2,2
- Activation - Relu

### Layer 2

- 2 Conv2D with 128 filters of 5,5 filter
- BatchNormalization layer
- Max Pooling layer with pooling window - (2,2)
- Activation - Relu

### Layer 3

- 2 Conv2d with 256 filters of 3,3 filter
- BatchNormalization layer
- Max Pooling layer with pooling window - (2,2)
- Activation - Relu

### Layer 4

- Flatten Layer
- Dense Layer with 128 Neurons
- BatchNormalization
- Activation Relu

- Dropout 0.25
- Dense Layer with seven neurons with Softmax activation function
- Loss: Categorical Crossentropy
- Optimizer: Adam

**Answer:** What parameters should be chosen to classify the images into various categories accurately?

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