Shahjalal University of Science and Technology

Department of Computer Science and Engineering

CSE 476

A Project Presentation on

"Facial Emotion Detection using Convolutional Neural Network"

Under the guidance of:

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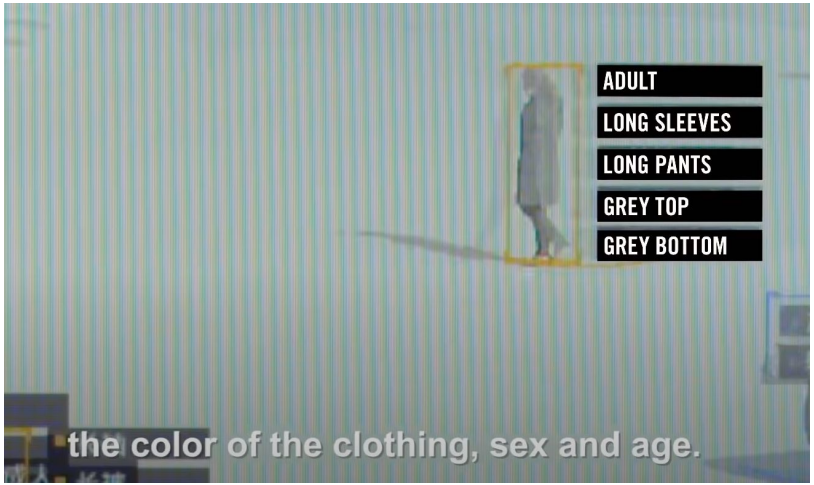
Objective

The objective of our machine learning project is to examine the facial emotions and gender in realtime using CNN. This is a special type of deep learning technique that will gives us the solution to many problems in facial emotion and gender recognition after significant amount of training. The main advantage of CNN is to completely remove or significantly reduce the dependency on physics-based models.



Objective

Emotion and gender, two of the key facial attributes, play a very foundational role in social interactions, making emotion and gender estimation from a single face image an important task in intelligent applications. Particularly, the study has the following sub objectives:

- Access control;
- Human-computer interaction;
- Law enforcement
- Marketing intelligence;
- Visual surveillance;
- Advertisements;

Problem Statement

Automatic emotion and gender classification has become relevant to an increasing amount of appli-cations, particularly since the rise of social platforms and social media. Nevertheless, performanceof existing methods on real-world images is still significantly lacking.

More specifically, the following question need to be addressed:

- How can we identify emotion and gender concurrently?
- How can we identify the factors that play a role to detect emotion and gender of a image?

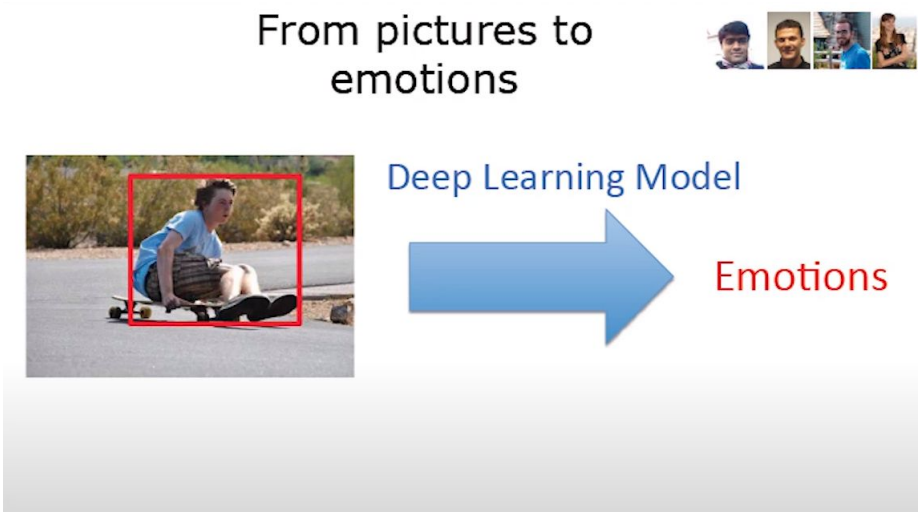
Problem Statement

Emotion detection has a wider scope now and, in the future, too. We have identified several areas
where this model as shown in Figure 1 can be implemented which is as follows:

- **Medication** - Helpful in executing initial analysis if a person is unable/not willing to speak, Checking the level of comfort with patients while giving treatment, Carrying out psychological analysis;
- **Entertainment-** Functionality of this model can be put upon to Sonyâs AIBO robot dog as well as to Anki Vector Robot, Camera applications: If the face detected in camera doesnât seem to smile, the device sprinkles water and makes that person smile;
- **Business Development**- When filling up the online surveys, the webcam detects if the person was actually happy or sad, The prototype can be used in the market research as well.

Methodology

Most of the human communication is done trough speech, hand gestures and facial expressions. Interpreting correctly any of these elements using machine learning (ML) techniques has proven to be complicated due the high variability of the samples within each task. In this project we propose an implement a general CNN building framework for designing real-time CNN. The implementations may be validated in a real-time facial expression system that provides face-detection, gender classification and that will achieves human-level performance when classifying emotions.



Methodology

CNN consists of the following layers:

- Input Layer: It contains raw pixel values of the image. Preprocessing is done before feeding pixels onto this layer;
- Convolution layer: This layer computes the dot product between the weights and a small region to which the neurons are connected on the input layer. It is followed by a pooling layer that samples down the dimensions along the width and the height to reduce the computational time due to a large number of convolution layers;
- Dense layer: It transforms the features through layers connected with trainable weights. This layer identifies the sophisticated features of the image that brings out the entire image;
- Output layer: This layer is connected to the previous fully connected layer and outputs the required classes or their probabilities;

Model Architecture

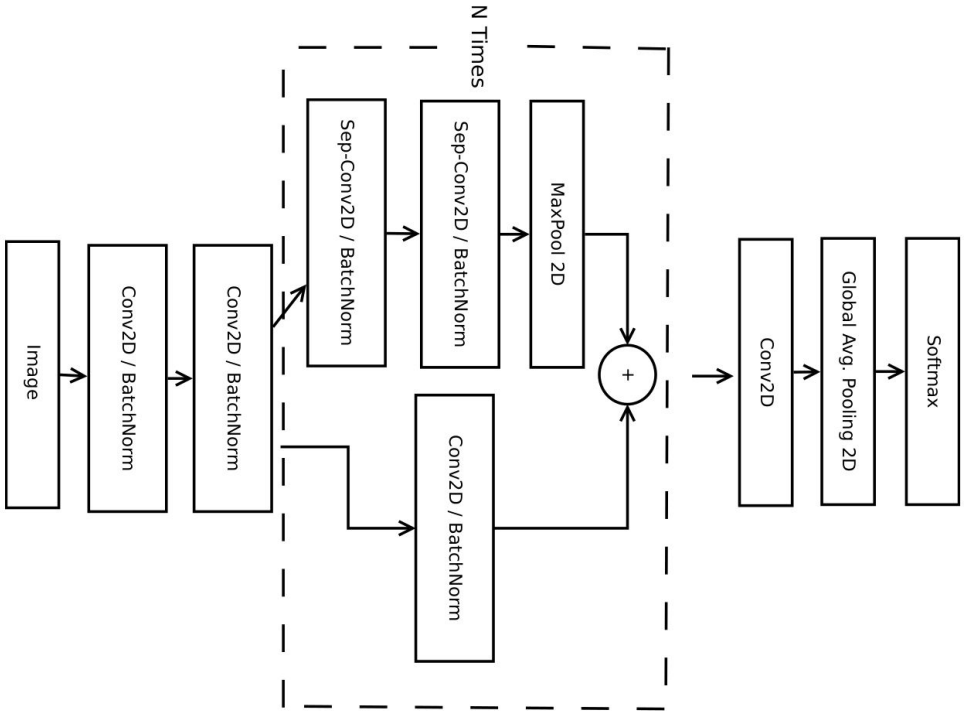


Figure 1: Architecture of Emotion Detection using CNN

Work Flow

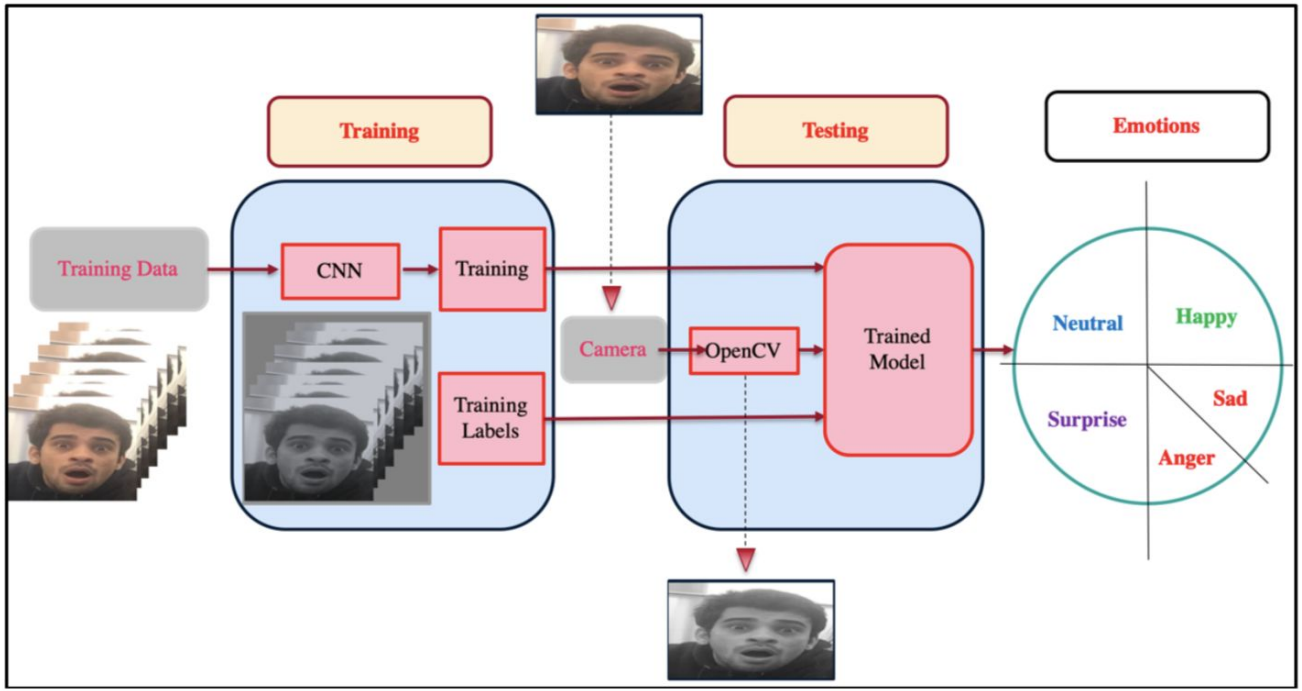
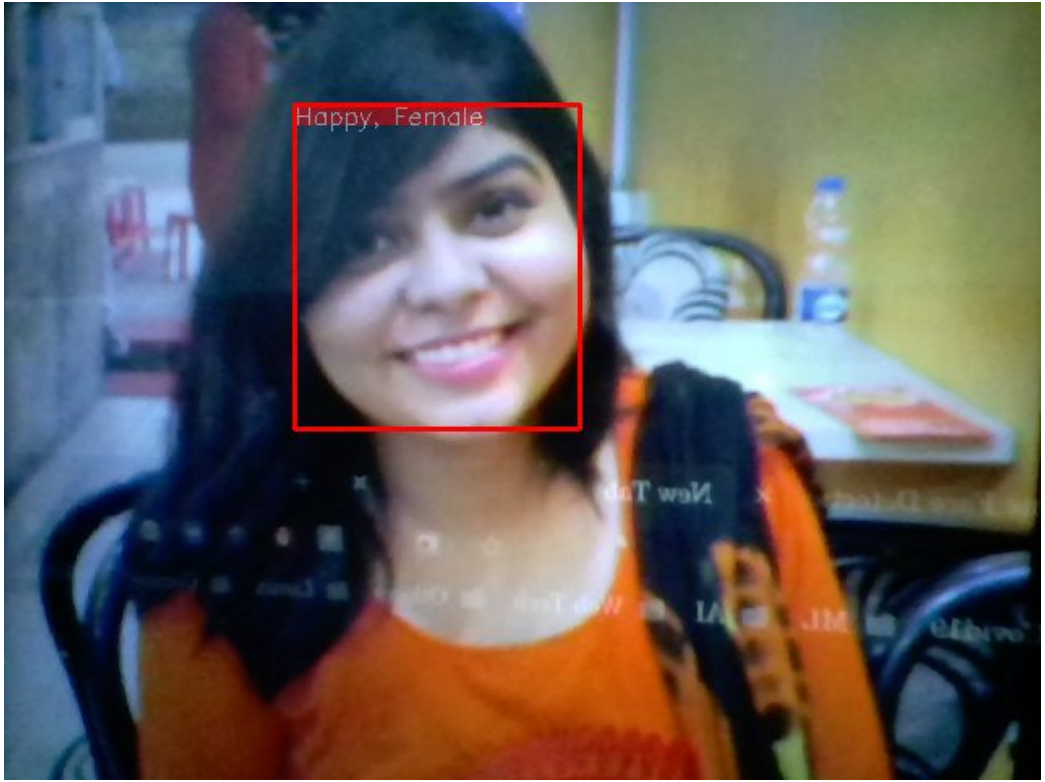


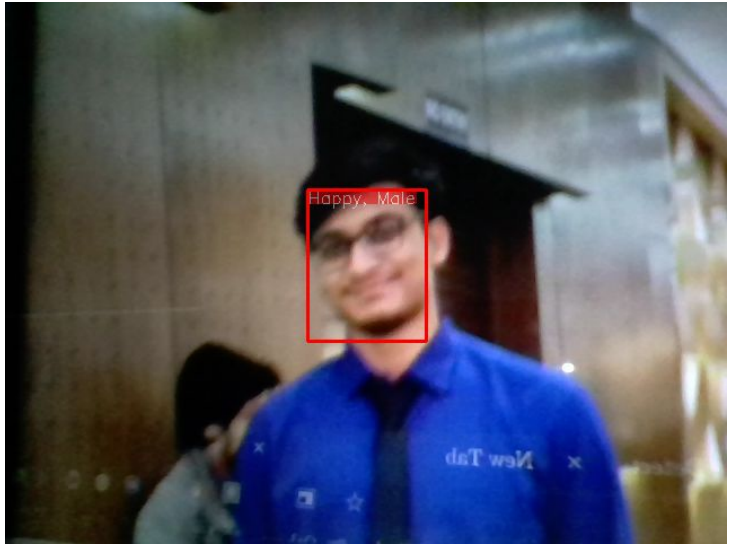
Figure 2: High level flowchart for Emotion Detection using CNN

Results

It achieved an accuracy of 66% in the FER-2013 Emotion dataset and 96% in the IMDB Gender dataset.

Examples






Thank You