Emotion detection

How to detect emotion using machine learning and use it as an input for video games.

Introduction

Emotional detection in computing is an essential field of research due to its many use cases such as "a device that assisted children with Asperger syndrome read and respond to facial expressions" stated by Schwartz (2019). As such this study will investigate the techniques involved within emotion detection from facial gestures. Similar techniques can be applied to speech and other emotional indicators.

Input (Greyscale image of a face)

Kumar (2019) indicated that one of the fastest methods compared to other face detection methods is Haar feature-based cascade classifiers. Viola and Jones (2019) explain that a Haar cascade takes a bunch of positive images and negative images and finds out what features make up a face by using rectangles and summing up the pixel intensities within it to find the difference between these sums.

Classification

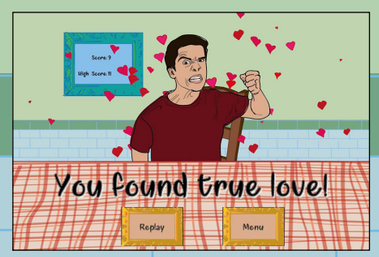
The Algorithmia Blog (2019) shows that the use of Neural networks is accepted to be the best way to detect emotion from imagery with computers specifically Convolutional Neural Networks (CNNs) as they are made to make use of images as inputs. Saha (2019) says that CNN is a type of deep learning algorithm that gets an image as input and then assigns weights to objects/features it can detect within the image . A CNN detects features by applying filters which is a matrix that is smaller than the input matrix that goes along a segment of the input matrix from left to right then moves down and goes from left to right again until the whole segment has been filtered to produce convolved features as Brownlee (2019) shows. The mini Xception CNN model is what was used to detect emotion in this project as it provides state-of-art performance as shown by Kumar (2019). The data used to train the model was the FER dataset as it contains 35,888 faces labelled with one of seven different emotions.

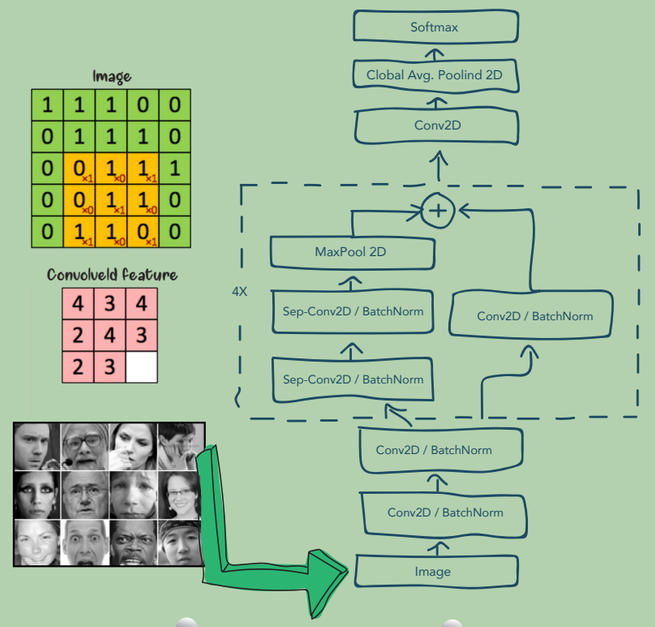
Output

The output we receive from the model is the probability of the face being each emotion demonstrated in the image to the right.

How to use an emotion

Considering of the output is just a probability of each emotion and how everyone's face produces different emotional probabilities. The input should only be querying one emotion at a time and should be preconfigured before use. This is done within the game produced as an outcome of this research "Emotional speed dating" where the user is first asked to make faces that portrays each emotion to which the results are saved to be compared with later during gameplay. For example when the game expects the user to portray happiness the output must have a happiness probability the same or higher to the saved probability to be considered accepted.





Conclusion

Emotion detection in computing is a growing area of technology, and there is continuing research into this area. The main issue is that there is no established best algorithm, and this is backed up by Kerkeni et al. (2018). However, with more research into the topic the output will become more reliable and useable therefore giving emotion detection countless use cases.

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