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Live Facial Emotion Detection

Soham Deshpande, Abhinandan Nahar, Achal Shah, Prachi Thete
Dept of Information Technology, MVPs KBT College of Engineering, Maharashtra, India

Abstract

Facial expression recognition is an important part of affective computing and artificial intelligence, and many academics have worked on it. However, because human face expressions change so subtly, most traditional techniques rely heavily on feature extraction for recognition accuracy. Meanwhile, deep learning has lately been a hot study issue in the field of machine learning, to simulate the organizational structure of the nerves in the human brain and combine low-level information to form a more abstract level. In this project, we use a deep convolutional neural network (CNN) to create a facial expression identification system that can uncover deeper feature representations of facial expressions and recognize them automatically. The suggested system is made up of three modules: input, recognition, and output Module. We introduce the expanded Facial Expression Detection Dataset, which can be used to simulate and assess recognition performance under various conditions (network structure, learning rate, and pre-processing).

Introduction

Facial emotion detection is the process of recognising human emotions through facial expressions. Emotions are automatically perceived by the human brain, and software that can recognise emotions has recently been developed. This technology is constantly improving, and it will eventually be able to detect emotions as precisely as our brains. One method for reading the human brain is to detect live emotions. While watching a movie, the actor or actress may forecast whether or not they are joyful, which is tied to emotions once again. During live meetings, we must also perceive emotions. As a result, our initiative, Live Emotion Detection, aids in the resolution of these and other challenges. Aiming to create a website that can recognize all seven basic emotions in real-time: happy, sad, fear, neutral, disgust, anger, and surprise. This will also aid in the analysis of facial expressions during a monologue or any other theatrical performance. Emotions are one of the ways that we can connect. This project involves creating a Machine model that will be deployed on Streamlit. Convolutional Neural Networks, Keras, Tensorflow, Numpy, Pandas, and other Python libraries are used in the model, which will be discussed further. The Facial Expression Detection Dataset was used to train the model. Streamlit was used to deploy this.

As you move through the process, you will learn about related tasks, design, implementation, results, and conclusions.

Background and Literature review

Humans are accustomed to interpreting nonverbal signs such as facial expressions. Computers are becoming more adept at reading emotions. There are seven types of emotions: happy, sad, fear, disgust, anger, neutral, and surprise. Many attempts have been made to create autonomous facial expression analysis tools because they have applications in a variety of sectors including robotics, medicine, driving assist systems, and lie detectors. Since the twentieth century, Ekman and his colleagues have. Regardless of the culture in which a human grows up, seven basic emotions have been defined (anger, sad, fear, happy, contempt, disgust, and surprise). Sajid et al. published a study on the facial recognition technology (FERET) dataset recently. The impact of facial asymmetry as a marker of age estimation was discovered. According to their findings, right face asymmetry is superior to left face asymmetry. Facial detection still has a problem with face posture appearance. Ratyal et al. proposed a solution to the problem of facial posture variability. They employed a subject-specific descriptor-based three-dimensional pose invariant technique. Convolutional networks are used to handle a variety of problems, including excessive makeup, stance, and emotion. Recently, academics have made remarkable progress in facial expression identification, leading to advancements in neurology and cognitive science, which are driving study in the field of facial expression. In addition, advances in computer vision and machine learning have made emotion recognition far more accurate and accessible to the general public. As a result, facial expression detection as a sub-field of image processing is quickly expanding. Human-computer interaction, psychiatric observations, intoxicated driver recognition, and, most importantly, lie detection are all conceivable uses.

Recognition of Facial Expressions Nitisha Raut uses Machine Learning to work on Emotion Recognition, which is used to determine whether the customer liked or disliked the product or offer by recognizing images. SVM was employed for feature extraction in this study. A facial landmark detector in the Dllib library determines the location of certain landmarks on the face. However, they did not focus on Face detection, which was a flaw. In our work, we use live recognition to provide real-time rather than static output, allowing any user to work on it right away. It features a user-friendly atmosphere, so anyone may use it.

Requirements and Analysis

Humans are social beings, which is what distinguishes us and allows us to conquer the globe. Effective communication is required for effective collaboration, whether it be in professional or personal interactions.Recognizing and explaining one's own or others' emotions is a near-impossible undertaking for around 10% of the general population or 32,000,000 people in the United States alone. Prof. Albert Mehrabian of UCLA conducted the most widely publicized and casually mentioned study on the relative importance of verbal and nonverbal cues in human interaction. He devised the 7–35–55 rule in the 1970s. That is, what we say (words) accounts for 7% of communication, while how we say it (tone of voice) accounts for 38%, and how we act accounts for 55%. (Body language).

So that's where the idea of recognizing emotion in real-time came from. We believe that if we can account for a person's body language and tone of voice, we will have covered 93% of their communication and will be able to deduce what emotion is being portrayed using computer vision.

Live Emotion Recognition can be used in a variety of applications. What if advertisers understood how you reacted to commercials, they showed you and could then show you ads that were more likely to elicit a pleasant emotion and lead to a purchase? Robots and Future Brain-Computer Interfaces are one thing, but when robots and other "smart" applications become more prevalent in our lives, the ability to perceive human emotions will be a tremendous advantage, allowing them to better comprehend our needs and behavior. Because this field is still in its early stages, the possibilities for using face emotion recognition are endless.

We used Dell Inspiron 15300 i3 Generation Laptop software.

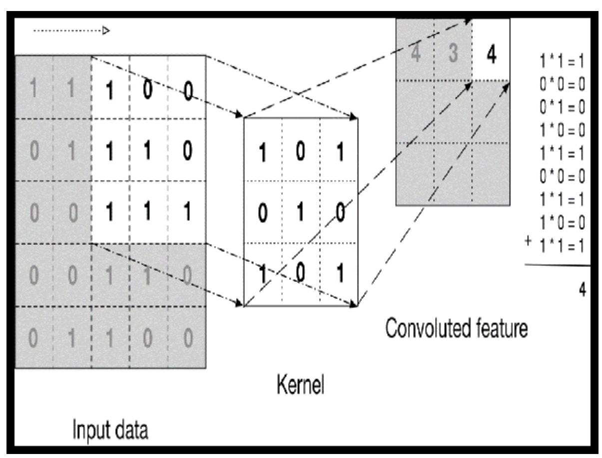
Implementation

For extracting physiological information and making predictions, the system uses CNN (convolutional neural network). The results can be obtained by scanning a person's image using a camera and comparing it to a training dataset to estimate their emotional state. [4].

This method can recognize a user's Live Emotions by comparing the input to a training dataset of known emotions to discover a match[3]. Different emotion kinds can be identified by combining information from facial expressions. Algorithms entail the application of several supervised machine learning algorithms to a huge set of annotated data for the system to learn and predict the proper emotion.

Working of CNN:

CNN is a type of artificial neural network, which is widely used for image/object recognition and classification.



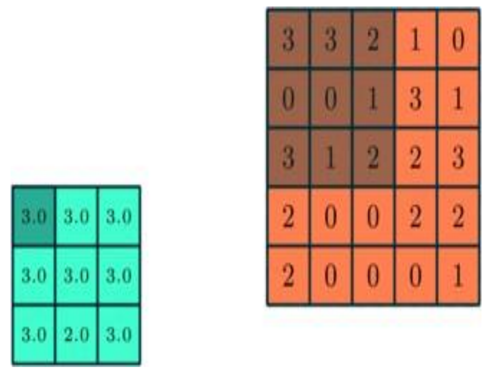
Using a CNN, Deep Learning recognises objects in an image. Essentially, CNN reduces the images into a format that is easier to interpret while preserving important properties for a solid prediction. CNN is the most likely method for pre-processing and image recognition.

We start with convolution. In a deep CNN, convolutional layers are where filters are applied to the original image or other feature maps. In the network, here is where the majority of the user-specified parameters are located. A neural network is a mathematical function that is envisaged as a representation of biological neurons. The basic building elements of a neural network are artificial neurons. The artificial neuron takes one or more inputs and adds them together to generate an output. Each layer creates many activation functions that are passed on to the next layer when you input an image into a ConvNet.

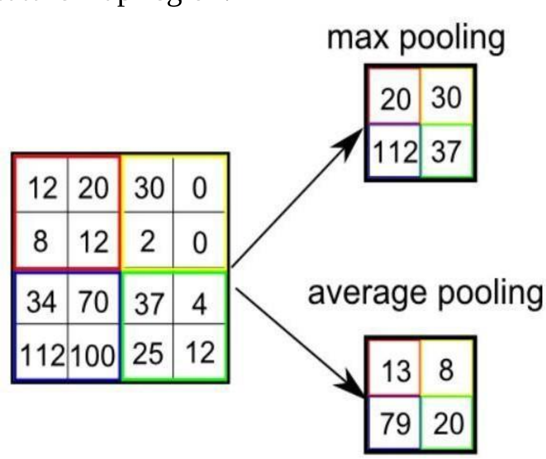
The first layer usually extracts basic properties like horizontal or diagonal edges. This data is sent on to the next layer, which is responsible for recognizing more complex features such as corners and combinational edges. As we delve deeper into the network, it becomes capable of recognizing more complex elements such as objects, faces, and so on.

Pooling layer

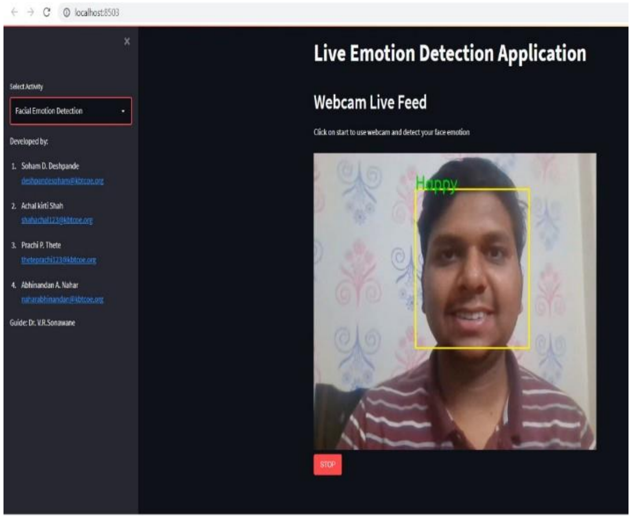
The dimensions of feature maps are reduced by using pooling layers. As a result, the amount of processing in the network and the number of parameters to learn are both lowered. The pooling layer sums together the features present in a region of the featuremap generated by a convolution layer As a result, rather of the convolution layer's precisely positioned features, the following actions are performed on the summarised data.This makes the model more robust to changes in the input image's feature position.Max pooling chooses the most significant element from the region of the feature map covered by the filter.

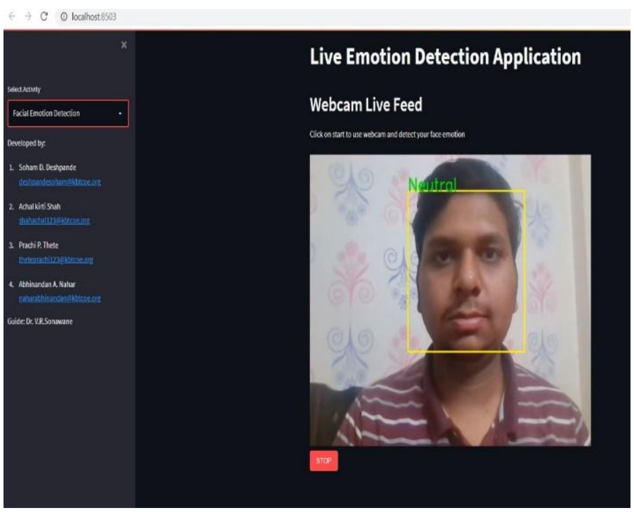


As a result, the output of the max-pooling layer would be a feature map with the most prominent features from the previous feature map. Average pooling is used to calculate the average of the objects in the filter's feature map region.



Results and Evaluation





Conclusion

The goal of this study was to use multiple models on the FER dataset to classify facial expressions into one of seven emotions. This will allow software and AI systems to provide a better experience for humans in a range of situations. Emotion detection or mood detection can be used in a variety of AI applications, from detecting potential suicides and stopping them to playing mood-based music. Using our program and live streaming, we can detect people's emotions. Also, guess the outcome. There is no need for human involvement with High-Speed Detection. Because of the large amount of sample data available, determining happiness was quite simple. Surprisingly, the experience of surprise came close to matching the accuracy. The accuracy of the other emotions was lower, but similar. Furthermore, when given an image to predict emotions, the model did not make a single final prediction. Rather, it projected a list of emotional probabilities. The final prediction was then made based on the emotion with the highest probability. As a result, the model's most likely emotion predicted was used to classify the status of the facial expression. It does, however, have several flaws. Because there is less evidence for emotions like "contempt," the model has a hard time predicting it.

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