

**FACIAL EMOTION DETECTION IN REAL TIME
USING MACHINE LEARNING
BY**

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This Report Submitted For Completing the Necessities for the Degree of Bachelor
of Science in Computer Science and Engineering

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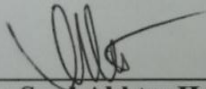


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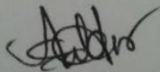
This Project/internship titled "**FACIAL EMOTION DETECTION IN REAL TIME USING MACHINE LEARNING**", submitted by Nafia Akter, ID No: 162-15-8021 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 12 September 2019.

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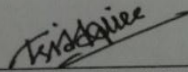
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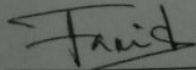
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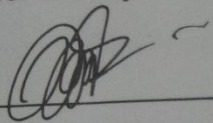
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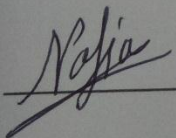
I therefore proclaim that, this proposition has been finished by me under the supervision of Sheik Abujar, Lecturer, and Department of CSE Daffodil International University. I additionally declare that neither this proposal nor any piece of this proposition has been submitted anyplace for honour of any degree or certificate.

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ABSTRACT

Emotion is a key component in a person's life. Anyway at some point it is hard to comprehend feelings that an individual need to express. What's more, comprehend feelings conveyed in such continuously because of mind boggling and unstructured nature of client produce substance is extremely troublesome. There are heaps of observation cameras gather immense measure of information, created and handled for security issue's additionally in media world for player articulation. So in this paper I am going to introduce you a proposal to fetch emotion from real time. The process that tall the exact emotion of a person in the live camera. Also Machine Learning techniques, Deep Learning model and CNN algorithm are used for emotion recognition.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Developing machines with emotional intelligence has been a chronic goal in AI world. Likewise feeling assumes a significant job in human correspondences. Furthermore, effectively identifying the passionate states has common sense significance in restorative recorded, humanoid robots, instruction, security issues, assessment and numerous other human PC cooperation frameworks. Sound and video or all the more explicitly can say discourse and outward appearances are two sorts of most dominant sign for people to express their enthusiastic states and thought processes. As indicated by the phonetics and physiology feeling changes and moves muscles of face [5].

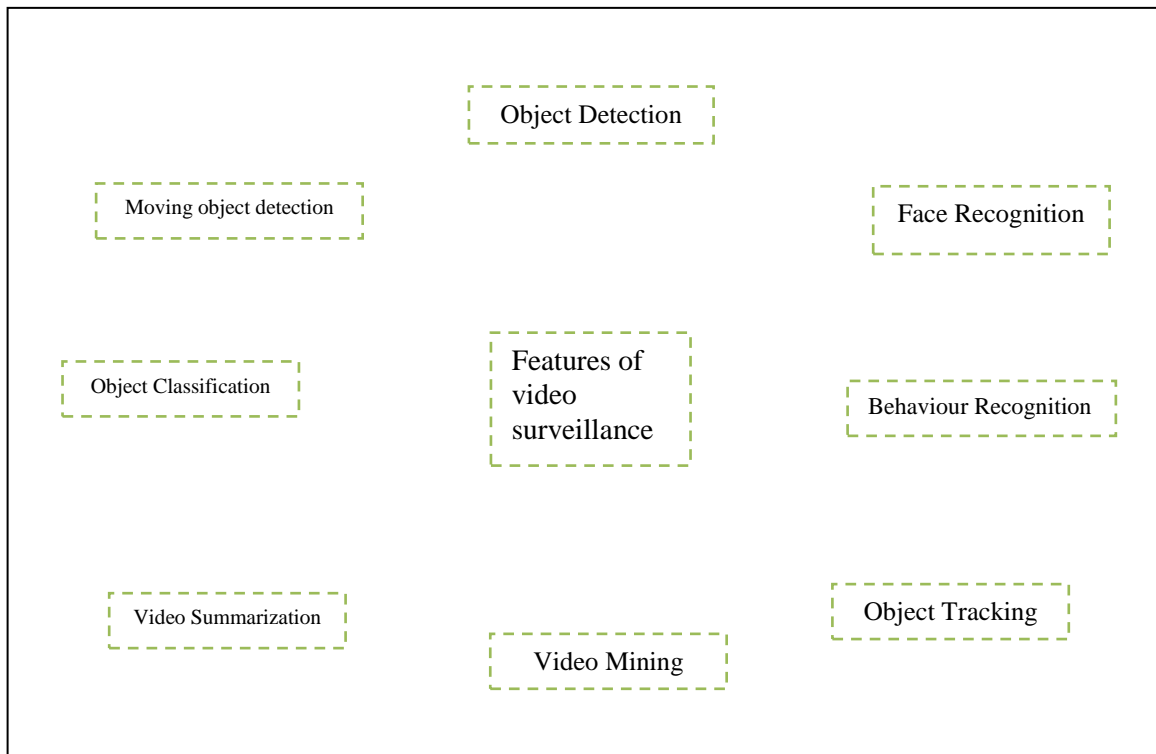


Figure1.1.1: Video surveillance features

Video reconnaissance framework is contributing its part for security issues. With the fast development of video reconnaissance framework. These checking frameworks relies upon the human administrators. The human administrators ought to constantly screen and required strides to be taken upon the skeptical circumstance. The doubtful misleading items and occasions will prompt exceptionally hazardous to life frightful of observation task in numerous reasonable territories like nation fringes, homes, airplane terminal, shopping centres, medical clinics, schools and so forth. The exploration are moving toward the video reconnaissance assignment to ensuing level by video being caught by different observation cameras [3].

For facial emotion recognition the traditional approaches usually consider a face image is distinguished from an info picture, and facial segments or milestones are recognized from the face districts. After that different spatial and worldly highlights are separated from these facial segments. At last dependent on the separated highlights a classifier, for example, support vector machine (SVM), random forest, is trained to produce recognitions results [5].

This paper is for the most part worried about perceiving feeling from outward appearance. Acquiring subjectivity from associated with enthusiastic encounters and individual contrasts. There are comparable modular sensible that can be accumulated from a sensible and impartial group of spectators. A measure of ongoing specialist concentrated on recognizing passionate effect of pictures and recordings as survey in the following segment.

I applied deep learning model. Deep learning is a well-set model in the pattern recognition domain. I use CNN algorithm. CNN(convolutional neural network) is a specific sort of artificial neural network that uses machine learning unit. CNN apply to objects detections, face recognition, image processing etc. Deep convolutional neural network (DCNN) composition of many neural network layers. Which is also can be able to extract the significant features from the data [18].

1.2 Report Layout

The report will be followed as follows:

Chapter 1 gives the short review of this research. Indicative discussion is the key term of this first chapter. And also the reason that motivated me to do such a research will be explained in this chapter too. The most important part of this chapter is the logic of the study.

Chapter 2 covers the discussion on what already have done in previous related paper. The details about the research papers lacking, what applications they used, what method they use, there data set, and also there advantages and disadvantages. And the summary o the research. It is also related with the problems, the scope arisen from their limitations. And in the very last part the challenges of this research are explained.

Chapter 3 is about the theoretical discussion on this research work. In this part it shows the method I have proposed for this research. There working procedure and the work flow.

Chapter 4 shows the outcome of the whole research and this thesis. And some experimental result. The visualization of output are shown too.

Chapter 5 is based on the summary of the whole thesis. And the conclusion of the thesis topic. This part is accountable to show the whole thesis report attached to recommendation. The chapter is closed with showing the limitations of my works that can be future opportunity to others who want to work in this topic.

1.3 Motivation

In this uplift world machines are more behaving like human. If machine could understand humans emotion's and understand how they are feeling and on behalf of that they take actions. And most of the time they are wrong. If machine can detect emotion from human face and give the accurate output in real time without waiting for next moment or wasting any time then it will be easy . Than a machine can behave and act like human more accurate.

1.4 Rationale of the Study The issue of detecting emotion in real time through machine learning. And training machine to act like human and behave and detect emotion and give feedback

instantly as like human then it will be a big revolution .It is no doubt there are lots of works on emotion detection from face and from voice. But given the result in real time is really rare. There are very few of paper is based on real time emotion detection. And directly based on real time emotion based paper published very recent time in 2018 to 2019.

1.5 Research Questions

- Can I collect raw data for facial expression?
- Can I retrain my programme with Machine Learning approaches?
- Can Deep Learning be good for image processing ?
- Can the Machine Learning process accurately detect the emotion of a person ?
- Can this Machine Learning process show emotion of a person in real time?
- How many category of an emotion can be detect correctly ?

1.6 Expected Output

This research has a high hope in the present world. I propose a system that will detect emotion in real time, It can detect many kinds of emotions like angry, happy, sad, clam etc.

At first It will detect the face from camera then take cropped photo of your face. Then identify the emotion of the face based on the pre-train method. It will diagnosis every part of the face. It detect emotions from every part of the face then give the expected match of emotion. Then the system will show the emotion of the person by using static bar chart in real time.

CHAPTER 2

Background Study

2.1 Introduction

Emotion detection is a global challenge in this competitive machine learning world. People are facing challenges to train machines about human behaviour like sad, happy, angry, clam etc.

According to research on emotion detection field, there have been very few research on real time emotion detection. Most of the research took places in 2018 to 2019. some research are focused on only face and also some research are based on only virtual part. Some of the research also combined both of the facial and vocal.

In real time emotion detection using the deep learning model and CNN algorithm is a good choose. Deep learning is a piece of machine learning methods dependent on artificial neural network. It will help to learn the hidden layout of the patterns through a layered structure.

2.2 Related Works

In a research field of emotion detection there is a contribution of several domain like machine learning, natural language, neuroscience etc. In previous works they individually rummaged facial expressions, voice features and textual data as universal indicators of emotions. Emotion can be classified into number of static classifications like happiness, sadness, disgust, anger, fear, and surprise. In later works are improved by combining the image, voice and textual data's. The fusion of this data's give the maximum accurate result. This type of fusion can be done in three ways early, late or hybrid. Other ethos feature the elements of emotion and the collaborations between emotional processes and other intellectual procedures.

All previous work are limited about predicting emotion or sentiment. In this paper I proposed a system of a software that can provide fusion of emotion expressions as in Real time output which can recognize emotion classes inconspicuous in the past preparing set. Moreover we are going to scrounge related common sense applications, already unaddressed by the network, similar to emotion focused video attribution and outline.

Table 2.2.1: Summary of Related Work

No	Application	Method	Data set	Disadvantages	Advantages	Ref
1	All kind of video applications	Non linear portrayal for a video (videoGraph[7])	CCV dataset	The unwavering quality of VideoGraph relies upon the precision of scene location	It focuses on the video content over the course of events by organizing scenes and appears with two-dimensional diagram.	Lie Zhang, et al.[7]
2	Video browsing	For displaying connections among video cuts in a space-time mindful way (Video Web[8])	From online videos, easygoing catches, film sections, and soon	It is hard to recoup the view arrangement dependably from the accessible recordings, forestalling right foundation of spatial multiView Connection (VR) correlation	It empowers clients to effectively peruse the videoclip accumulation in a deliberate way	Hua Huang, et al.[8]
3	All kind of applications	RPCA-based structure for key casing extraction	Open video project, consumer video dataset	The time required for creating a video skimming portion relies upon a specific equipment, it is practically difficult to deliver a reasonable	Limits the reproduction blunder, Augments the aggregate of particular data	Chinh Dang et al.[9]

4	Georeferenced User-generated video	Geographic District of Intrigue outline (Gaussian-based model)	Geo Vid Portal	A few casings may look outwardly comparable despite the fact that they are situated at various separations and points. This may lessen the visual decent variety, particularly for huge items..	Computer structure numerous information videos, calculation time is low, Creates brilliant rundowns heartily and proficiently	Ying Zhan g et al.[10]
5	Wireless video sensor network	Model(GMM)for on-line multi-view synopsis (Gaussian Mixture)	BL-7F dataset	The online synopsis is great relies upon the prerequisite of the applications	Low computational multifaceted nature and the memory asset prerequisite is low	Shun - Hsin g et al.[11]
6	Surveillance videos and UGV	Context-aware video synopsis (Sparse coding)	UCLA office dataset VIRAT dataset SumMe dataset TVSum50 dataset	The abridged yields possibly longer consequently, there might be some repetition in the outlined yield	To catch the significant video divides, ready to discover new occasions just as various occasion relationships	Shu Zhan g et al.[12]
7	All kind of video applications	Ready to outline a video stream with the least data misfortune (Near-Lossless Video Summarization[13])	Null	The effectiveness and precision of subshot characterization profoundly rely upon the computationally serious estimation of relative model	It accomplishes amazingly low stockpiling utilization and it is utilized to remake the first video with a similar span	Lin-Xie Tang et al.[13]

8	UGV applications	Semantic Acknowledgment, and feeling acknowledgment for quick outline of client created videos	UGVs from youtube	It is tedious contrasted with k-implies and won't consider sound track	Pleasant summaries, highly efficient	Baohan Xu et al.[14]
9	Multi-camera video reconnaissance, cognitive dynamic surveillance,	Monitoring of multiple video streams (Probabilistic framework)	UCR video web exercises informational collection, freely accessible informational collection	This model spotlights on neighborhood object examination and does not semantic data caught by cameras with various scales and points	Spotlights on the most useful stream or camera, distinguishes fascinating articles or exercises, or changes to a progressively gainful stream	Paolo Napolitano et al.[15]
10	Surveillance/monitoring systems	Gaussian entropy combination model, and bipartite coordinating for multi-view video summarization	BL-7F	May not be reasonable for enormous span multi-see reconnaissance video	It is a mix of highlights, to be specific, shading, surface, visual pack of words a tamura	Sanjay K. Kuana et al. [16]
11	Pilot applications and exhibitions	Interactive spiral tape video summarization (Spiral tape Mechanism)	Video clasps were extricated from the motion pictures the ruler of milu, enormous buck rabbit, frantic housewives	A nonlinear portrayal utilizing a winding example has not been connected to video synopsis	Gives a continuous in general structure of video substance takes plan standards including minimization, progression, productive review and intuitiveness into thought	Yong-Jin Liu et al. [17]

From this table I found that there are so many unsolved challenges and there are many features missing in some research topic as mine. There as those researches are not based on our country.

Lei Zhang et al. showed video graph non-linear portrayal for scene structure of a video . They proposed CCV dataset. Also, this can be utilized in all sort of video applications. There program can focuses on the video content over the course of events by organizing scenes and emerges with two-dimensional chart. Be that as it may, the issue is The dependability of Video Graph relies upon the precision of scene recognition [7].

HuaHuang,et al. showed for introducing connections among video cuts in a space-time mindful way. They proposed database From online recordings, easygoing catches, film fragments, and soon. Also, this can be utilized in Video perusing. There program can empowers clients to effortlessly peruse the video cut gathering in a deliberate way. Be that as it may, the issue is It is hard to recuperate the view arrangement dependably from the accessible recordings, anticipating right foundation of spatial multi see Relation(VR) connection [8].

ChinhDang et al. showed RPCA-based structure for key edge extraction. They proposed database Open video venture, customer video dataset. Furthermore, this can be utilized in all sort of uses. There program can limits the reproduction blunder, Maximizes the entirety of particular data. In any case, the issue is the time required for creating a video skimming selection relies upon a specific equipment, it is practically difficult to deliver a reasonable [9].

IsafiadeetLin-Xie Tang et al. indicated ready to condense a video stream with the least data misfortune. They didn't use any database. And this can be used in All kind of video applications. There program can accomplishes incredibly low stockpiling utilization and it is utilized to reproduce the first video with the same duration. But the problem is The proficiency and exactness of sub shot arrangement exceptionally rely upon the computationally escalated estimation of relative model [13].

BaohanXu et al. showed Semantic Recognition, and feeling acknowledgment for quick synopsis of client produced videos. They proposed database UGVs from youtube. And this can be used in UGV applications. There program can pleasant summaries, highly

efficient. But the problem is It is tedious contrasted with k-implies and won't consider sound track [14].

Sanjay K. Kuanar et al. showed Gaussian entropy fusion model, also, bipartite coordinating for multi-see video rundown. They proposed BL-7F dataset. . Also, this can be utilized in Surveillance/checking frameworks. There program is a mix of highlights, to be specific, shading, surface, visual sack of words a tamura. Yet, the issue is it may not be reasonable for enormous term multi-view surveillance video [16].

Yong-Jin Liu et al. indicated Interactive winding tape video outline. They proposed dataset Video clasps were separated from the motion pictures the ruler of milu, enormous buck rabbit, frantic housewives. What's more, this can be utilized in Pilot applications and displays. There program gives a continuous in general structure of video substance takes plan standards including conservativeness, coherence, proficient diagram and intuitiveness into thought. In any case, the issue is A nonlinear portrayal utilizing a winding example has not been connected to video outline [17].

Shun-Hsing et al. showed model(GMM)for on-line multi-view summarization. They proposed BL-7F dataset. And this can be used in wireless video sensor network. There program gives low computational intricacy and the memory asset prerequisite is low. Be that as it may, the issue is the online synopsis is great relies upon the necessity of the applications [11].

2.3 Research Summary

In normal, detecting emotion is done by only face or voice. One of the weaknesses of this detection is only face or only voice not always give the accurate expected output. There are many kinds of emotions that human carry and a express them in many ways. So it comes to know that it needs lots of data and a high system to get the accurate outcome.

2.4 Problem

There are some unsuccessful and successful examples of supervised emotion recognition. The successful examples are given at the top and unsuccessful examples of supervised emotion recognition on bottom.

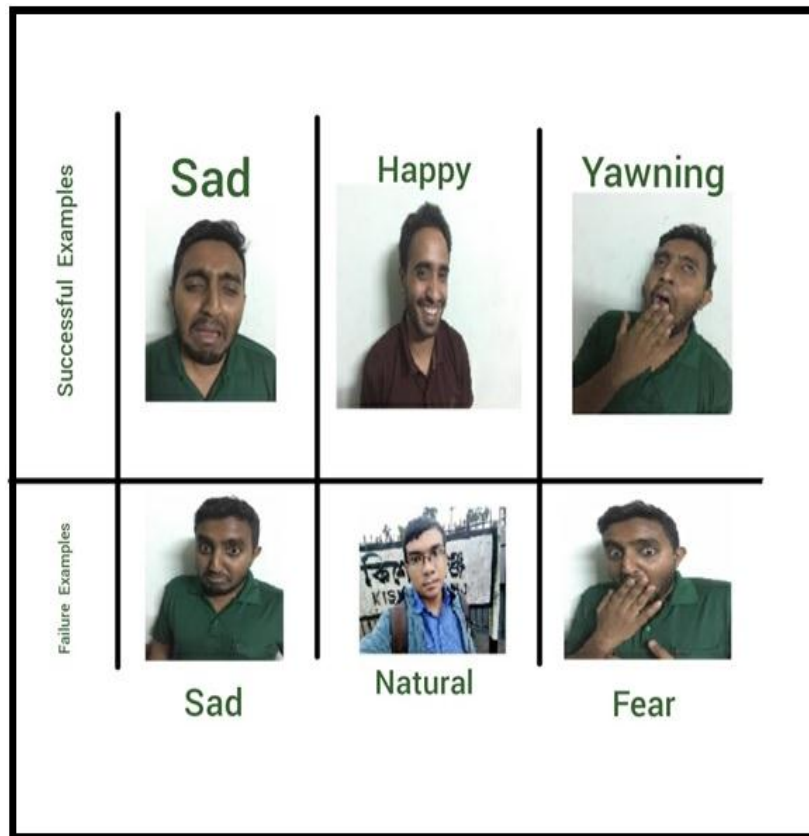


Figure 2.4.1 Successful and Failure emotion recognition

In Figure 2.4.1 we can see that some emotions can be successfully recognised but some are failed to detect. If we can get enough row data along with a high performance computer, it will be easier for us to increase accuracy to more than 95%. I will also be able to use our technique for a specific regions or fields.

2.5 Time Management

It's was a matter of fact that whether I can finish the work in time or not. Because it takes a lot of time to collect and analyse data for one person.

2.6 Data collection

I have collected lots of emotion expressed picture of a face from real world. It took a lot

of time because all the people are not cooperative natured person. So I have to face some difficulties to collect the real data. I also download data set from kaggle.com.

2.7 Data analysis

I have analysis the data of emotion which r for angry person faces, which r the sad person faces and so on. What kind of expression angry people give, what kind of expression sad people give so on. I used 28709 data training samples and 3589 test samples.

2.8 Data sorting

I have received a lot of random images during the collection of data. It took lot of time to find out which of these data is useful and which are not. The training samples are converted into 48×48 pixel and only use there pixel number in the data.

2.9 Challenges

In every stage of life there are challenges but I have to overcome the challenges to create something good. The challenges I have faced are given below:

2.9.1 Lack of data

It was one of the biggest problem for me that I have spent a huge time to collect the data from the trusted sites or sources.

2.9.2 Problem finding

As for some related papers have already been created. I tried my best to find out the bugs and the missing features that should have been in the paper.

2.9.3 Tools

I have used deep learning methods. As a machine learning program the whole program is written in python language. The tools used iscolab, keras, tensorflow, haarcascade_frontalface_alt, opencv, numpy, laptop, webcam, real and some downloaded pictures. And data set downloaded from kaggle.com.

CHAPTER 3

Research Methodology

3.1 Introduction

If we think about the leading challenge faced by machine learning and the entire system is the training part. Where the system has to train by using real data of human face reactions. For example if the system has to detect an angry face then first system has to be acquainted with the angry face. Also if the system has to detect a happy face then first system has to be acquainted with the happy face. To antecedents the system with this emotions the re-training process has been used. The re-training data were collected form real world and some from online. The most hardest part of this system was the re-training part. There are also many other part in the system.

Machine learning is a strong tool which enables data analysis of large databases more proficiently and fleetly. This enables the capability of detection emotion more accurate. It gives the feedback in real time. The system did not wait for the result for the future nor the image has to be stored. With help of modern day computers, neoteric data mining techniques can analyse thousands of data within a very short amount of time saving lots of hours. In addition, using and installing such programs costs significantly less. If properly optimized these data mining techniques can give perfect outcomes than a human.

In this thesis, I have presented a general and feasible framework for emotion data mining to identify emotion pattern using machine learning. I also measured the usefulness of this framework using raw data and online stored data set.

3.2 System Development Method

In this paper the proposed the program based on Deep learning model and computer vision emotion recognition. This proposed method uses CNN algorithm for this paper

Different With Deep learning and computer vision I have tried to achieve to my goal. I have used colab, keras, python, numpy, tensorflow, opencv and some real data and online data set from kaggle.com for training my program.

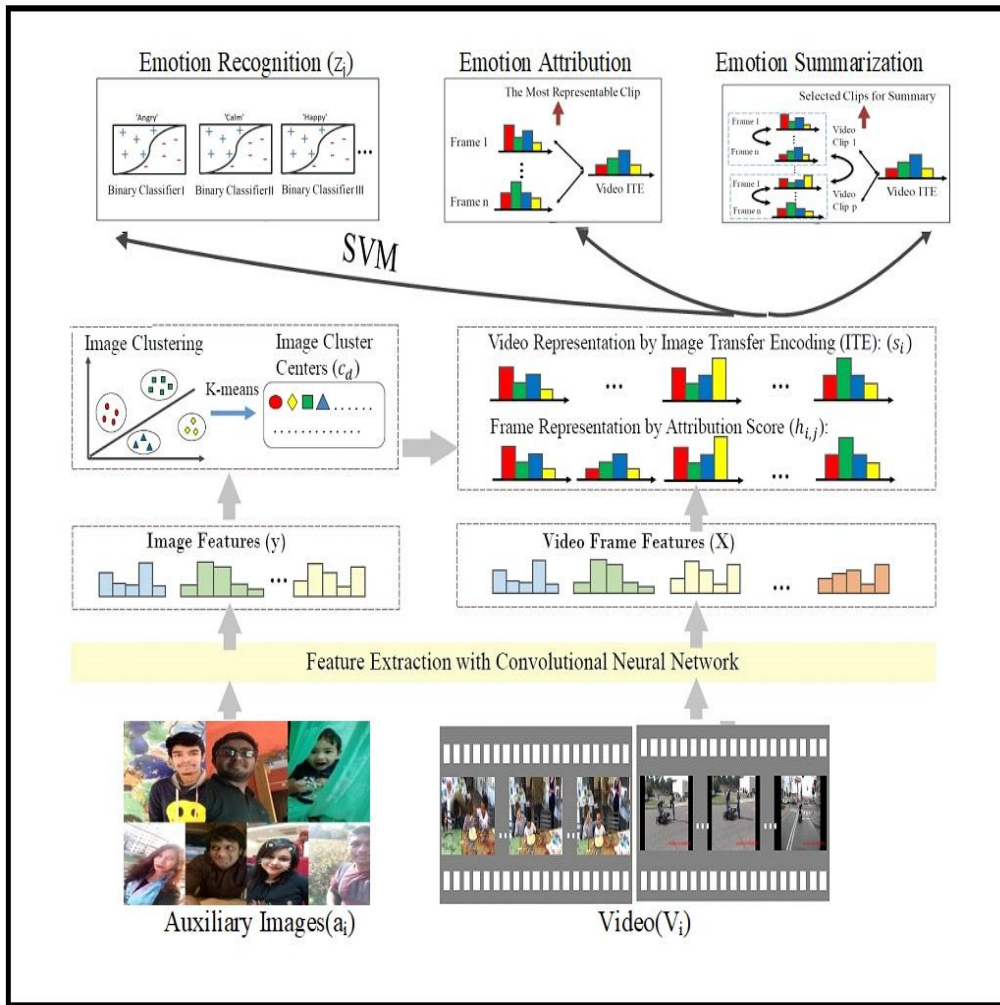


Figure3.2.1: An overview of work flow

In upper figure on base left data from the helper picture is utilized to extricate a feeling driven word reference from put away encoded picture components, which is consequently used to encode video in base center in the Fig3.2.1. What's more, recognize feeling in upper left in Fig3.2.1, Finally a similar encoding is utilized for feeling attribution and outline in top centre in Fig3.2.1.

This Emotion Detector can be used to know whether a person is happy, angry, sad and many other expression only through his/her face. This program code can be carry out such a task. It use your Webcam and then identifies your expression in real time . Yes in real time.

This is a three step process. At first we need to load the Haarcascade_frontalface_alt.xml file for detecting the presence of parsons faces. It can detect multiple faces at a time. And then we retrain our network with our image on different categories. After that we import the program and set up everything in real-time. We need to be installed tensorflow, opencv, numpy.

I am using the “Frontal Face Alt” haarcascade classifier for detecting the presence of face in the webcam. This file is included with this functions. Ithave to load the xml file too.

Next I am going to retrain the network with the help of tensorflow and keras image classifier. I am going to create an image classifier that identifies whether a person is happy, sad, angry and many other emotions and then show this text on the opencv window. There are some sub steps here .

- a) First I created colab account with my mail id. And a colab folder will be created in the google drive. I store the data set on that folder. And put some real time data too. In this data sethave images like angry, happy, sad, clam, yawning or many others.
- b) Now the training data only use the pixel of the image not the direct images. The images were resized into 48×48 pixel. And it use only the images number.
- c) The program should run on the GPU option. If GPU is active than program will execute faster. And show the output soon.
- d) Once the all setup was finished than run all. The whole program run at a time and train it self. Then it will open the webcam and take the real time image. And after that it will give the output showing the emotion in static bar chart shaped.

Finally I have kept everything under the colab folder in the google drive. And the data set are also kept there. The whole program automatically saved into the google drive.

3.3 Data Collection Procedure

In the data collection steps I use both real world media and online media to collect as much data as I could. Real world includes different type of emotional pictures of friends and family members, relatives , some known unknown peoples different kinds of facial expressions. The culled data was initially stored for further future analysis.

From online media I collected data set from kaggle.com. They have uploaded this data set 6years ago. They have the most trusted data set of emotions. They converted the data into 48×48 pixel grayscale images of faces. It contains two sections pixels and feeling. The feeling section contains a numeric code which running from 0 to 6. What's more, the pixel section contains a string incorporated in statements for each picture.

Furthermore, the picture should be only the picture of a face. So the collected pictures are resized and cropped picture of a face. And a clear picture.

3.4 Analysis of Different Data Mining Algorithms

Traditional data mining technics which includes prediction and classification, association analysis, outlier analysis and cluster analysis gives best result for a structures data.

Some modern techniques allow identification of emotion data in structured and also unstructured data.

Emotion react while video is being sensed by Electrocardiography (ECG) signals and facial expressions. These signals are multiplier of each other. Facial expressions are received using front cameras which are encyclopaedic in mobile devices while Electrocardiography (ECG) signals are experienced by smart wrist or unsheathed from facial images [1].

Period of CMN is to essence multimodal highlights of all emphases in the changes. The dyadic discussions are approaching as recordings. Every complement of a specific discussion is in this way little segment of the full video. For every highlight concentrate highlights for the modes sound, content and video [19].

CNN (Convolutional Neural Network) algorithm is a deep learning algorithm which can take image as input, assign learnable weights and biases to various aspects in the image and capable to differentiate one from the other. CNN including AlexNet, VGGNet, and ResNet then take a fixed-size contribution due to the restriction of full connected layers [5].

3.5 Emotion Detection Framework

It has been found that there are many endeavours that have been taken using several automated techniques to analyse emotions. However, most of them are found without any establishing framework and describing how to properly use them. More specifically, understanding and maintaining the emotion analysis capability can help law-enforcement authorities effectively use machine learning techniques to track and identify emotion patterns.

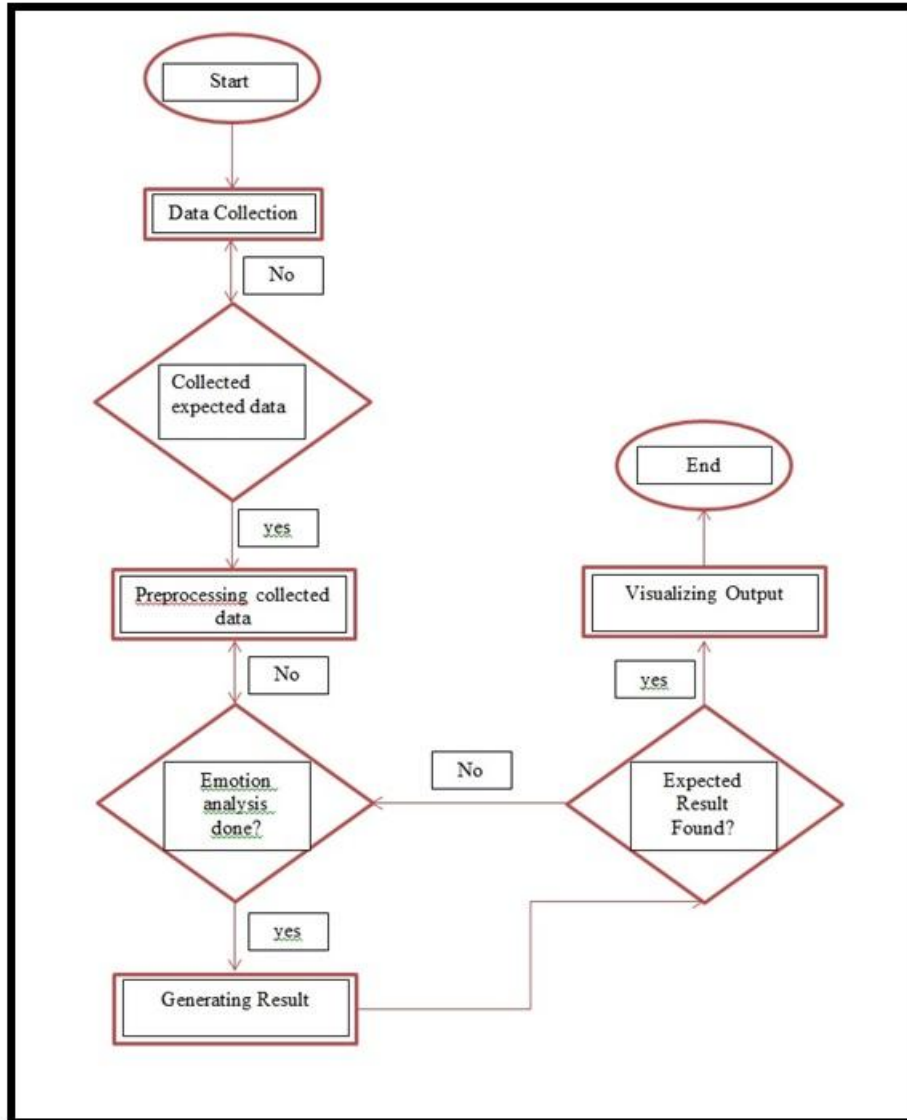


Figure 3.5.1: Emotion Detection DataFlow diagram

CHAPTER 4

Experimental Results

4.1 Introduction

In this part I'm going to describe our framework that competed as emotion detector in real time. This work done by using deep learning model CNN algorithm and computer webcam. The better matches the conditions of the training DCNN pre-trained for face recognition [6]. In our approach I have separated and analysed different generally utilized visual type of images collected from real data.

The first major challenge was confined measure of information for preparing broad framework. Which needs to defeat for framework in nature. Move learning is the most prevalent response for this. In this methodology I began from pre-prepared strategy and calibrated this model with the put away information which is gathered from genuine world. A progression of starter investigations affirmed the presumption that face acknowledgment would serve better in highlight extraction. Anyway there are models where such systems are effectively utilized.

4.2 Experimental Results

For perfect visualization of emotion I have used kares,opencvpython,tensorflow, numpy, haarcascade_frontalface_alt. The attributes are represented by colab.

We give a review stream for the outcome in Figure 5.2.1 since the face contain the most noticeable visual sign the initial step is the recognition and enlistment of face. This progression can't be dismissed notwithstanding for profound neural system models [6]. Will significantly affect the outcomes.

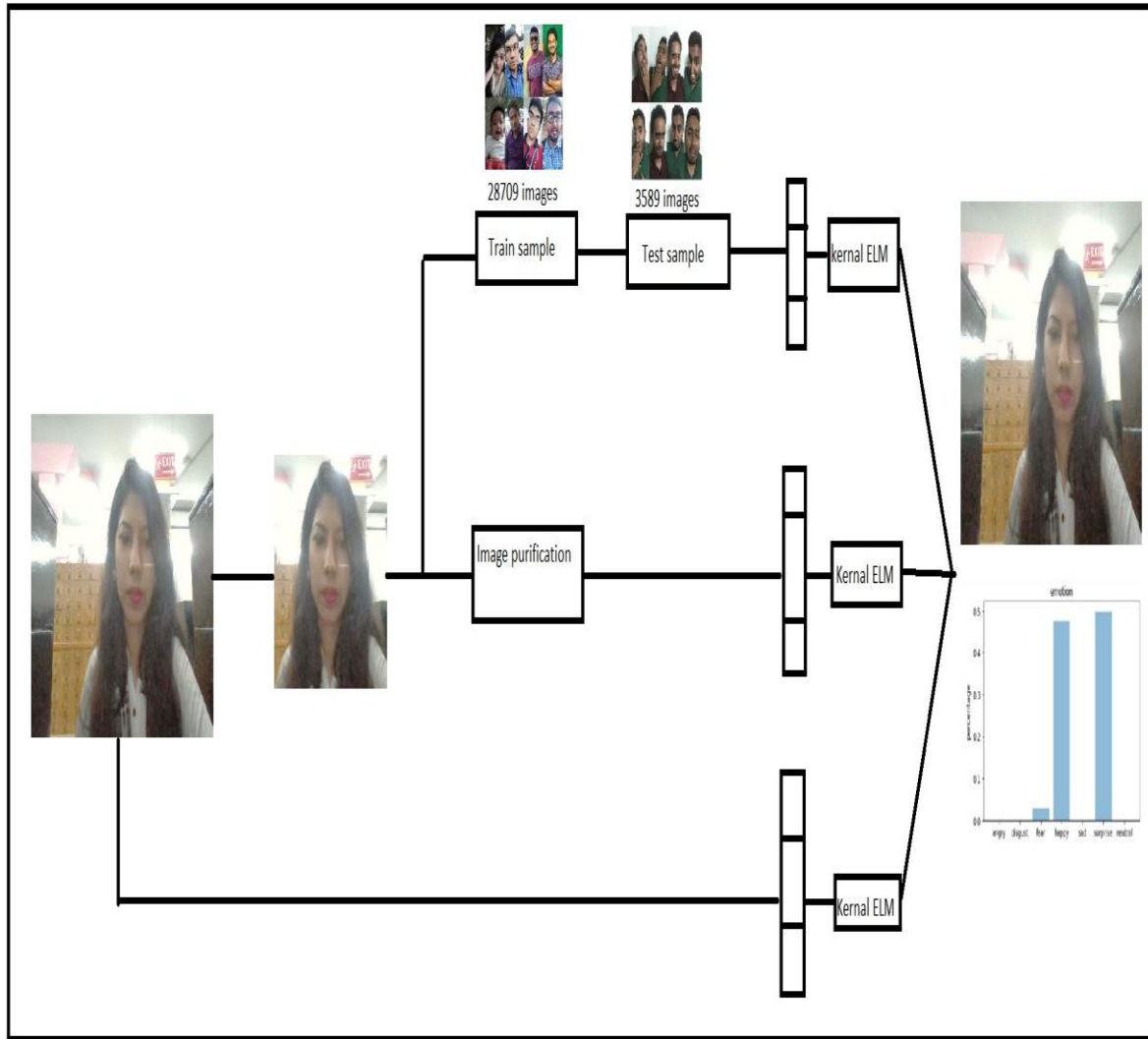


Figure 4.2.1 Output

To process the face with exchange learning approaches we use deep learning CNN algorithm. After training the face recognition run the whole program and it will open a new window of webcam and identifies the face. Then crop the face and identifies the facial expression by comparing the faces with the trained data. Then show the emotion of the facial expression by using static bar chart.

4.3 Sentiment Analysis and Data Processing

For sentiment analysis, data processing and overall, alignment we have used deep learning

CNN algorithm which is supervised learning method. In deep learning algorithm It run information through a few layers of neural network algorithms, In every one of which passes an improved appointment of the information to the following layer. Most of the machine learning algorithms work well on the datasets that have a couple of hundred highlights or segment. The algorithm successfully classifies an image and classify the sentiment of the image and choose the match emotion for the image. What I get here is that,

“Is it the exact emotion for this human expression?”

The reason behind choosing the deep learning classifier is that the classifier run data through several layers. And deep learning algorithm can be useful for less unpredictable issues since they gain admittance to an immense measure of information to be compelling. For picture the regular benchmark for preparing profound learning models for broad picture acknowledgment approaches more than 14 million pictures.

4.4 Analysis of the Image to Identify Emotion

The next phase of my work is to analysis the emotion upon successful pattern identification where patterns and expression r identified. I use Haarcascade for identification. I also use tensorflowankares library function. Because tensorflow is an open source software library. It make easier to train deep learning models.

Taking a sample of 5 to 6 emotion reports of a place and applying the deep learning algorithm provides information related to frequent emotion patterns of that face. If similar emotion occur in a same place repeatedly then there is a recurrently then there is high probability to occur the similar crimes again. Right now we are considering very few patterns which providing promising output. In future , I am interested to include more characteristic to get the best results regarding human emotion detection identification. For example, some characteristics can be;

Characteristics 1: Machine talking the emotion

Characteristics 2: Analysing also voice emotion with face emotion

Characteristics 3: Detecting suspicious behaviour

Characteristics 4: Applying the system on the security camera

The above mentioned characteristic helps to give the more proper out come and also give

the security to people. Suspicious movement of a person can be detected easily. If we find any kind of symptom we can take action before something happened.

4.5 Result Generation

For perfect visualization of our emotion detection pattern analysis I have used a decision tree. In the decision tree, the characteristic is represented by the nodes and layers and also the outcome of the experiment is represented by the branch. The advantage of the decision tree is that it very helpful and easy to visualize the emotion and interpret the result.

The working process of a decision tree is easy to understand. If I have classified the data according to their movement, reactions and order which ideally different types of emotions. I also have classified them into trees and sub trees which reflects that the Whether the person is sad, angry or happy etc. if I could find something that I can categorize them using this methods more simply. To do this I have used retrain method that memorized the pattern and satisfy the condition. When any of the condition is satisfied it carry on to the end of the tree. However, if none of the condition satisfy the intermediate condition, it will stop checking and say “The emotion cannot be identify. The emotion is unknown”.

4.6 Output Visualization

The emotion on the facial areas can be graphically represented using the bar chart. Which indicates the level of happiness, sadness, angrinessetc emotions. Usually small bars indicates low amount of possibility of a particular emotion and the long bars indicates the high amount of possibility of a particular emotion.

I have represented the outcome in a visual form. The more emotions are identified the more bar is going to create and more high and low emotion bar are shown.If the emotion percentage is high than the bar will be large. If the emotions percentage is low then the bar will be created small. It also indicates that the larger the bar size, the more accurate that the emotion is for that human. So the chart shows;

- Perfect visualization of an emotion
- Large size represents the high possibility
- Small size represents the low possibility
- It reflect behalf on the data I have analysed
- The emotions those are not presents are out of the count
- Show the most high possibility emotion

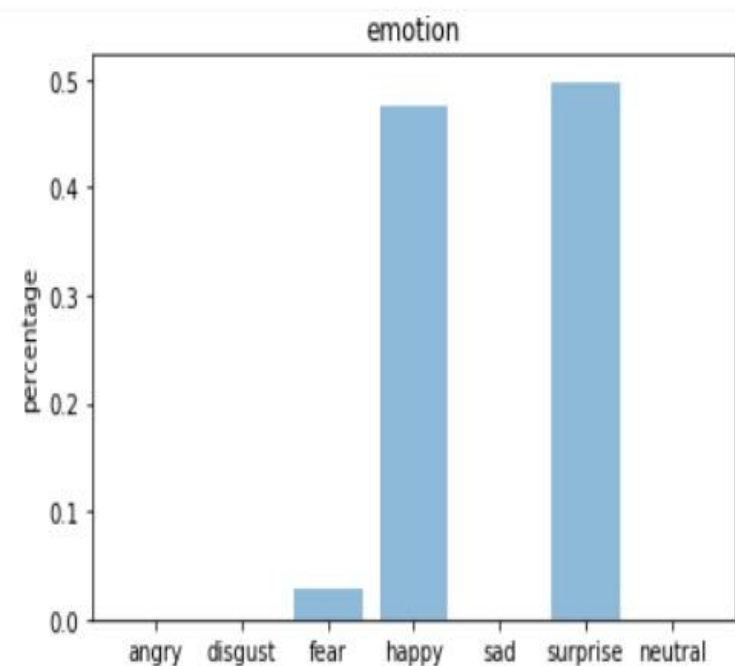


Figure 4.6.1 OutputVisualization Static graph

4.7 Descriptive Analysis

Emotions are complicated to understand. There are different kinds of expression for same emotion. Different people give different kinds of expression for same kind of emotion. Morden day machine learning technology can help law-enforcement authority to detect emotion so machine can understand the emotion of human and more behave and act like human. My data for emotion came from different online and offline media. Such as

google, kaggle.com site.friends and family, random people etc. I use tensorflow classifier to initially classify and analyse the emotion data I got. Then with the help of harcasade and opencv and numpy I identify the emotion. And with the help of platform anaconda and the softwarepycharm I generate the output from the raw data where the result is going to show on realtime. The hierarchical data mining procedure like decision tree helps to generate probability decision by calculating various probability decisions by calculating various characteristic which are initially used to identify the emotion pattern. Along with offline and online data collection I also conducted an effective field study at "DIU foundation ceremony" to gather more people and various kind of people and various emotion deferent expression lots of different face.

In online data collection I took the data set from kaggle.com. They provide the quality datas. They converted the images into pixel grayscale and use the numerical number of the images. So it gives the quality data and the batter result.

Both of the experts believed that this analysis of sentiment could help identify emotion more accurately and help to take accurate actions behalf of accurate emotion identification. It would provide more knowledge about different types of expression there sentiment as well as percentage of each existedvarious kinds of emotions.

CHAPTER 5

Summary, Conclusion, Recommendation and Synthesis for Future Research

5.1 Summary

An experienced human can often identify another human's emotions by analysing and looking at him or her. However in this modern age machine are becoming more intelligent. For the time been machines are trying to act more like human. If we could train machine how to react behalf of the human sentiment at that time. Then machine can behave and act like human. On the other hand if machine can identify the emotion it can prevent lots of occurrence too. With increased proficiency and errorless computation emotion data mining can facilitate accurate expression patterns enabling machines to find and act more like human effectively. In order to determine the emotion expression patterns I created or framework with comprehensive research and field works. I followed the framework step by step to get the expected outcome. To follow the framework and to identify the emotion expression patterns more effectively I used deep learning CNN algorithm along with kares, tensorflow and re-training concepts. With these techniques it was possible to identify emotions, type of emotion at the real time. To delineate the result and procedures more visually I have also introduced decision tree techniques which helps to decide which emotions percentage is high and which emotions percentage is low. Now the high percentage emotions get the most possible accurate emotions. And the low percentage emotions get the low chance of existence.

With this discovery, it is now possible to determine the accurate emotions. And machine can identify emotion more accurately and on behalf of that they can give proper reaction and also can help to prevent same unwonted occurrence. For this machine can also become the replacement of a human.

5.2 Conclusion

Making a forceful emotional prayer to viewers is the last objective of numerous video producer. In this way having the option to perceive a feeling is a significant errand for computer vision. And showing the emotion in real time is really challenging. I propose

the deep learning method and computer vision for learning the task of understanding real time emotion.

The achievement of the methodology on the different difficulties speak to the adaptability of the proposed strategy. Treating the individual modalities makes it simpler to naturally produce clarifications for the given choices.

My finding in this research is promising as I am able to identify emotion in real time. If enough data found, I can use this technique to identify more emotion for different vision of expression. Furthermore we can use this technique in video surveillance cameras for preventing crime. To give security and media world also can be benefited by this.

5.3 Recommendation

While completing the thesis I have found that, a large quantity of test data and keywords are needed if I want to get the greater accuracy. Lack of good quantity of raw data is also required to extend the research work. A high configuration graphics processing unit (GPU) qualify computer is also required if I want to process large quantity of test data in shortest time.

So if I get adequate data along with a high performance computer, it will be easier for me to rise the accuracy to more than 98%. I will also be able to use my system for a different platform for different outcome and help to determine the emotion expression pattern.

5.4 Synthesis for Future Research

World-wide the number of machines and there intelligences are also increasing as well as the techniques of understanding the human. Introducing emotion machine learning in this consideration brings new bounding line to determine show the accurate emotion in real time. It is highly useful to determine the emotion in real time. I use my technique to determine emotion expression patterns for different human faces. The accuracy of my system is quite good, but its features and research needs to be increase for better outcome and utilization. So the future scopes can be;

- Collecting more emotions data for greater accuracy
- Using more test data to give the system more repletion
- Finding and using more emotion expression key point
- Implement the algorithm for different kind of devices

- Working with the security too so that my system can be used for real life motive

If I could be able to carry through all of these future works, I can say that my system will be highly beneficial for finding emotion expression patterns in real time as well as preventing some unexpected occurrence.

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