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Sentiment Analysis on Videos

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Abstract:- Sentiment Analysis, sometimes also referred to as Opinion Mining, is the study of the sentiments of humans and their different states of mind. It is a technique which determines whether a sentiment is good, neutral or negative. Traditionally Sentiment Analysis was frequently used to identify polarity of Textual data. Social-Media is widely used now and is a very important source of sharing your thoughts, ideas and even now is used for promoting your business. The most popular application of Sentiment Analysis can be seen in Social Media Analytics. The analysis of Social Media helps us to acquire a broad understanding of opinions made by people upon a specific topic. Since visual content such as photographs and videos is becoming a new medium for self-expression in social networks, multimedia sentiment analysis has gained a lot of attraction. In this paper we propose an way to perform sentiment analysis on videos by identifying the various facial expressions by using techniques of CNN and Deep Learning..The goal of this study is to create a system that can evaluate a video and anticipate a person's expression.

Keywords:- *CNN, Deep Learning, Face Emotion Recognition.*

I. INTRODUCTION

Finding out what goes through inside someone's mind has always been a very crucial element of the knowledge gathering habit for humans. When it comes to making a decision or choosing amongst many options, other people's perspectives can be really useful. People frequently rely on the prior experiences of their friends and family members when it's time for making decisions that require important resources (for example, investing time and money to buy products or services).We often ask our friends or acquaintances for opinions about our daily life decisions, and now with the prevalent use of the Internet we can find out the opinions and experience of people all around the world [1]. Social-Media, as an effective media for exchange of knowledge, has become a key source of information on a broad selection of subjects.

Social-Media is widely used now and is a very important source of sharing your thoughts, ideas and even now is used for promoting your business. An increasing number of people are making their views and opinions known to the world through the Internet. Thus we have a large availability of opinion rich resources on the internet, which include Amazon, eBay, which are two popular e-com sites or CNET, gsmarena.com; the online site to posts reviews and also Blogging sites like Google blog, live journal. Individuals and organizations are increasingly relying on social media opinions to make purchasing decisions, vote in elections, and advertise and design products. Opinions that are positive frequently render into earnings and limelight for businesses and individuals, which sadly offers greater incentives for people to rig the system by posting fictitious opinions or reviews to endorse or defame particular target merchandise, services, organisations, individuals, or even ideas without uncovering their true intent or the person or organisation for which they are secretly working. These people are known as "Opinion Spammers" and their behaviour is referred to as "Opinion Spamming" [2]. However, this data that is present on the internet is "unstructured" and exceedingly big. Moreover, because this data is primarily meant for human use, it cannot be evaluated by machines [4]. Thus, with the ever expanding size of data it is practically unrealistic to manually analyze it all. That's when the concept of Opinion Mining and Sentiment Analysis comes into play. Users nowadays post a great amount of content in the form of photographs on social media sites, whether it is their own photo, or a picture of a landscape, or personal view points through memes. Graphics have turned into a vital aspect of people's lives in the modern day. Images can be used to transmit everything from a single detail to a large number of features. Reviewing these materials from image-sharing websites or social networking sites such as Twitter, Instagram, Facebook, and others can provide insight into people's general feeling and the emotions they share. Gathering the opinions and views of public regarding social occasions, political movements, corporate strategies, marketing efforts, and product preferences is gaining traction in the scientific world which may be due to the interesting open tasks. However it has also made its impact in the world of business because of its extraordinary marketing ramifications and potential financial market forecasting. Thus, Opinion mining and sentiment analysis are two of the fields that have emerged as a result of this. Whereas the terms opinion mining and sentiment analysis are frequently used interchangeably to refer to the same topic of research, they mainly pay attention to the detection of polarity and emotion recognition.

II. SENTIMENT ANALYSIS (SA) - DISCRIPTION AND INTRODUCTION

Opinion Mining, sometimes referred also as Sentiment Analysis, is a term that is frequently misunderstood. Fundamentally, it is a method for determining the intensity of the tone behind a series of words, which is used to decipher the states of mind and feelings expressed in an online or electronic form.[1] Sentiment analysis is a method of analyzing opinions, attitudes, and emotions that is computationally based. Sentiment analysis is a technique for determining if a sentiment is good, neutral, or negative. Sentiment analysis is carried out by converting data into text, which can then be analyzed using text mining methods.[2] Sentiment analysis is the challenge of categorizing a person's state of mind and feelings from a specific kind of input into categories such as happy, sad, and furious. However,

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traditionally sentiment identification was frequently used to identify polarity, and the two domains are frequently put under the same field or even treated as synonyms. Both of these fields employ the approaches of data mining and natural language processing (NLP) to identify, extract, and synthesize facts and opinions from the huge textual content on the Global Internet. However, extracting ideas and sentiments through natural language is challenging because it requires a full understanding of direct and indirect, standard and irregular, and grammatical and conceptual language rules. Meanwhile, much work has already been done in the subject of textual sentiment analysis, and it has emerged as one of the most successful study fields in recent years.Social media is an important means for information exchange, and it has become a key resource on a wide range of matters. The interactive digital content published on social networking sites promotes personal engagement and community management. The sentiment analysis of social media content has emerged as an important research focus, with the goal of extracting public perceptions, sentiments, and emotions from social networking sites. [2] An example being, a shopping system which is based in online mode can use sentiment analysis to classify clients' emotional states and provide them with more appealing deals based on their mood.

III. LITERATURE REVIEW

With the purpose of extracting people's ideas, attitudes, and emotions from social networks, social media sentiment analysis has arisen as a research focus. Conventional sentiment analysis is mostly concerned with textual material. The majority of current text information processing research has been (almost solely) focused on factual information mining and retrieval, such as information extraction, Web search, and a range of other text mining and natural language processing application [3]. People and businesses are rapidly depending on opinions generated from the platform of social media, to make decisions such as product buying, voting, and promoting and innovating new products. Till now, work on sentiment extraction from text has advanced significantly. Traditional approaches could only divide text into separate themes, regardless of the user's preferences. Sentiment, on the other hand, is an ordered variable that may be used to rank user interests in a logical manner. Sentiment prediction necessitates knowledge of the sentence context, making it far more complex than topic classification. Sentiment predictions determine whether a client had a happy or bad experience, and emotion recognition accounts for specific feelings that can be used to generate resonance among product reviews. Traditionally, Sentiment analysis was carried out by converting data into text, which can then be analysed using text mining methods. Labelling, tokenization, stemming, and filtering are all examples of text pre-processing. When it comes to making a decision or choosing amongst many options, other people's perspectives can be really useful. People frequently rely on the prior experiences of their friends and family members when it's time for making decisions that require important resources (for example, investing time and money to buy products or services).We often ask our friends or acquaintances for opinions about our daily life decisions, and now with the prevalent use of the Internet we can find out the opinions and experience of people all around the world [1]. Social media, as an effective media for information exchange, has become a key source of information on a broad range of topics.

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- **Machine Learning Approach**: In the realm of sentiment analysis, machine learning approaches are commonly employed to create sentiment classification models. These methods begin by constructing a training set and then labelling the training data with sentiment. The training data is then used to obtain a range of attributes that are then fed into a classifier model. Some of the model classifiers used are ; Naive Bayes classifier (NB), Support Vector Machine (SVM), Logistic Regression (LR), Random Forest (RF), and etc. Following training with labels of sentiments, the classifier can be used to estimate the sentiment polarity of an unlabelled sample.
- **Lexicon-Based Approach:** This methods estimate the overall sentiment polarity of textual contents based on words labelled with orientation or pole scores. The Lexicon approach has been commonly used in traditional textual sentiment analysis due to the fact that they do not require training data.
- **Hybrid Based Approach:** To handle the challenge of textual sentiment analysis for media platforms, machine learning and lexicon-based algorithms can be integrated. Twitter based sentiment analysis uses a hybrid approach for entity level.
- **Graph-Based Approach:** Because machine-learning algorithms necessitate a high number of annotated examples, researchers use label dispersion to lessen the demand for labelled data. In label propagation-based semi-supervised learning, social graphs are utilised to disseminate labelling to nodes.
- **And some other approaches:** Some sentiment analysis methodologies do not fit into any of the categories listed above. For example, we have an ontology domain model which uses concept analysis, proposed by Kontopoulos et al. Also, a sociological approach which can manage texts

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which are short and noisy and is based on the Twitter data characteristics was put forward by Hu et al.

IV. VIDEO SENTIMENT ANALYSIS-NEED

Since visual content such as photographs and videos is becoming a new medium for self-expression in social networks, multimedia sentiment analysis has gained a lot of attraction. Many web platforms, on the other hand, are used to post non-textual content like movies, images, and animations, and they allow users to leave comments on each item. Till now, work on sentiment extraction from text has advanced significantly. People are continually transferring their opinions about a product or service from text to video, as it is now easier and faster for them to create and distribute multimodal information. Potential customers are increasingly looking for video reviews of products they are interested in rather than long written assessments[6]. Multimodal sentiment analysis is becoming more prominent among researchers as video sharing websites and social network applications grow in popularity. Visual information incorporates key sentiment elements in the speakers' movements and facial expressions, in addition to natural language information. The goal of sentiment analysis based on visual social media is to extract sentiment information from video elements shared by people on social media. The most essential challenge in visual sentiment analysis is linking between visualization content and sentiment attitude, despite the fact that visual sentiment analysis tries to forecast the sentiment orientation of the transmitters on social media.[4] As a result, sentiment analysis for visual based social media platforms can be thought of as a subset of sentimental content analysis for videos and photographs. Conventional works on emotional sentiment analysis for visual content are typically specific to its application. Most of these research are concerned with the impact of visualisation on recipients, and the majority of them explicitly create a connection among the low-level visual elements and emotional interpretation. Furthermore, the overwhelming majority of graphics and videos on social media are tactile, and their emotional interpretations are influenced indirectly by intellectual meaning. As a result, the low level visual feature-based approaches are inapplicable to sentiment analysis of visual information on social media platforms. Additionally, video content on such platforms are shared wildly. There are numerous new sources of opinion mining and sentiment analysis. Users that have webcams attached in their cellphones, touchscreens, or other devices can offer their opinions in voice or video format rather than text.[7] The interaction between different types of data and their sentiment alignment is extremely complicated, and the data sparsity problem is absolutely critical. Studies have attempted to reconcile the conceptual gap by using semi expressions as a link between low-level visual parameters and sentiment polarity.While the approach of deep learning has had such success in computer vision field, studies in recent years have proceeded to deploy deep learning approaches to the field of sentiment analysis and opinion mining for visual input. Therefore, mid level based approaches and approaches based on deep learning are the two categories available for the visual information in social media.[8]

Video Sentiment analysis is a relatively untapped area of study in which the videos emotions and sentiments are restored by analysing the image frames, sound, and texts obtained from the entire video, if any. Sentiment analysis based on realistic sound has lately emerged as a potential topic of research. It is frequently performed by doing automated speech recognition on the sound and then extracting the sentiment of the speaker [1]. Fig 1.below depicts the process of visual sentiment analysis.

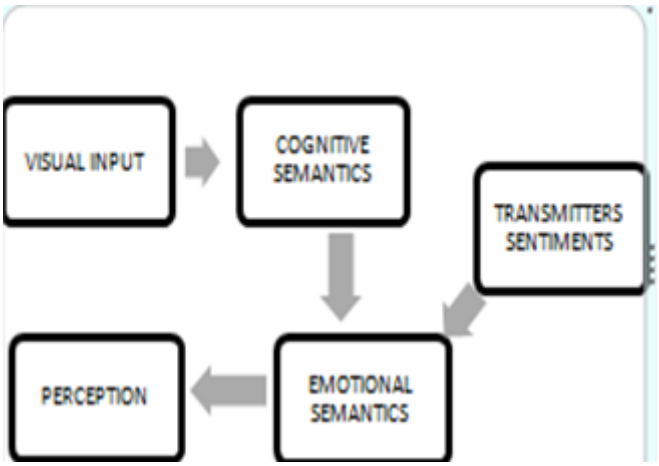

Fig. 1: Visual Sentiment Process of delivery

V. APPROACHES AND METHODS

In the project a CNN based deep neural networks for emotion detection is used to recognize and monitor faces in video. CNN is proved to be much more efficient and accurate when it comes to processing images for analysis of sentiments.A feed-forward neural network which is known as CNN is mostly used for classification, processing of images. Thus, image analysis is one of CNN's most significant functions. The project is divided into the following steps which will be discussed in the below section one by one.

- **DEEP LEARNING APPROACH:**

There are several applications of Sentiment Analysis and Face detection seen in today's world. Deep learning has become a major research area in past few years due to its great results in the AI field. T he deep learning employs models which are multi layer in order to translate the features which are low-level into an idealized feature set that, when compared to artificial aspects, can better describe the innate content of input data. People have the potential to perceive and differentiate between various features. Computers can now perform the same thing. This opens up a plethora of possibilities. As seen in the latest iPhones, detection and recognition of faces is applied for the payment process and other things. This can be used to better the access and the security. The goal of sentiment analysis based on visual social media is to extract sentiment information from video elements shared by people on social media. The most essential challenge in visual sentiment analysis is linking between visualization content and sentiment attitude, despite the fact that visual sentiment analysis tries to forecast the sentiment orientation of the transmitters on social media.[4] As a result, sentiment

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VI. METHODOLOGY

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A. PREPROCESSING

The preprocessing step incorporates downloading a random video from YouTube and splitting the video into frames and storing these frames in jpeg format.

First step involves downloading the YouTube video using Pytube library of Python. The Pytube library of python is used to download video from the web. To use this library we need to install it first.

Second step involves extracting the downloaded video into your python and working on it. Read the video from the specified path and then creating a separate folder “data”, where we are going to save all the frames. The library used for this is open cv.

In the third step, finally, the video is splitted into frames and all the frames get saved in the folder data.

In our project, around 5490 data frames were created and saved in jpg format in the data folder.

B. FEATURE EXTRACTION

This step is divided into 3 further steps

- Facial Detection- using python library Face detection. Expertise to locate a face in any image input or frames. The result is the recognized faces' bounding box coordinates.
- Facial Recognition-using python library face emotion recognition (fer).
- Emotion Detection-classifying the face emotions as angry, sad, excited etc.

C. FACE EMOTION RECOGNISER

The application begins by reading the photo or video that needs to be analysed. The FER() function is loaded with a facial detection classifier (either Open CV Haarcascade or MTCNN).In our case we used OpenCV . We then invoke the detect emotions method of this function by feeding it the input data image or video. The end result is an array of sentiments, each with a number attributed to it. Ultimately, the 'top emotion' method can isolate and return the object's most rated emotion. Face Emotion Recognition an image classification method falls under the area of Computer Vision.

The Face Emotion Recognizer (FER) is a free and open-source Python package. FER is mainly used for analyzing the sentiments and emotions of a still image or a video.

The FER approaches consist of three primary process:

- Identification and Detection of the components of face.
- Extraction of features.
- Classification of different expressions.

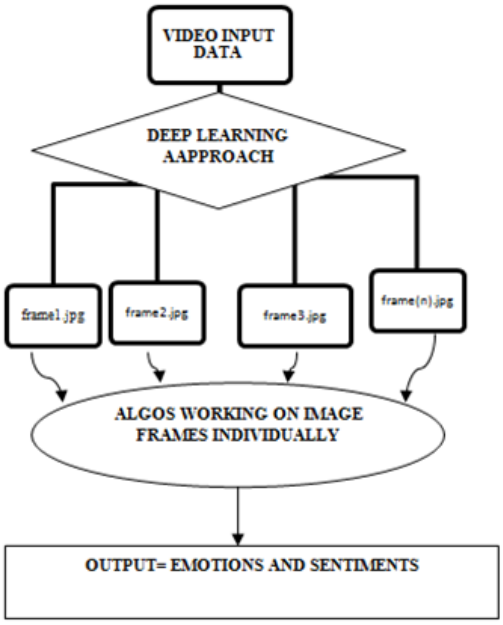

Fig. 2: Method

VII. STEPS INVOLVED IN THE RECOGNITION OF EMOTIONS:

- The process begins with extraction of face from the input video or frame.
- The next step begins with the detection of various features of the face detected from the input data.
- After the extraction of the facial features, the detection of various spatial and temporal components that will be derived from the initially extracted facial features will begin.

All of this takes place with the help of some pre-trained classifiers of Facial Expression such as the SVM (Support Vector Machine).

VIII. FUTURE SCOPE

In the field of Video Sentiment Analysis, there are still some possibilities that can be considered. In this paper the sentiment detection of both video and the frames obtained from the video is done. However, in future along with feature extraction, speech recognition of the video can also be considered to make the process of emotion detection of videos much more reliable and efficient. The above discussed

strategy can be effective in the platforms of social-media, where video sharing is rapidly increasing, as this can save the time of users by not having to type or look for emotion tags. It can also be used for dealing with security issues, such as detecting the emotions and action of person recorded on a CCTV camera

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