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Detection of Possible Illicit Messages Using Natural Language Processing and Computer Vision on Twitter and Linked Websites

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ABSTRACT:

Human trafficking is a global problem that strips away the dignity of millions of victims. Currently, social networks are used to spread this crime through the online environment by using covert messages that serve to promote these illegal services. In this context, since law enforcement resources are limited, it is vital to automatically detect messages that may be related to this crime and could also serve as clues. In this paper, we identify Twitter messages that could promote these illegal services and exploit minors by using natural language processing. The images and the URLs found in suspicious messages were processed and classified by gender and age group, so it is possible to detect photographs of people under 14 years of age. The method that we used is as follows. First, tweets with hashtags related to minors are mined in real-time. These tweets are preprocessed to eliminate noise and misspelled words, and then the tweets are classified as suspicious or not. Moreover, geometric features of the face and torso are selected using Haar models. By applying Support Vector Machine (SVM) and Convolutional Neural Network (CNN), we are able to recognize gender and age group, taking into account torso information and its proportional relationship with the head, or even when the face details are blurred. As a result, using the SVM model with only torso features has a higher performance than CNN.

Index Terms: Human Trafficking, Social Networks, Twitter, Natural Language Processing, Support Vector Machine, Convolutional Neural Network, Image Classification, Age Detection, Gender Detection, Haar Models.

1.INTRODUCTION

Initially the websites were isolated and just placed for reading since the user could not truly interact with the web. However, from the innovation and arrival of web 2.0, there was a revolutionary and radical change since the user stopped being a simple spectator and became an active individual in social networks such as Facebook, Twitter, Instagram, among others.

Unfortunately, a door has also been opened for illegal businesses such as human trafficking, where some countries, such as Latin American countries, have the highest rates of smuggling of people, especially children and adolescents under 14 years old. It is important to note that the average age of consent is 14 years old in Latin American countries, so if underage people are used for illicit services are directly considered victims of human trafficking. Currently, in Twitter, it

is possible to find websites that offer escort or similar services where young girls are promoted for the consumption of ‘‘customers.’’ These girls are generally abused physically, psychologically, and sexually .

In recent years many criminal organizations advertise these ‘‘sexual services’’ using social networks hiding their illegal activity with seemingly innocuous terms such as ‘‘chicken soup’’ to refer to child pornography. Websites and social networks are used to extend this crime to the online environment, where covert advertising and messages are used to promote illegal services to exploit people who are victims of this crime, mainly minors Although there are previous tweet filtering and image classification works to detect illicit messages, most of them use natural language processing methods or computer vision techniques separately. However, a different treatment of text and images is shown in. In this paper, the authors focus their efforts on the analysis of advertisement published on the web for automatic detection of suspected messages. They use 10,000 ads manually annotated for this task. This work labels advertising that has text and images, and the analysis combines both types of information. They use a deep multimodal model called Human Trafficking Deep Network, and they obtained an F1 value of 75.3% with a recall of 70.9%.

On the other hand, the current image classification models use only facial information without taking into account that most of the images have the face blurred. In , the authors use computer vision algorithms to predict age with an approximate accuracy of 86.64%. In , SVM and CNN classification models are used to define the gender of a person. To the best of our knowledge, there are no works that consider characteristics of the upper body (upper torso) in the images to classify age groups The present work has two phases. In the first stage, natural language processing techniques are used in order to identify messages on Twitter that promote illicit services provided by minors. In the second phase, from the websites categorized as suspects, images are extracted in order to perform image processing and gender recognition of two age groups: over 14 years and under or equal to 14 years old. For this recognition, not only the characteristics of the torso but also the facial features were used. It is worth to mention that several images are often blurred and pixelated.

2.EXISTING SYSTEM

As there is no staff available in unmanned restaurants, it is difficult for the restaurant management to estimate how the concept and the food is experienced by the customers. Existing rating systems, such as Google and TripAdvisor, only partially solve this problem, as they only cover a part of the customer’s opinions. These rating systems are only used by a subset of the customers who rate the restaurant on independent rating platforms on their own initiative. This applies mainly to customers who experience their visit as very positive or negative.

3.PROPOSED SYSTEM

In order to solve the above problem, all customers must be motivated to give a rating. This paper
introduces an approach for a restaurant rating system that asks every customer for a rating after their visit to increase the number of

ratings as much as possible. This system can be used unmanned restaurants; the scoring system is based on facial expression detection using pretrained convolutional neural network (CNN) models. It allows the customer to rate the food by taking or capturing a picture of his face that reflects the corresponding feelings. Compared to
text-based rating system, there is much less information and no individual experience reports collected. However, this simple fast and playful rating system should give a wider range of opinions about the experiences of the customers with the restaurant concept.

4.SYSTEM ARCHITECTURE

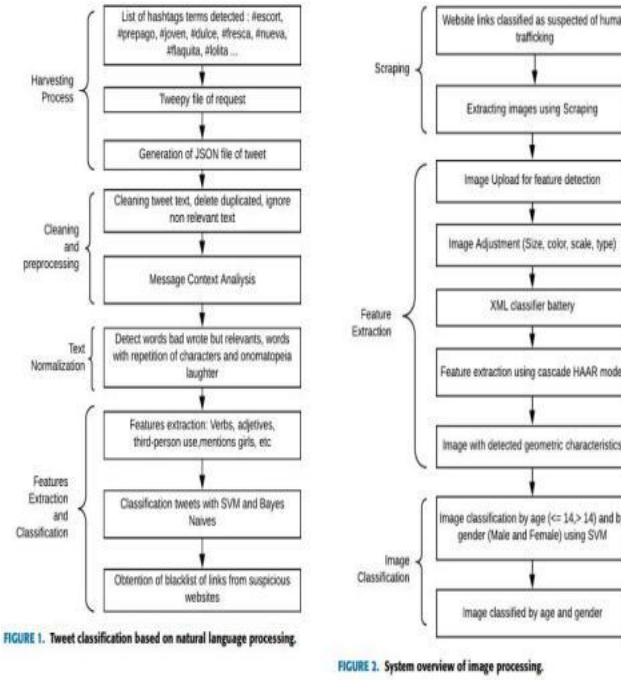

Figure 1. System Architecture

5.IMPLEMENTATION

In this paper author is describing concept to detect human trafficking by analysing social media text messages with the help of SVM and Naïve Bayes machine learning algorithms. In this paper author first crawling twitter by using words like Lolita, escort and many more and then extracted tweets will go for cleaning to remove special symbols and stop words (words such as the, where, and, an, are etc.) and then tweets will be analyse to extracts words such as VERBS and ADJECTIVE and this words may contains important subjects or suspicious words used by HUMAN TRAFFICKERS (the suspicious words can be chicken soup, girls, penguin and many more. Clean tweets will be given input to SVM and Naïve Bayes classifier to detect suspicious words.

If any tweet contains suspicious words then that tweet website will be scanned for images and each image will be processed through SVM HAARCASCADE classifier to detect face from that image and same algorithm will be used to detect upper body and both resultant images will be input to CNN (Convolution Neural Networks) classifier which will detect or predict AGE and GENDER from the resultant images. In this paper we are detecting gender as MALE and FEMALE and AGE will predicted with two classes as UNDER 14 Years or OVER 14 Years.

Note: To run this project your system must connect to internet to crawl twitter and to scrape websites for image

This project consists of following modules

1) Online Crawl Twitter: In this module we can enter HASHTAG and then application will crawl twitter using TWEEPY API to read all tweets from given hashtag.
2) Offline Upload Twitter Dataset: In this module if you don't want to crawl twitter then you can upload existing twitter dataset.
3) Clean Tweets & Extract Features: using this module each tweet will be processed to remove special symbols and stop words and then extract VERBS and ADJECTIVES and the clean tweets will be feed to SVM and Naïve Bayes algorithm. In both SVM and Naïve Bayes algorithms SVM is giving better suspicious tweets detection result.
4) Suspicious Tweets Classification using SVM & Naive Bayes: using this module we will input clean tweets to SVM and Naïve Bayes algorithms and then the application will divide entire data into train and test parts where 80% data will be used for training and 20% data will be used for testing. First by using 80% data algorithms will be trained and generate a model. A trained model will be applied on test data to calculate prediction accuracy, precision, recall and FSCORE.
5) SVM & CNN Classification for Gender & age Prediction: After detecting suspicious tweets then each suspicious tweet website will be scan to read all images and then from that image face and upper body part will be extracted using SVM classifier and the resultant images will be input to CNN to predict AGE and GENDER.
6) Comparison Graph: in this module we are displaying comparison graph between SVM and Naïve Bayes in the form of precision, recall and FSCORE.

6.RESULTS

To run project double click on 'run.bat' file to get below screen

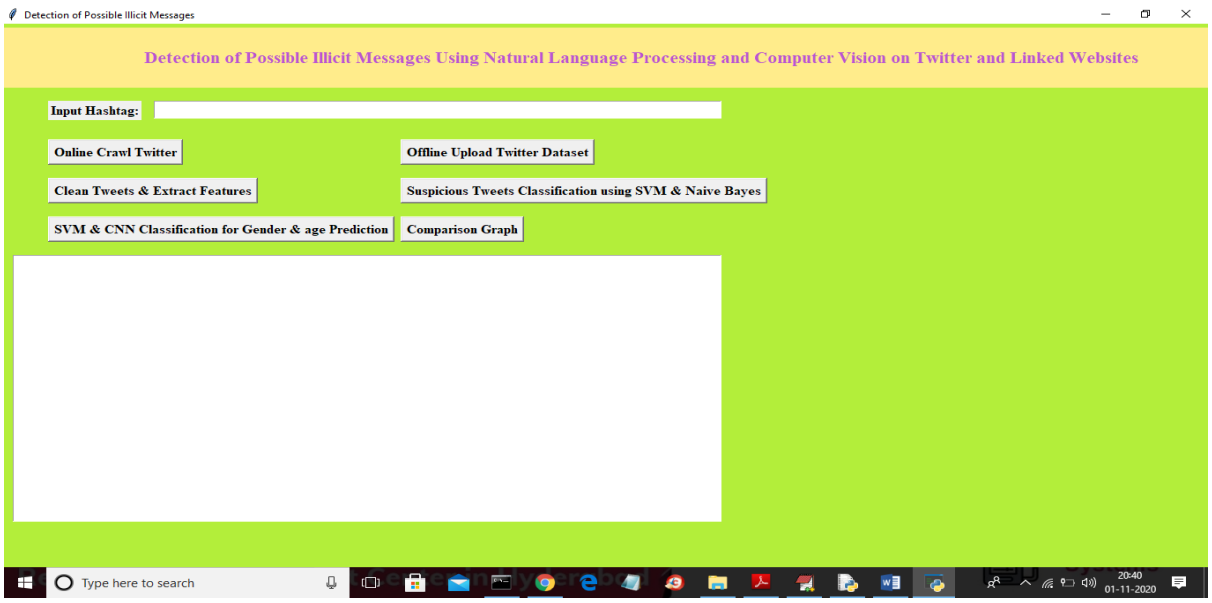

Figure 2.Home Screen

In above screen enter hashtag and then click on 'Online Crawl Twitter' button to start crawling.

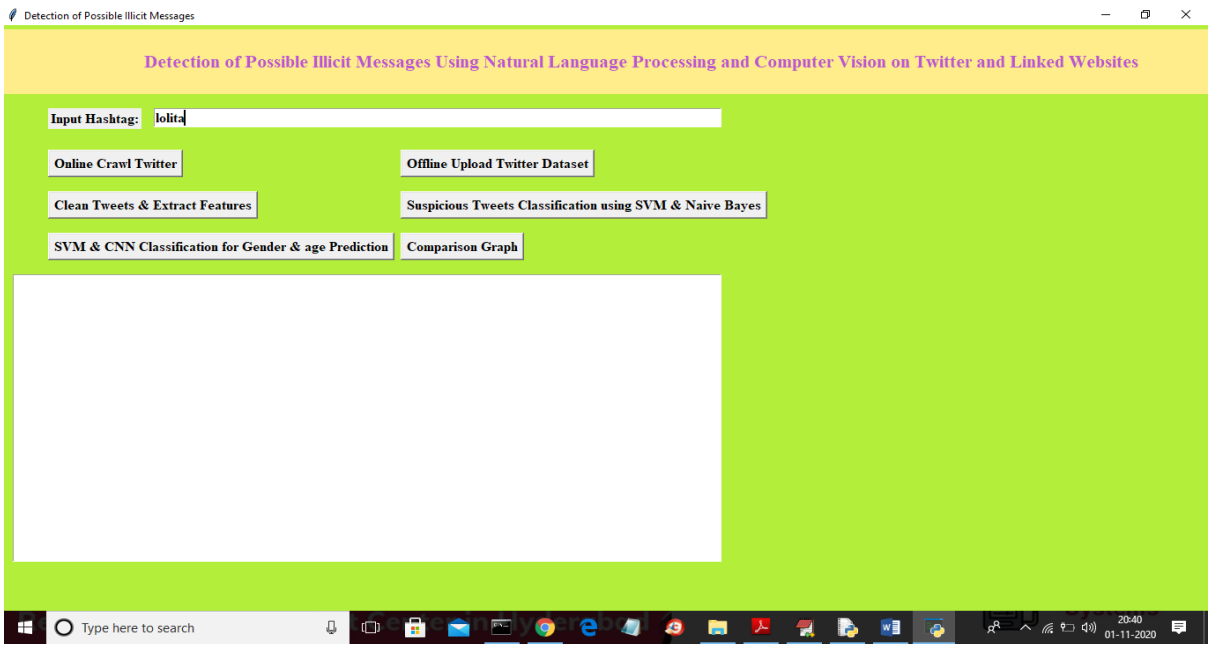

Figure 3.Add Twitter Screen

In above screen I entered hashtag as 'lolita' and the press 'Online Crawl Twitter' button to start crawling. In below black screen we can see crawling started and I am displaying tweet date and tweet text

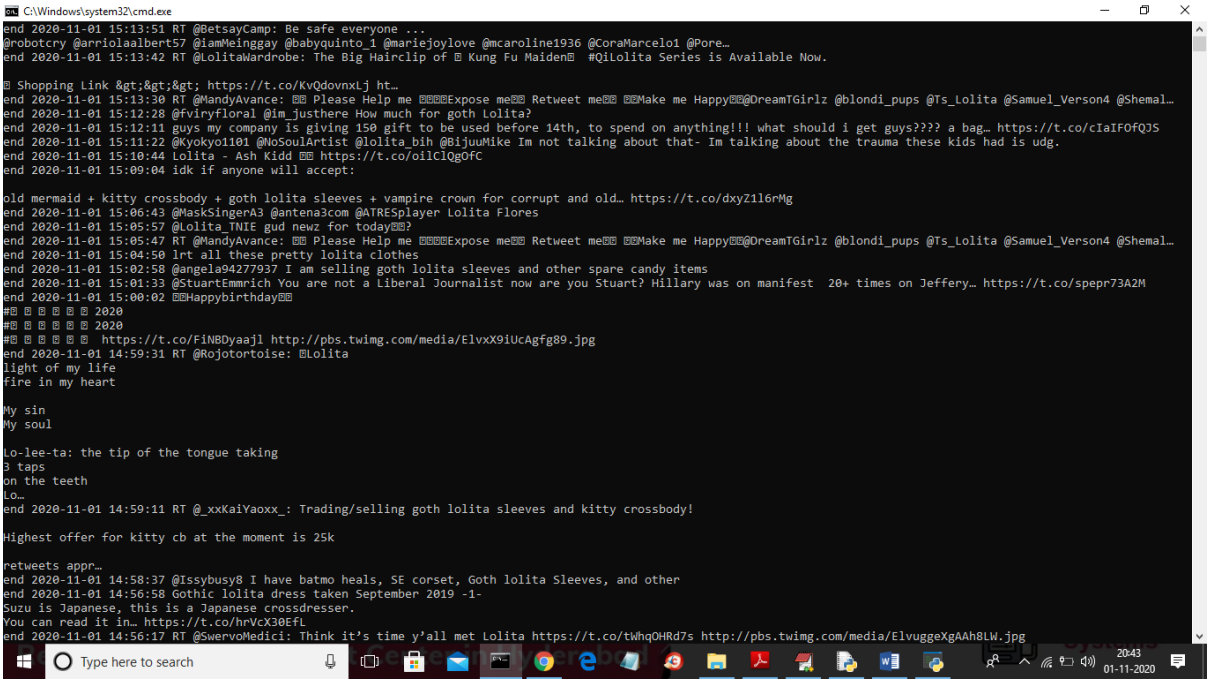

Figure 4.Console Screen

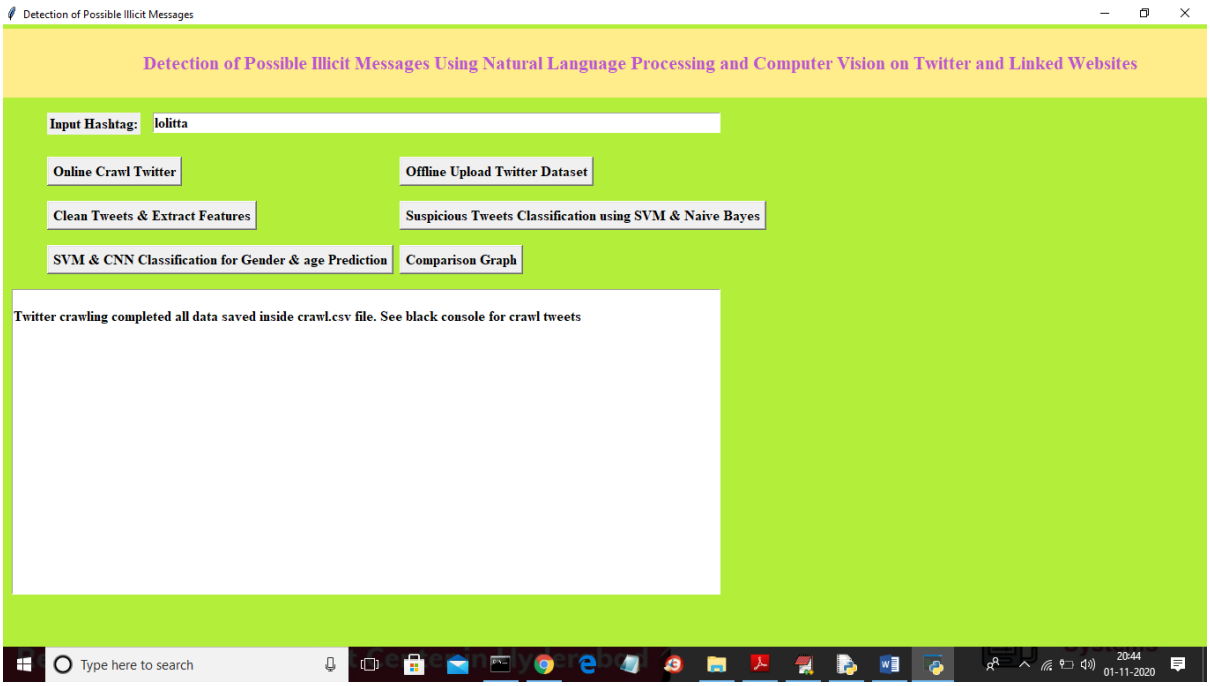

Figure 5.Twitter Details Screen

In above screen we can see status message as twitter crawling complete and now click on ‘Clean Tweets & Extract Features

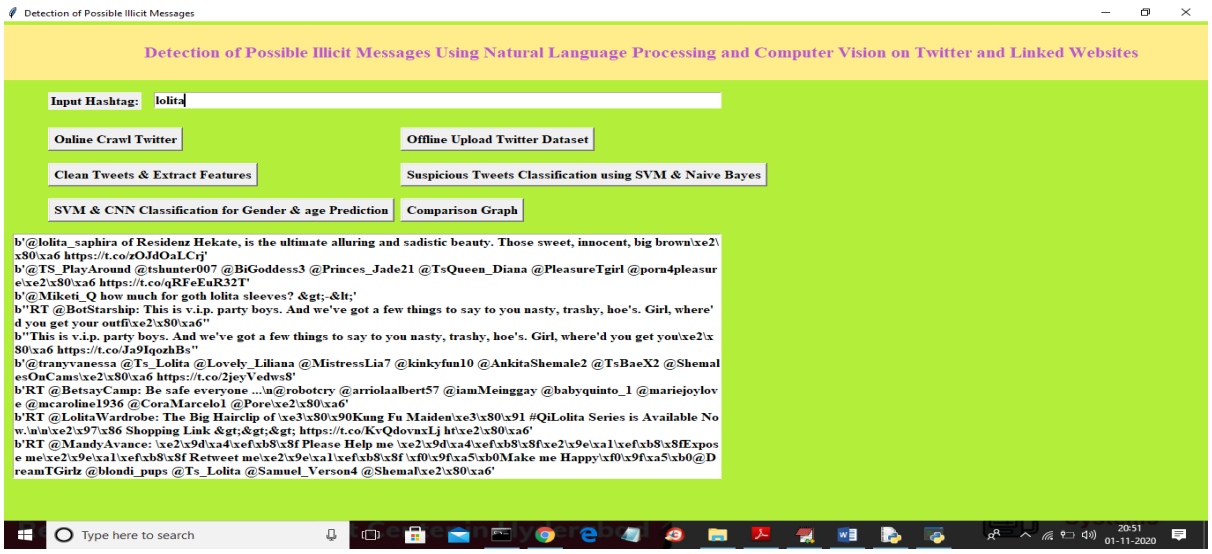

Figure 6. Clean Tweets & Extract Features Screen

In above screen we can see each raw tweets that get processed for cleaning and now clean tweets are ready and to detect suspicious words click on ‘Suspicious Tweets Classification using SVM & Naive Bayes’ button to apply SVM and Naïve Bayes on each tweet to get suspicious words

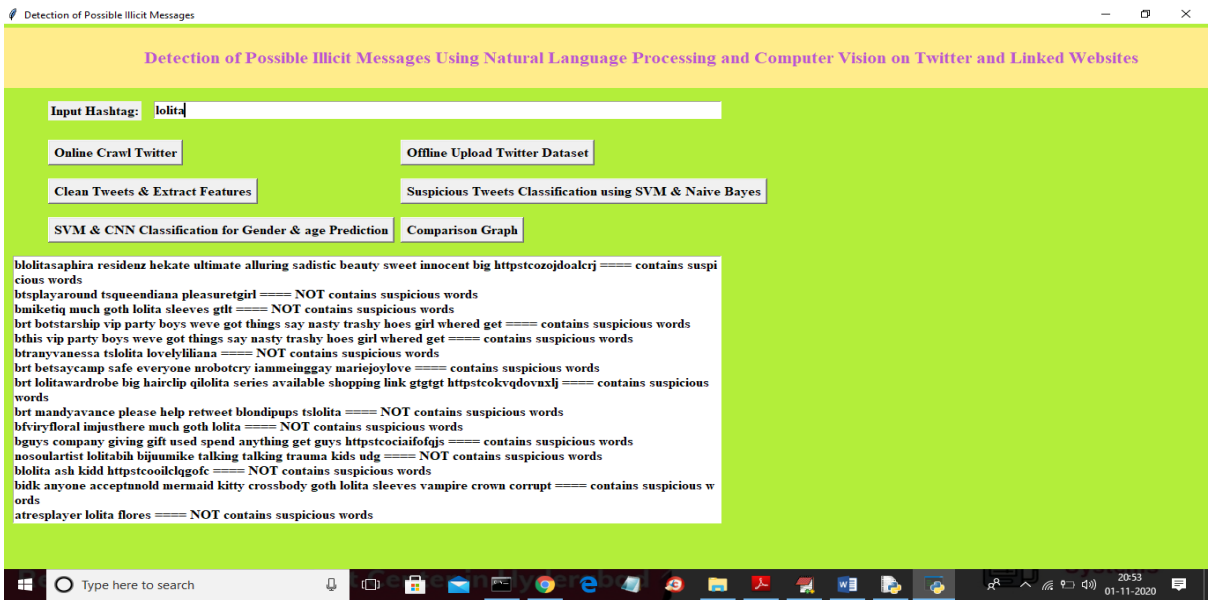

Figure 7. Suspicious Tweets SVM and Naïve Bayes Screen

In above screen displaying each cleaned tweets and after equal to symbol displaying detected result as contains suspicious words or not. Now we have tweets which contains suspicious words and now click on 'SVM & CNN Classification for Gender & age Prediction' button to scrape each tweets website to read image and the predict AGE and GENDER from images

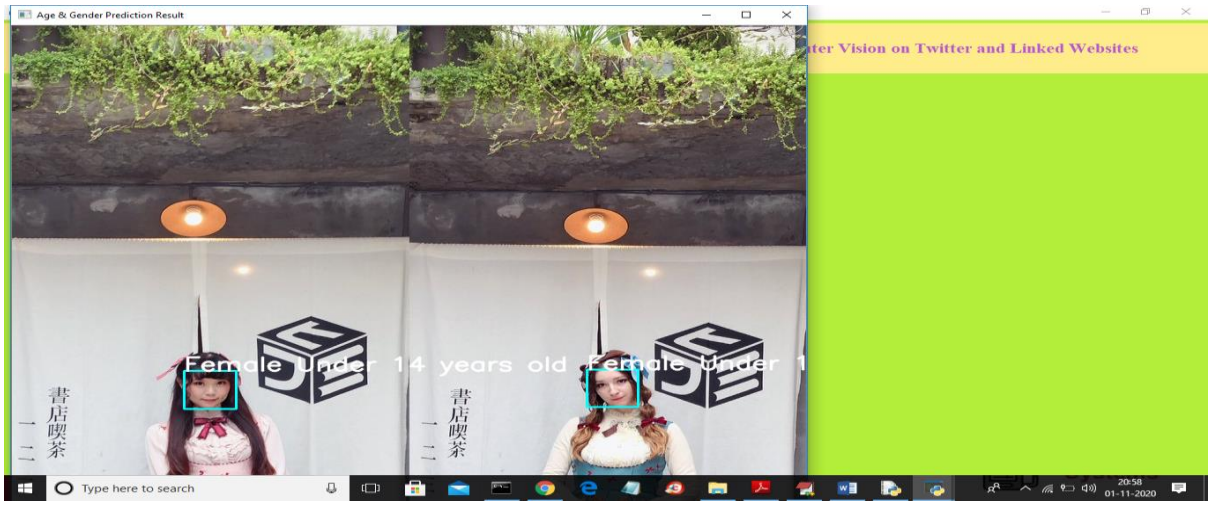

Figure 8.Gender Classification Screen

In above screen application detected face and then displaying female under 14 years and application repeats above steps for all tweets and below see another image

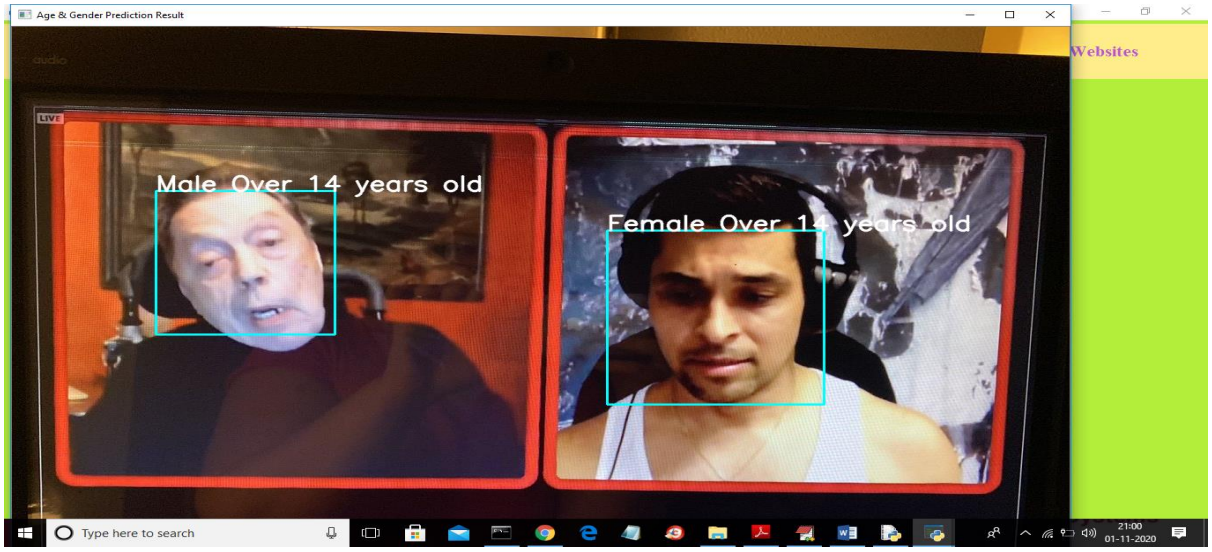

Figure 9.Age Classification Screen

In above screen we can see the result of another image

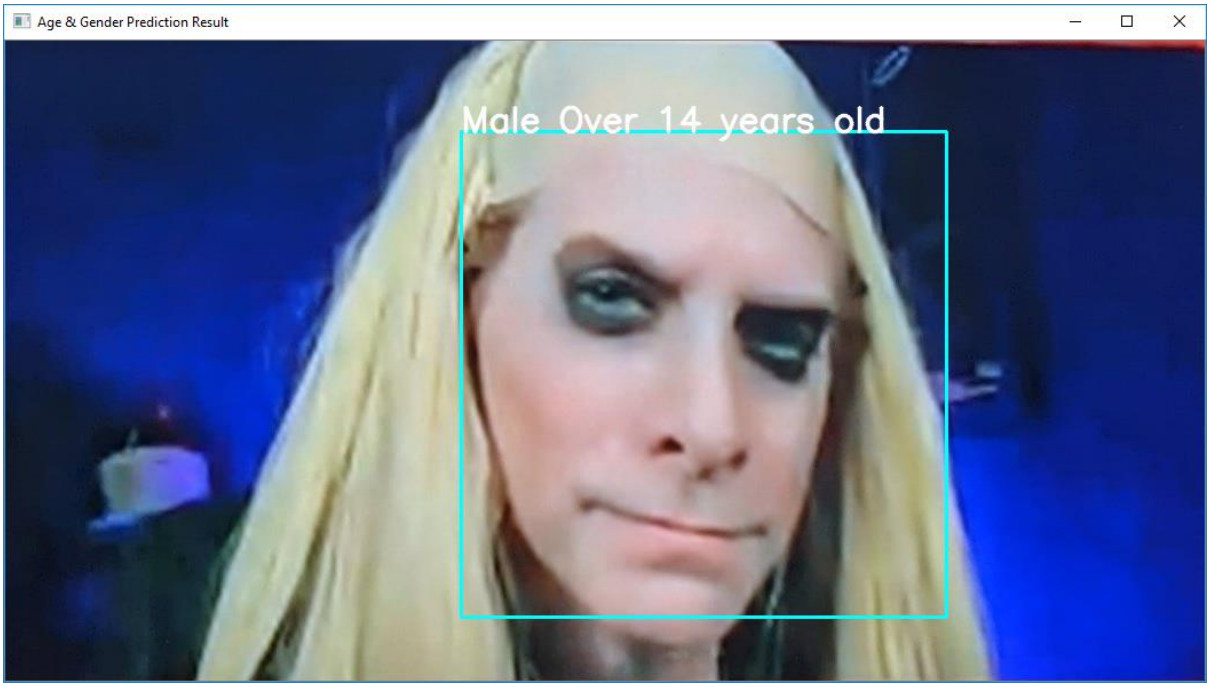

Figure 10. Age Classification Screen

Figure 11. Age Classification Screen

Note: No algorithms are 100% perfect to detect accurate faces and gender and so our algorithms also give 70% correct prediction as I have not trained model with

huge number of epoch. We need super computers to train dataset with more than 1000 epochs and will take days of time to trained model. Due to that reason our model will predict 70% correctly.

Now click on 'Comparison Graph' button to get below graph

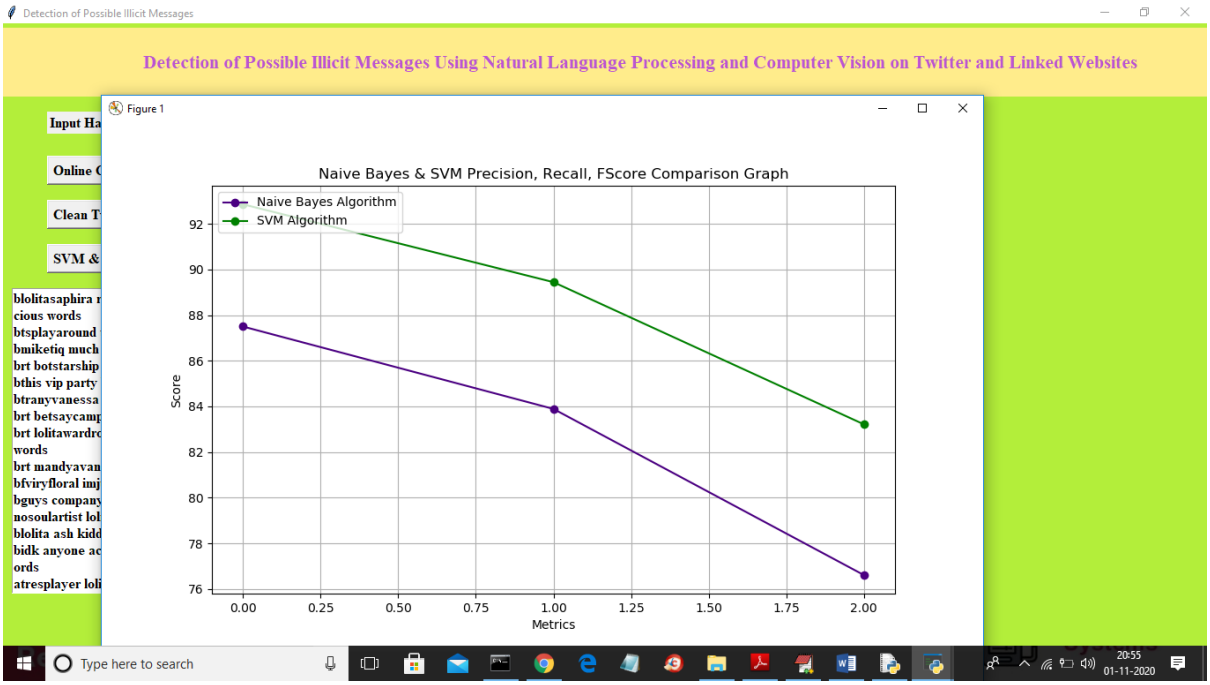

Figure 12. Comparison Graph Screen

In above graph blue line represents Naïve Bayes precision, recall and FScore and green line represents for SVM. In above graph x-axis contains precision, recall and FScore and y-axis represents its values. From above graph we can conclude that SVM is giving better performance.

7.CONCLUSION

Face recognition algorithms and machine learning models have been improved during the last years. For example, in the ILSVRC competition, an accuracy value of 90% +− 5% was obtained. In these conditions, machine learning recognition can be similar to visual object recognition used by human beings. Many factors have a direct impact on image recognition, such as size, color, opacity, resolution, kind of image format, among others. Therefore, the results of image recognition and classification depend on the dataset quality.

In this work, we probed that satisfactory performance can be obtained using just

geometric features of the torso and not only facial characteristics. For this paper, Haar filters combined with an SVM classifier were used for the extraction process of features, and then we classified the age group and gender with an SVM classifier. The obtained results were compared with the outcomes of a CNN algorithm.

SVM is a model widely accepted, and in this work, we obtained a classification accuracy higher than 80% for both experiments (face and upper body), not only for gender classification but also for age group classification. In this paper, our main contribution is the image classification based on the upper body to predict the age group to detect human trafficking.

To the best of our knowledge, this work is the first approach related to image classification without facial features but just the upper-body geometric characteristics. Currently, there is no similar research that takes into account only the upper body features of minors. Thus, the results of this paper can be applied to human trafficking, disappearance, kidnapping, among others. Moreover, the obtained information can be used by the police or other security institutions.

8.FUTURE WORK

Finally, future work includes: 1) the study of some characteristics related to ethnic and racial features, 2) to extend the proposal to extract geometric features of the entire body, another kind of images, or inclusive videos in different formats, 3) detection of medical issues by means the analysis of features extracted from torso images, legs, back, among other characteristics, and 4) the use of other algorithms or the applicability in other networks like Instagram.

9.REFERENCES

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