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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

There is a worldwide epidemic of human trafficking that diminishes the self-respect of millions of victims. When it comes to promoting illegal services on social media, covert communications are being utilized to spread the word. As resources for law enforcement are limited, it is critical that messages that may be connected to this crime and serve as clues be automatically detected. In this paper, we use natural language processing to identify Twitter tweets that potentially promote illegal services and exploit kids. It is now feasible to identify photos of children as young as 14 years old among the images and URLs identified in suspicious messages. We followed this procedure to conduct our research. The first step is to mine real-time tweets using hashtags relating to minors. After the tweets have been cleaned out of extraneous noise and typos, they are either labeled as suspicious or not. Haar models are also used to select facial and torso geometric features. We can recognize gender and age group by using Support Vector Machine (SVM) and Convolutional Neural Network (CNN), even when the facial details are blurred, by using torso information and its proportional relationship with the head. Because of this, the SVM model with just torso features outperforms CNN.

Keywords :- Support Vector Machine (SVM) and Convolutional Neural Network (CNN).

I. INTRODUCTION

Websites were isolated and just intended to be read at first since users couldn't actually connect with the web. However, with the emergence of web 2.0, the user's position in social media platforms such as Facebook, Twitter, and Instagram transformed from that of a passive observer to that of an active participant. Some nations, such as Latin American countries, have the highest percentage of smuggling persons for illicit activities such as human trafficking and smuggling children and adolescents under the age of 14. Because the average consent age in Latin American nations is 14 years old, underage persons forced into prostitution or forced into prostitution in Latin American countries are undoubtedly victims of human trafficking. Escort

and similar services are already accessible on Twitter, where young ladies are offered for "customers'" consumption. These females are frequently subjected to physical, psychological, and sexual abuse.

These'sexual services,' promoted on social media by criminal gangs, conceal their criminal conduct under ostensibly benign terms like "Chicken Soup," which alludes to child pornography. Victims of this crime, often youngsters, are utilized by criminals who use websites and social media to spread the word about illegal services. Despite previous efforts to filter tweets and photographs for illegal material, the majority of the work depends on natural language processing or computer vision.

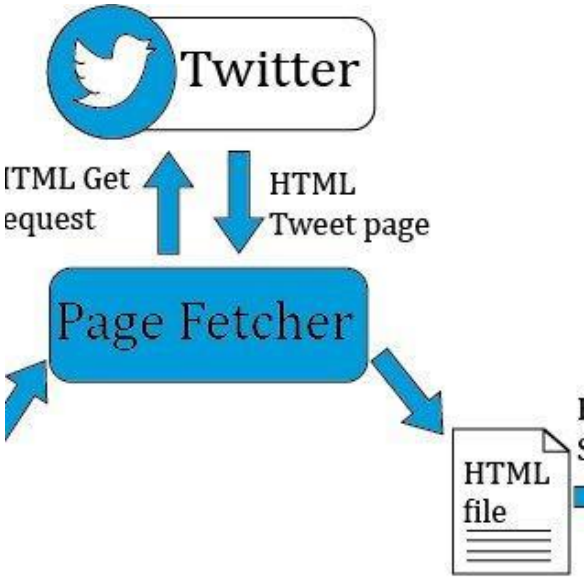

Fig.1 : Example Figure

However, there is a clear distinction in how text and visuals are handled. This study's researchers are interested in automatically detecting possibly harmful content in web ads. To achieve this purpose, they use 10,000 ads that have been carefully labeled. This research classifies both text and image-based advertising, and the analysis includes both types of data. The F1 result for the Human Trafficking Deep Network, a deep multimodal model, was 75.3 %, with a recall of 70.9 %.

Existing image classification systems, on the other hand, depend primarily on face data, ignoring the fact that most images have blurred portraiture. With 86.64 percent accuracy, a computer vision system can detect an individual's age. SVM and CNN classification algorithms are often used to determine a person's gender.

On the other hand, existing picture classification techniques exclusively employ facial information, ignoring the fact that most photographs have the face blurred. The authors of forecast age with an approximate accuracy of 86.64 percent using computer vision techniques. SVM and CNN classification models are employed in to determine a person's gender. To the best of our knowledge, no studies examine upper body (upper torso) traits in photos to define age groups.

II. LITERATURE REVIEW

2.1 A non-parametric learning approach to identify online human trafficking

Human trafficking is one of the most complex law enforcement concerns, requiring a global effort to combat. In this paper, we use publicly accessible data from the classified ad website "Backpage" to discover plausible patterns of online human trafficking activity and the most likely advertisements related with trafficking. We must rely on two human analysts to hand-label the little quantity of crawled data: a human trafficking survivor and a law enforcement officer. Then, an unsupervised learning system is demonstrated, which is taught on labelled and

unlabeled data before being assessed on previously unknown data with the assistance of experts.

2.2 A new algorithm for age recognition from facial images

This work provides an age-group recognition algorithm based on frontal face pictures. The algorithm's four primary stages include pre-processing, extraction of facial features using a unique geometric feature-based technique, analysis of facial features, and age classification. To utilise the approach, we require a face image database that provides age-related information about the people in the photographs. The unavailability of such a database drove us to create our own, which we termed the Iranian face database (IFDB). The IFDB holds digital photos of people ranging in age from one year to eighty-five years. Following pre-processing, the essential features of a database may be consistently determined. Finally, a neural network is used to classify face parameters such as wrinkle density and ratios.According to the results of an experiment, the system accurately classifies the age range with a precision of 86.64 percent.

2.3 Detecting deception in text: A corpus-driven approach

Deception is an ubiquitous psycholinguistic phenomena that ranges from false site reviews to lying in court. It has been studied for millennia, from the ancient Chinese technique of spitting dry rice to today's polygraph. As a result of the current surge in bogus online assessments, there has been an increase in demand for automated deception screening systems. Human performance is often prone to chance, but earlier research shows that the linguistic signals produced by purposeful deception are adequate for constructing automatic systems capable of distinguishing between false and real articles. We are intrigued in deception detection, and we believe that the encouraging findings in automatic deception detection are mostly due to the side effects of corpus-specific traits.We established the BLT-C, the world's biggest publicly available shared multidimensional deception corpus for online reviews, for this purpose (Boulder Lies and Truths Corpus). To assist overcome the inherent lack of ground truth, a set of semi-automatic procedures for verifying corpus validity has been developed. It is proved in this thesis that detecting deception using supervised machine learning algorithms is prone to mistakes. The accuracy of this corpus has been demonstrated to vary depending on the type of deception and the content aspects of the text (e.g., sentiment) analyzed, exposing the limitations of previous studies.

2.4 A text-based deception detection model for cybercrime

While text messages are so prevalent, incidents of cybercrime including text-based deceptive talk are on the rise. In cybercriminal networks, we utilize machine learning and linguistic techniques to identify fraud in text communications. We create cybercrime detection algorithms based on online genres. Our contributions are as follows: models trained in scams in social media web genre identify fraud in email web genre communications with 60% predictive accuracy; models trained in fraud in email genre predict scams in social media web genre with 50% predictive accuracy. Because of the language variances of hackers in this study, the forecast for the email model is encouraging. We also show how to build cybercrime detection models utilising characteristics from natural language processing and linguistic psychological processes related to cybercrime.

III. IMPLEMENTATION

Human trafficking is a global issue that deprives millions of people of their dignity. Currently, social networking sites are being utilised to disseminate this crime online through the use of hidden messages that offer unlawful services. Given the limited resources available to law enforcement, it is critical to

automatically recognise messages that may be relevant to the crime and may potentially serve as clues.

IV. DISADVANTAGES OF EXISTING SYSTEM

Although there have been prior attempts to detect unlawful content via twitter filtering and picture classification, the most of them have relied on natural language processing or computer vision techniques.

PROPOSED SYSTEM

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.

ADVANTAGES OF PROPOSED SYSTEM

The image categorization process is done through a training phase and a testing phase using predictive models such as Vector Support Machine (SVM) and Convolutional Neural Networks (CNN).

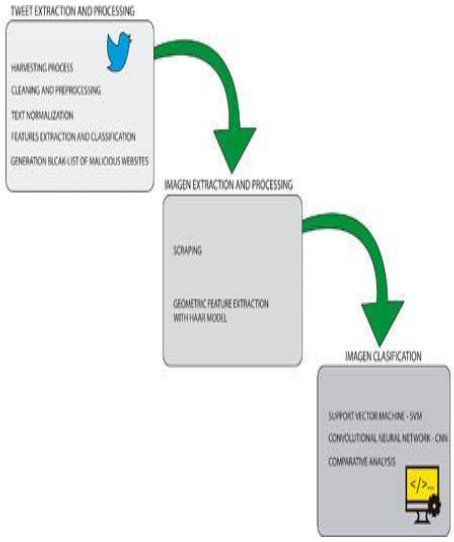

Fig.2: System architecture

The entire procedure of detecting potentially unlawful messages relating to human trafficking is described. The first step is to use natural language processing to analyse and classify tweets. After that, a blacklist of suspect websites is produced. Finally, using Haar filters and SVM or CNN classifiers, the photos associated with the questionable websites are analysed and categorised.
MODULES:

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.

V. ALGORITHM

SVM:

Support Vector Machine(SVM) is a supervised machine learning algorithm used for both classification and regression. Though we say regression problems as well its best suited for classification. The objective of SVM algorithm is to find a hyperplane in an N-dimensional space that distinctly classifies the data points. The dimension of the hyperplane depends upon the number of features. If the number of input features is two, then the hyperplane is just a line. If the number of input features is three, then the hyperplane becomes a 2-D plane. It becomes difficult to imagine when the number of features exceeds three.

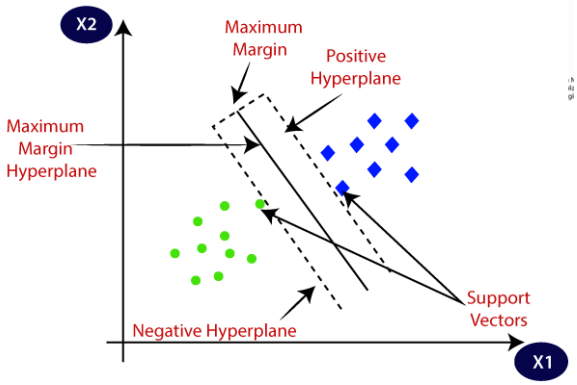

Fig.3 : SVM model

The SVM kernel is a function that takes low dimensional input space and transforms it into higher-dimensional space, ie it converts not separable problem to separable problem. It is mostly useful in non-linear separation problems. Simply put the kernel, it does some extremely complex data transformations then finds out the process to separate the data based on the labels or outputs defined.

Advantages of SVM:

Effective in high dimensional cases

Its memory efficient as it uses a subset of training points in the decision function called support vectors

Different kernel functions can be specified for the decision functions and its possible to specify custom kernels

CNN:

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. CNNs are used for image classification and recognition because of its high accuracy. It was proposed by computer scientist Yann LeCun in the late 90s, when he was inspired from the human visual perception of recognizing things. A Convolutional neural network (CNN) is a neural network that has one or more convolutional layers and are used mainly for image processing, classification, segmentation and also for other auto correlated data.

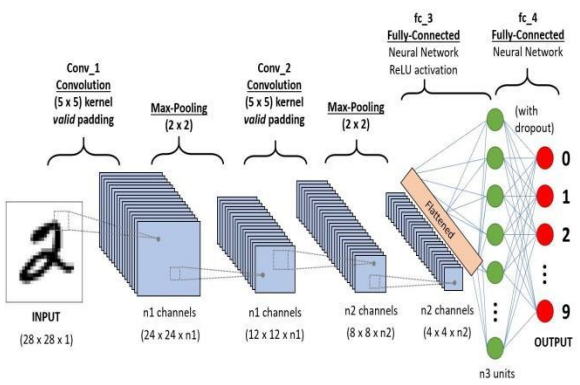

Fig.4: CNN model

Step by Step Guide

Step 1: Choose a Dataset. ...

Step 2: Prepare Dataset for Training. ...

Step 3: Create Training Data. ...

Step 4: Shuffle the Dataset. ...

Step 5: Assigning Labels and Features. ...

Step 6: Normalising X and converting labels to categorical data. ...

Step 7: Split X and Y for use in CNN.

VI. EXPERIMENTAL RESULTS

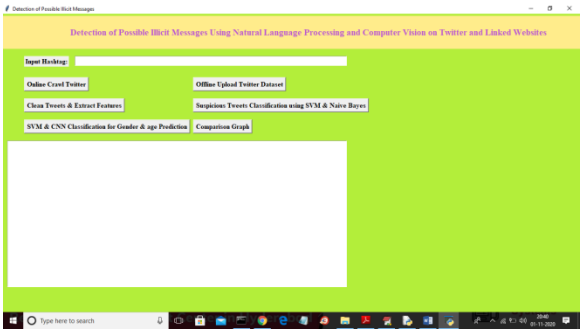

Fig.5: Home screen

In the above page, I input the hashtag 'lolita' and then clicked the 'Online Crawl Twitter' button to begin crawling. Crawling has begun in the dark screen below, and I am showing the tweet date and text.

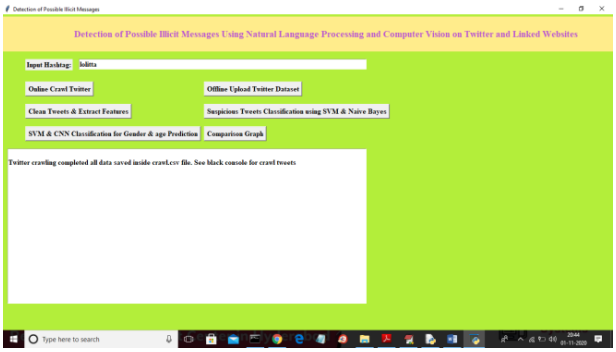

Fig.6: Clean tweets

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

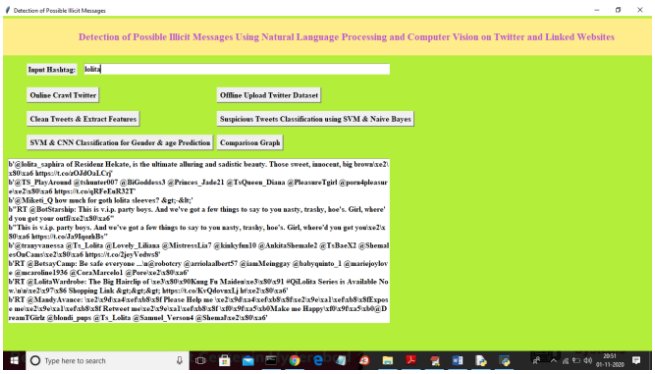

Fig.7: Features extracted

On the screen above, we can see each raw tweet that was processed for cleaning, and now clean tweets are available for detection of problematic terms. To classify suspicious tweets using SVM and Naive Bayes, click the 'Suspicious Tweets Classification Using SVM & Naive Bayes' button.

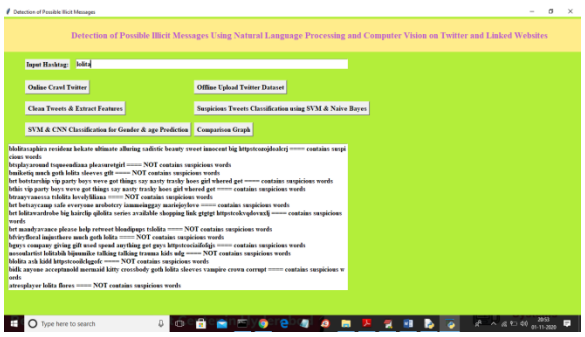

Fig.8: Suspicious Tweets Classification using SVM & Naive Bayes

In the above screen, each cleaned tweet is displayed, and following equal to symbol, the detected result is displayed as whether it includes suspicious terms or not. Now that we have tweets with suspicious terms, click on the 'SVM & CNN Classification for Gender & Age Prediction' button to scrape each tweet's website to read the picture and predict the AGE and GENDER from the photographs.

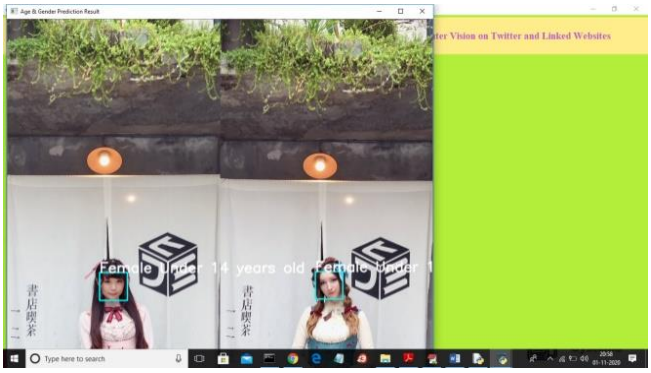

Fig.9: SVM & CNN Classification for Gender & age Prediction

In above screen application detected face and then displaying female under 14 years and application repeats above steps for all tweets.

Fig.10: Comparison graph

The blue line in the graph above indicates Nave Bayes precision, recall, and FScore, whereas the green line represents SVM. The x-axis in the graph above comprises precision, recall, and FScore values, while the y-axis indicates their values. We may deduce from the graph above that SVM provides superior results.

VII. CONCLUSION

In recent years, advances have been made in face recognition algorithms and machine learning models. The ILSVRC competition, for instance, yielded an accuracy score of 90% +/- 5% Machine learning object identification can be comparable to human visual object recognition under these circumstances. There are many elements that affect image recognition, including the image's size, color and opacity, as well as its resolution and the type of image format. Therefore, the quality of the dataset is critical to the results of picture recognition and classification. During this investigation, we found that a sufficient performance can be achieved using simply the torso's geometric properties instead of facial traits. For this study, we employed Haar filters and an SVM classifier to extract features, and then we used an SVM classifier to classify the age group and gender. The results were compared to the results of a CNN algorithm, and the results were found to be similar. For both trials (facial and upper body), we achieved a classification accuracy of more than 80% using the widely established SVM model, and this was true not just for classifying people by gender but also for classifying people based on their age. Image categorization based on the upper body is the key contribution of this paper, which aims to detect human trafficking. To our knowledge, this is the first attempt to classify images based only on upper-body geometric properties without regard to facial features. There is currently no research that just considers minors' upper body traits. Human trafficking, kidnapping, disappearance, and the like can all benefit from the findings of this study. The collected data can also be used by law enforcement and other security agencies.

VIII. FUTURE SCOPE

Finally, future work will include: 1) the investigation of some ethnic and racial characteristics, 2) the extension of the proposal to extract geometric features

of the entire body, other types of images, or inclusive videos in various formats, 3) the detection of medical issues through the analysis of features extracted from torso images, legs, and back, among other characteristics, and 4) the use of other algorithms or the applicability in other networks such as Instagram.

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