Comparison Analysis and Data Retrieval to identify the associated people of Instagram by Image Processing

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Abstract*— Instagram has become a fastest growing social network in the last three years. It let the users to share their status by uploading images with a descriptive text, a location, and certain hashtags that do not necessarily represent the substance of the pictures. So now Instagram has become a most popular photo-sharing website. While it is a relatively simple service, Instagram's simplicity has contributed to its worldwide success. But unfortunately, some people misuse this website for unethical activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc. Therefore, this work is to recognize the suitable technologies that can be used to retrieve and analyze image data from Instagram such as Demographic analysis, Text analysis, Image analysis, Snowball Technology and some of the face recognition technologies used in iPhone photos , face recognition technologies such as Eigenfaces technology, Neural Networks, Graph Matching, Line Edge Mapping for a system to retrieve and analyze image data from Instagram and to identify the most associated people of a certain Instagram user.

Keywords— ***Instagram, Social network, Face Recognition, Neural Networks, retrieve and analyze image data, Demographic analysis***

I. INTRODUCTION

In the modern world, social media has become an extremely important part of our lives. Social media applications such as Facebook, Instagram, WhatsApp, and Twitter have become indispensable to everyone. So, when concerning about Instagram, people share thousands of images, posts, comments on their accounts. But sometimes these images, posts, or the comments influence for the national security of a country. This means some people misuse Instagram for some of the illegal activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc. Unfortunately, some of these illegal activities causes for the murders, crimes, or suicides also.

Especially when concerning about Sri Lanka, day by day these kinds of illegal activities are rising. So, it is very important to develop a system to retrieve the data from Instagram accounts and analyze that data to identify the mostly associated people of a certain account.

In present, as some people use Instagram for illegal activities such as sharing false propaganda and fake news, terrorist activities, unethical religious activities, illicit drug distributions etc., many of the times it affects for murders, crimes, or the suicides also. So, to eliminate these types of issues, we may develop a new system that analyses data in a specific user's Instagram account and predict the most associated people with that Instagram account. In here, this system is mainly focusing on developing an algorithm with image processing to recognize the faces of the extracted images and predict the percentages of the mostly associated people. Finally, this system will display the images of most associated people of a certain Instagram user.

So, before the implementation of a system to retrieve data from Instagram and analyze to identify the associated people of Instagram by Image processing we must do a literature review. By this review we present the advantages and drawbacks of some of the data retrieving and analyzing methods and some of the face recognition algorithms, to understands the most suitable technologies for the system that is to be built.

II. LITERATURE REVIEW

This section gives an overview on literature for several existing data retrieving and analyzing technologies and methods such as Demographic analysis, Text analysis, Image analysis, Snowballing method, Coding rules: binary coding and Regression analysis etc. And also, the face recognition algorithms used in iPhone photos, Eigenfaces technology, Neural Networks, Graph Matching technology and Line Edge Mapping Technology.

A. Data Retrieving and Analyzing

There are many research that have been done to retrieve many kinds of data from Instagram and analyze them and identify the relevant details of a certain Instagram image.
According to the study of Pang et al.[1] [2] it says that Instagram can be used for demographic analysis, text analysis, image analysis, and age detection. In this work the demographic had been analyzed by the images with various face detection and face analysis technologies. The tags that are corresponding with the images were examined. Penetration has been accomplished via studying the followers of the brand, as well as drinking behaviors.

Then according to the research by Park et al.[1] it says that Snowballing method ,Coding rules: binary coding and Regression analysis can be done with Instagram.[2] To investigate the association between sexual pictures and social involvement, a quantitative method is applied. The number of likes was also utilized. The snowballing approach was used to acquire visual data from individuals. The photos were self-coded using a binary coding method. The behavior of users was examined using regression analysis.

According to a research done by Hosseinmardi et al.[3] Fivefold cross validation , logistic regression classifier with forward feature selection approach can be performed for Instagram.[1] Data is gathered from the very first posts. A predictor was trained using LRC. Instagram comments, photos, and followers were utilized to assess the behavior. The emphasis was on unigrams and bigrams.

When considering the research INSTAFIER it is an Instagram profile verifier.[4] According to the method used in this work they examine an Instagram profile and provide a comprehensive analysis of the account by displaying pie charts for each factor test. So, these pie charts make it easier to learn more about the account.

B. Face Recognition Technologies

a) Face Recognition Technologies use in iPhone Photos

Face recognition and image similarity checking process is mainly used in iPhone photos. Apple initially invented face detection accessible in the Core Image framework as a public API via the CIDetector class. Also this API was utilized by Apple internally in the applications such as Photos. The Viola-Jones detection technique was utilized in the first version of CIDetector.[5]. When they started functioning on a deep learning method to recognizing faces in photos in 2014, Deep convolutional networks (DCN) were only getting started to show promise on tasks that require object recognition. The highly significant of them was a method known as "Overeat" [7] which popularized several simple principles that demonstrated DCNs were highly efficient at scanning a picture for an item. Another technology known as network-in-network [8] is also employed. Utilizing such a network in the previously proposed picture scanning technology would be absolutely unfeasible. They resulted in low efficiency and excessive energy consumption. They wouldn't even being able to save the network into the memory. With that, they tried to approach a technique known as "teacher-student" training [9]. This method offered them with a methodology for training a second thin-and-deep network (the "student") in such a way that the outputs of the enormous, complicated network (the "teacher") that we had trained matched extremely closely. Finally, they developed a deep neural network technique for facial identification which could be executed on-device. They went through numerous cycles of training to get a network model precise enough to support the intended applications. While this network proved accurate and practicable, a significant amount of work had to be done before it could be deployed on millions of consumer devices [10].

b) Eigenfaces

Eigenface is another most extensively researched techniques that is used for facial recognition. Also, it is referred to as the Karhunen-Loève expansion, eigen picture, eigenvector, and primary component. Principal component analysis was employed in references [6], [7] to effectively portray photographs of people's faces. They contended that each face image could be roughly recreated using a simple set of weights for each face and a typical picture of the face or the eigenpicture. By placing the face image on the eigenpicture, the weights characterizing each face are acquired. Reference [8] employed eigenfaces for face detection and identification, which was inspired by Kirby and Sirovich's method. They said that a face image may be roughly recreated using a minimal set of weights for each face and a typical face photo. By projecting the face image onto the Eigen picture, the weights characterizing each face are acquired.

c) Neural Networks

The desirability of employing neural networks may be related to the nonlinearity of the networks. Because of this, the stage of feature extraction may be more quicker than the linear Karhunen-Loève approaches. WISARD, a network with only one layer of adaptation with a different network for each stored individual, was one of the earliest artificial neural network approaches which is utilized for facial recognition [9]. The method used to build a structure of neural network is crucial for good recognition. It is heavily influenced by the intended use. Face detection has been accomplished using multilayer perceptron [10] and convolutional neural network [11]. A hybrid neural network combining local image sampling, a self-organizing map (SOM) neural network, and a convolutional neural network was proposed in reference [11]. The SOM quantizes picture samples into a spatial area where the input data that are close in the original space are similarly close in the output domain, resulting in dimensional reducing and invariable to slight alterations in the picture sample. In a hierarchical series of layers, the convolutional network captures gradually bigger features and gives partial invariance to translation, rotation, scaling, and deformation.
The PDNN [7] learning scheme is divided into two parts. During the first stage, each subdomain is taught using its own images of the face. The subdomain parameters can be learned by certain specific sample data that was collected from different classes of the faces in the second phase, known as learning based on decisions. The strategy of learning based on decisions doesn’t train using all of the training examples. Only patterns that have been misclassified are utilized. When any sample is incorrectly categorized to a wrong subdomain, the correct subdomain will adjust its parameters. As a result of which its judgment nearer to the incorrectly classified sample.

The benefits of both the statistical techniques and neural networks are combined in a PDBNN-based biometric identification system, and its shared computing premise is

reasonably simple to execute on a parallel computer. This was stated in [12] that the PDBNN facial recognition system could recognize up to 200 persons and obtain a percentage of 96 correct identification rate in around 1 second. Nevertheless, if the amount of people grows, the cost of computing will rise as time goes on. In generally, neural network techniques run into issues as the number of classes grows. However, they are unsuited for a single model image identification test since training the algorithms to "optimal" parameter values necessitates a large number of model photographs for each individual.

d) Graph Matching

Another method for recognizing faces is graph matching.[13] described a dynamically network structure for deformation resistant object identification that used graph matching to locate the nearest recorded graph Dynamically networked architecture is a variation on traditional artificial neural networks. Objects that were memorized are represented as sparse graphs, the vertices of which are labeled with a multiresolution description in terms of a local power spectrum, and the edges with geometrical distance vectors. Recognition of objects may be expressed as graph matching, that is accomplished by stochastic optimization of a matching cost function. They reported positive results on a database of 87 persons and a tiny collection of office objects consisting of distinct phrases rotated 15 degrees.

On a parallel computer with 23 transputers, the matching procedure is computationally intensive, requiring roughly 25 seconds to compare with 87 stored items. The approach was expanded in reference[7], which matched human faces to a gallery of 112 neutral frontal view faces. Because of the rotation in depth and the shifting face expression, the probe pictures were distorted. On faces with considerable rotation angles, encouraging results were found. They reported recognition rates with the percentage of 86.5 and 66.4 for matching tests of 111 faces rotated 15 degrees and 110 faces rotated 30 degrees to a gallery of 112 neutral frontal images, respectively. In terms of rotation invariance, dynamic link architecture outperforms conventional face recognition systems; nonetheless, the matching procedure is computationally costly.

e) Line Edge Map (LEM)

Edge detail is a helpful object representating element that is relatively insensitive to variations in illumination.
Despite the fact that the edge map is widely utilized in many pattern recognition domains, it has been mostly ignored in face recognition, with the exception of recent work presented in [7].Object edge images might be utilized for object detection and similar to grayscale photographs in terms of accuracy. Edge maps were used in reference [7] to assess the similarity of facial pictures. The accuracy rate was 92 percent. Takács contended that the process of face recognition may begin considerably earlier, and that edge pictures can be utilized to recognize faces without the participation of high-level cognitive capabilities. [14] proposes a Line Edge Mapping technique for extracting lines as features from a face edge map. This method may be thought of as a hybrid of geometrical feature matching and template matching. The LEM technique not only offers the benefits of methods based on features, it has benefits such as invariance to illumination and minimal memory demand, but it also has an excellent template matching recognition performance.

Line Edge Mapping technology combines structural and spatial information from a face picture by grouping pixels from the face edge map into line segments. After narrowing the edge map, the LEM of a face is generated using a polygonal line fitting procedure [15]. Figure 1 depicts an illustration of a human front face Line Edge Mapping. Because it simply retains the termination points of line segments on curves, the LEM representation requires less storage. Furthermore, as LEM is a middle-level image representing technology that is constructed from a bottom-level edge mapping representation., it is projected to be less susceptible to variations in light. The line segment is the fundamental unit of LEM, which is made up of pixels from the edge map.

A face prefilering approach is presented for use as a preprocess of Line Edge Map that matching in a facial recognition program. The prefilering technique may accelerate the search by lowering the quantity of applicants, and the real matching of the face is only performed on a subset of the models that are remaining.
Experimentations that were done on front view of the faces under controlled or ideal settings show that the suggested Line Edge Map regularly outperforms the edge map. On face databases, LEM successfully identifies a percentage of 100 and 96.43 of the input front views of the faces [14]. Line Edge Map accomplished similarly as the eigenface approach for faces under ideal settings and much better than the eigenface technique for the faces with minor fluctuation of the appearance.

[14] demonstrates that the LEM technique outperforms the eigenface approach for detecting faces in various illumination conditions. The LEM technique is likewise less susceptible to position alterations compared to the eigenface technique, however it is more sensitive to big changes of the expressions on the face.

Figure 1 Line Edge Mapping Illustration

III. ANALYSIS AND DISCUSSION

So, when concerning the above describes data retrieving and analyzing methods in the literature review Snowballing method can be considered as one of the best methods that can be used to collect image data from Instagram.

When concerning Eigenface face recognition technology, it is an effective method for facial recognition. Due to the

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simplicity of its method, the construction of an eigenface recognition system is simple. It saves time and space during processing and storage. PCA decreases an image's dimension size in a short amount of time. There is a strong relationship between the training and recognition data. Many factors influence eigenface correctness. Because it uses the pixel value as a comparison for the projection, the accuracy decreases as the light intensity changes. Image preprocessing is essential to produce a decent outcome. One advantage of this technique is that the eigenfaces are created specifically for certain purposes, making the system extremely efficient. One disadvantage is that it is sensitive to lighting conditions and head position. A disadvantage of PPC is that it takes a long time to find the eigenvectors and eigenvalues.

Neural networks are utilized in a wide range of applications, including pattern identification, character recognition, object recognition, and autonomous robot driving. The basic goal of a neural network in face recognition is to be able to train a system to recognize a complicated class of face patterns. To achieve the optimum performance from the neural network, the number of layers, number of nodes, learning rates, and other parameters must be fine-tuned. Because neural networks are nonlinear in nature, they are a popular tool for face recognition. As a result, the extraction of features may be more advantageous and efficient rather than the Principal Component Analysis. The creators When 400 photos of 40 people were used, the face recognition technique achieved 96.2 percent accuracy. When concerning the classification time, it takes less than 0.5 seconds.

Unlike eigenfaces, the graph matching algorithm treats one vector per face feature. The benefit of this is that if any of the features change or are missing, the individual will still be identified. The data may be readily transferred to a database for storage. When new face photos are added, no further work is required to edit templates because they are already saved in the database. It is able to distinguish a person up to 22 degrees of rotation. The disadvantage of this technique is that it is quite sensitive to lighting conditions, and many graphs must be manually positioned on the face. When there is a major shift in illumination, the recognition rate decreases significantly.

The Line Edge Mapping (LEM) approach offers the benefits of feature-based techniques, such as lighting insensitivity and cheap memory requirements. Also has the benefit that the template matching has a high level of recognition performance. Because it simply retains the termination points of line segments on curves, the LEM representation requires less storage. Furthermore, because Line Edge Mapping is a middle-level image representation built from a bottom-level edge map representation, it is projected to be less susceptible to variations in light. The fundamental unit of Line Edge Mapping technique is the line segment, which is made up of pixels from the edge map. A face pre-filtering technique is described for usage as a pre-process of LEM matching in a face identification application. The pre-filtering procedure can speed up the search by lowering the number of possibilities, and facial LEM matching is only performed on a subset of the remaining models. The only drawback of this technique has been overcome by the specifications of current computer systems and is no longer considered a limitation in any way. Earlier systems had storage capacity issues, making the size of each individual's face template (16 Kilobytes) too large for outmoded computer systems. The application's concurrent multi-threaded processor processes presented a threat to elderly computers as well.

Table 1 Comparison on Face Recognition Technologies

Technology	Advantages	Disadvantage
Eigenfaces	• Simplicity is high. • Effective • Save time and space	• Sensitive to lighting conditions and head position.
Neural Networks	• Accuracy is high. • Feature extraction is more efficient. • Classification time is very low.	• Much storage is needed.
Graph Matching	• if any of the features change or are missing, the people will still be identified	• Sensitive to lighting conditions
Line Edge Map	• Insensitive for the lighting conditions. • Cheap memory requirement.	• Computing requirement and the specifications are high.

So according to the review of above advantages and limitations of the face recognition technologies, the most suitable face recognition technology for this system will be Neural Networks.

IV. CONCLUSION

In present, Instagram has become a most popular social media network among the society. Unfortunately, some people misuse it for many of the illegal activities. Also, some of these illegal activities causes for the murders, crimes, or suicides etc. So, it is very important to develop a system to retrieve the data from Instagram accounts and analyze that data to identify the mostly associated people of a certain account.

Data retrieving, Analyzing and Face recognizing technologies are popularly used in the modern world for many applications. In this review paper various Data

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Retrieving, Analyzing and Facial Recognition algorithms are discussed, along with their benefits and drawbacks. By using this review as a future work, we will implement a system to retrieve Instagram data and analyze them and identify the most associated people of a certain account of Instagram by Image Processing.

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