**SMARTBRIDGE SUMMER INTERNSHIP PROGRAM-2019**

**TEAM NAME :** BINARY BEASTS.

**PROJECT NAME** : SMART SECURITY SYSTEM USING IMAGE RECOGNITION.

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SMART SECURITY SYSTEM USING IMAGE RECOGNITION

# 1. INTRODUCTION:

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Modernization is leading to a remarkable increase number of crimes, especially robbery. In the report, the law enforcement agencies throughout the US showed an overall increase of 1.7 percent in the number of violent crimes, which are brought to their attention for the first 6 months of 2015; and, robbery has been increased by 1 percent from 311,936 cases in 2014 . Therefore, Security systems have a crucial role to safeguard people. It is necessary to have a robust system which can distinguish between people and respond differently based on their privileges.

A number of methods are available for detecting and recognizing faces with various levels of complexities. Face recognition facilitates automation and security. It has already been used in many applications including ID issuance, law enforcement, border control, and many other commercial products. The state-of-art recognizers using convolutional neural networks (CNN) outperform the human’s recognition rate; however, these systems are not automatically improving. Another issue with these systems is that it requires adequate data to be trained before it is actually being deployed. It is essential that the system is robust to recognize people and that the training should be accomplished without much difficulty.

The robustness of face recognition systems depend on the changes in conditions of light or expression or even in the partial blocked of the face can be considered. Several papers have proposed various techniques for face recognition under those conditions. Eigenfaces are variant extracted feature to above factors. Facenet using deep convolutional neural network with the architecture of Inception model from Google and uses a novel online triplet mining method to train instead of an intermediate bottleneck layer. On the widely used Labeled Faces in the Wild (LFW) dataset [15], Facenet system achieved a new record accuracy of 99.63%. However, unfortunately, not only the size of the database increases but also its computational cost increases and recognition accuracy declines accordingly

## 1.2. Objectives of Research:

1. Develop a computational model

2. To apply wide it to wide area problems

* + Criminal Identification
  + security
  + Image and Film processing

3. Extraction of unique characteristic features of a face useful for face recognition.

4. Detection of faces amongst other face characters such as beard, spectacles etc.

5. Effective recognition of unique faces in a crowd(individual recognition in crowd).

6. Automated update in the database without human intervention.

## 1.3. Problem Statement:

Smart Security System Using Image Recognition

* Given an image to idebtify it as a face and extract images from it
* To retrieve the similar images from the given database of face images

# 2.Review Of Literature:

* This section gives an overview on the major human face recognition techniques that apply mostly to frontal faces
* face and fingerprint in multimodal biometric identification
* The methods considered are eigenfaces (eigenfeatures), neural networks, dynamic link architecture, hidden Markov model, geometrical feature matching, and template matching

# 3. Data Collection:

* The biggest problem of deep neural network is data.
* The VGG dataset is only around 2.6 million images with around 2.6 thousand identities.
* To compare with Google datasets mentioned in Facenet paper [ they use hundreds of millions of images from Google and Youtube.
* On the purpose of researching or business, you have to pay for a robust face dataset or manually collecting the data will take a while, and the data are also insufficient
* Here we tested face recognition in a real time environment
* Here in this project we directly capture images by using code
* Therefore captured images are undergo for train and test
* The systems also confused between two people with similar faces, but more face images with different angles and expressions will solve the problem
* The light condition is also important, the background should not be too illuminated.
* we trained a new model with updated data using incremental learning

# 4. Methodology:

* In this methods local features such as eyes, nose and mouth are first of all extracted and their locations and local statistics (geometric and/or appearance) are fed into a structural classifier.
* A big challenge for feature extraction methods is feature "restoration", this is when the system tries to retrieve features that are invisible due to large variations, e.g. head Pose when we are matching' a frontal image with a profile image. Distinguishes between three different extraction methods:

1. Generic methods based on edges, lines, and curves
2. Feature-template-based methods
3. III. Structural matching methods that take into consideration geometrical Constraints on the features

* In the beginning of the 1970's, face recognition was treated as a 2D pattern recognition problem
* In beginning period These methods are used to face recognition.

1. Holistic Matching Methods

2. Feature-based (structural) Methods

3. Hybrid Methods

* Face recognition is such a challenging yet interesting problem that it has attracted researchers
* who have different backgrounds: psychology, pattern recognition, neural networks, computer vision, and computer graphics

## 4.1.Exploratory Data Analysis:

* In this study we gathered statistical information about how the emotional changes in one face and aging changes of one person acts during their evaluation for the recognition purposes.

* We studied only small sample of faces as such manual measurements is a time-consuming process
* Here in this project we captured images and preprocessed train into the system so that the trained images can be recognised by giving input
* Though the data seem to be clustering inappropriately, clustering of aging faces has, according to our opinion

## 4.1.1. Figures and Tables:

* In this project we captured images directly by camera opened through code
* By giving 1000 images each person could captured images then that images are undergo for preprocessed or trained for system
* That trained and tested images are predicted by opening an other interface.
* Here we can also check the given image is recognised by giving the input as image path.
* In some cases accuracy will go wrong so that images cannot predicted correctly.

## 4.2 Data visualization:

Visualizing what Convolution Networks learn :

* Several approaches for understanding and visualizing Convolutional Networks have been developed in the literature, partly as a response the common criticism that the learned features in a Neural Network are not interpretable. In this section we briefly survey some of these approaches and related work.

### Visualizing the activations and first-layer weights:

* The most straight-forward visualization technique is to show the activations of the network during the forward pass.
* For ReLU networks, the activations usually start out looking relatively blobby and dense, but as the training progresses the activations usually become more sparse and localized
* One dangerous pitfall that can be easily noticed with this visualization is that some activation maps may be all zero for many different inputs, which can indicate dead filters, and can be a symptom of high learning rates.
* The second common strategy is to visualize the weights. These are usually most interpretable on the first CONV layer which is looking directly at the raw pixel data
* The weights are useful to visualize because well-trained networks usually display nice and smooth filters without any noisy patterns
* Noisy patterns can be an indicator of a network that hasn’t been trained for long enough

# 5.FACE ENGINE SPECIFICATIONS AND SUGGESTIONS:

## General recommendations for facial recognition:

* Face recognition accuracy of the MegaMatcher algorithm heavily depends on the quality of a face image. **Image quality during enrollment is important**, as it influences the quality of the face template.
* **32 pixels is the recommended minimal distance between eyes** for a face on image or video stream to perform face template extraction reliably.
* **64 pixels or more** recommended for better face recognition results. Note that this distance should be **native**, not achieved by resizing an image.
* **Several images during enrollment** are recommended for better facial template quality which results in improvement of recognition quality and reliability.
* **Additional enrollments** may be needed when **facial hair** style changes, especially when beard or mustache is grown or shaved off.
* A stream of consecutive images (usually a video stream from a camera) is required for the live face detection.
* Only **one face should be visible** in these frames.
* When the liveness check is enabled, it is performed by the face engine before feature extraction. If the face in the stream **fails** to qualify as "live", the features are **not extracted**.

# 5.CONCLUSION:

* The face recognition is a very difficult process. In the age of automated systems, the probability of finding similar faces, apart from its possible emotional changes, rises with every modern algorithm. This paper’s aim was to show, how the data are variable if measured by classical statistical-analytical technique used by the photo-anthropometry. According to the performed tests, the changes in one face’s emotions are statistically evaluated as similar for the intra-individual group, although testing with the inter-individual group showed the insufficiency of method. For such cases, the innovative approaches of the modern face recognition (e.g. neural networks, recognition based on gray-scale, etc.) or addition of more anthropometrical points (up to 600) focusing on bigger amount of features can be marked as the only solution for databases with dozens more faces, respectively their etalons.