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An Efficient way to Trace Human by Implementing Face Recognition Technique using TensorFlow and Facenet API

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Abstract: *Trafficking in a person is a serious crime and a grave violation of human rights. Every year, thousand of men, women and children fall into the hands of traffickers, in their own countries and abroad. Almost every country in the world is affected by trafficking, whether as a country of origin, transit or destination for victims.*

Keywords: *Face Recognition, TensorFlow, Inception, Facenet, Open CV (Computer Vision).*

I. INTRODUCTION

Face Recognition (FR) is one of the domain from Computer Vision (CV) that has raped more interest in long. The practical applications for it are many, ranging from biometrical security, to automatically tagging your friend's picture, and much more. Because of the possibilities, many companies and research centres have been working on it.

Although slavery is commonly thought to be a thing of the past, human traffickers generate hundreds of billions of dollars in profits by trapping millions of people in horrific situations around the world, including here in the India. Traffickers use violence, threats, deception, debt bondage, and other manipulative tactics to force people to engage in commercial sex or to provide labour or services against their will. The project title as the AN EFFICIENT WAY TO TRACE HUMAN BY IMPLEMENTING FACE RECOGNITION TECHNIQUE USING TENSORFLOW AND FACENET API is a web based application.

The project brings the capability of handing the common citizen to help the society to fight against the human trafficking without spending much of their time. To do so the helper only wants to click the photo of the victim and upload with the details that are needed. The system present at the server will fetch the details feed by the helper and also the location and the personal information. The server will start searching the photograph with the database present and will inform the guardian or the reporter if found else the photo will be stored in the database for future reference. The project will use the google open source software library called tensorflow. It provides primitives defining a function on tensors (multidimensional graph) and automatically computing their derivatives. The project is the implementation of the tensorflow library which will best fit for our used that work for and have the accurate result over face detection.

Human Tracker is a citizen centric portal for the missing and vulnerable person, where any one can register the missing report with details and photos of missing person. It provides the platform where any citizen or NGOs volunteers can provide information about a missing or sighted child, without waiting to complete the legal formalities. Use artificial intelligence to search and recognize the sighted person with the missing person using the face recognition technology using google API library tensor flow. Message the complainer about the details of search or sighted person if found. If the sighted person is not found or matched then respected details will stored in the database for further use.

TensorFlow computations are expressed as stateful dataflow graphs. The name TensorFlow derives from the operations that such neural networks perform on multidimensional data arrays.

These arrays are referred to as "tensors". In June 2016, Dean stated that 1,500 repositories on GitHub mentioned TensorFlow, of which only 5 were from Google. Systems based on Face Recognition (FR) have roused interest for the last decade, and in particular, the field of security research is going to spread the employment of such technology in many contexts.

This is due to many reasons: at first, the face is the body part generally always exposed and it contains a large number of identifying features that make it suitable for recognition. In addition, compared with other technologies (e.g. based on iris, fingerprints, retinal scans), FR requires a lower degree of cooperation of the subject to be recognized, thus becoming, in some cases, the only way for identifying a subject.

A. *The Face Recognition Problem*

This problem is also a difficult one, and it has not been until recent years that quality results are being obtained. In fact, this problem is usually split into different sub-problems to make it easier to work with, mainly face detection in an image, followed by the face recognition itself. There are also other tasks that can be performed in-between, such as formalizing faces or extracting additional features from them. Through the years, many algorithms and techniques have been used, such as Eigen faces or Active Shape models. However, the one that is currently mostly used, and providing the best results, consists in using Deep Learning (DL), especially the Convolutional Neural Networks (CNN). These methods are currently obtaining high-quality results, so, after reviewing the current state of the art, we decided to focus this project on them.

B. *Motivation*

This project was developed for the company NAGSTUD TECHNOLOGIES LLP. Their goal is to create an AI enriched system oriented to fight against human trafficking. As such, one of their main departments is devoted to developing such AI technology. This project was born there, as they wanted to recognize faces in uncontrolled environments. The uses for such a project are many, but there are some that are especially most relevant for NAGSTUD TECHNOLOGIES LLP. First, to automatically recognize a sighted person in uploaded pictures to match with the database of the lost and missing.

C. *Goal and Implementation*

- 1) Our goal was to create a complete Face Recognition system, capable of working with any kind of images, and to constantly improve itself. This improves- meant had to be autonomous, and to allow it to better recognize people in it, and to include new ones. On top of that, the time requirements were also an issue, as this recognition must be done as close to real-time as possible.
- 2) The task of recognizing faces, especially outside of controlled conditions, is an extremely difficult problem. In fact, there have been many approaches throughout the history that have not succeeded. Apart from the variance between pictures of the same face, such as expression, light conditions or facial hair, it is difficult to determine what makes a face recognizable.
- 3) As such, our intention at the beginning of this project was not to start from the scratch but to make use of some of the already existing research. This would allow us to speed up the process, and to make it more feasible to obtain quality results. In order to do so, we researched the history and current state of the field, as more thoroughly explained in technology we used. By doing so, we looked for successful ways of addressing the problem in which we could inspire.
- 4) In the end, we decided to focus on the TensorFlow software library API known as the facenet and inception implementation arise in Google's AI section. The main reasons are the good outcomes obtained – being really close to the state of art, and the quality of the description. It consists of a 3step process. First, the face in the image is located and frontalized, so that it is looking at the camera. Then, the frontalized face is sent through a CNN, and a set of relevant features are extracted. Finally, these features are used as attributes to compare pairs of images to determine whether they belong or not to the same person.

II. HOW IT WORK

- 1) Face recognition is really a series of several related problems
- 2) First, look at a picture and find all the faces in it.
- 3) Second, focus on each face and be able to understand that even if a face is turned in a weird direction or in bad lighting, it is still the same person.
- 4) Third, be able to pick out unique features of the face that you can use to tell it apart from other people— like how big the eyes are, how long the face is, etc.
- 5) Finally, compare the unique features of that face to all the people you already know to determine the person's name.
- 6) Computers are not capable of this kind of high-level generalization (at least not yet...), so we have to teach them how to do each step in this process separately.
- 7) We need to build a pipeline where we solve each step of face recognition separately and pass the result of the current step to the next step. In other words, we will chain together several machine learning algorithms:

A. *Face Recognition—Step by Step*

Let us tackle this problem one-step at a time. For each step, we will learn about a different machine-learning algorithm. I am not going to explain every single algorithm completely to keep this from turning into a book, but you will learn the main ideas behind each one and you will learn how you can build your own facial recognition system in Python using Open Face and dlib.

- 1) *Step 1: Finding all the Faces:* The first step in our pipeline is face detection. Obviously, we need to locate the faces in a photograph before we can try to tell them apart! If you have used any camera in the last 10 years, you have probably seen face detection in action.
- 2) *Step 2: Posing and Projecting Faces:* When, we isolated the faces in our image. But now we have to deal with the problem that faces turned different directions look totally different to a computer. Humans can easily recognize that both images are of Will Ferrell, but computers would see these pictures as two completely different people. To account for this, we will try to warp each picture so that the eyes and lips are always in the same place in the image. This will make it a lot easier for us to compare faces in the next steps.
- 3) *Step 3: Encoding Faces:* Now we are to the meet of the problem—telling faces apart. This is where things get interesting! The simplest approach to face recognition is to directly compare the unknown face we found in Step 2 with all the pictures we have of people that have already been tagged. When we find a previously tagged face that looks very similar to our unknown face, it must be the same person. Seems like a good idea, right?

There is actually a huge problem with that approach. A site like Facebook with billions of users and a trillion photos cannot possibly loop through every previous-tagged face to compare it to every newly uploaded picture. That would take way too long. They need to be able to recognize faces in milliseconds, not hours. What we need is a way to extract a few basic measurements from each face. Then we could measure our unknown face the same way and find the known face with the closest measurements. For example, we might measure the size of each ear, the spacing between the eyes, the length of the nose, etc. If you have ever watched a bad crime show like CSI, you know what I am talking about.

- 4) *Step 4: Finding the person's name from the encoding:* This last step is actually the easiest step in the whole process. All we have to do is find the person in our database of known people who has the closest measurements to our test image. You can do that by using any basic machine learning classification algorithm. No fancy deep learning tricks are needed. We will use a simple linear SVM classifier, but lots of classification algorithms could work. All we need to do is train a classifier that can take in the measurements from a new test image and tells which known person is the closest match. Running this classifier takes milliseconds. The result of the classifier is the name of the person.

III. RESULTS AND DISCUSSION

A. Overview of Proposed System

The proposed system uses the most updated artificial intelligence domain and library for the facial recognition. In proposed system rather developing the algorithms from scratch we can stand on the shoulders of big giant like Google, Microsoft, Facebook that rigorously made an outstanding research in the field of artificial intelligence over facial recognition domain which provide accurate results. In the proposed system, we used the open source software library that is originally developed by google Brain team called as TensorFlow.

The TensorFlow is software library that provide a set of various libraries on the concept of machine learning, convolutional learning and neural network. The TensorFlow is a machine learning framework that is used to train the data set and then find the result out of the train data set by comparing or by applying the set of data rules. The library is originally provided by the google brain team which is a versatile but it was originally created for the task that requires heavily numerical computations. TensorFlow may have any number of inputs and a single output. Basically, TensorFlow and dimensional graph. The TensorFlow software library can be easily implemented with the help of python and C plus languages. The proposed system may use different types of libraries or cross-pollination different libraries that work on gradients computation over the dataset all paragraphs must be indented. Title and Author Details

IV. MODULES

A. There Are Basic Ten Modules Followed In Human Trafficking, These Are Is Under

- 1) *Home Page:* When the user reach at the website domain then the home page will appear like above it consists common Navigation bar, images, links for registering complain form, check status form, register sighted person form, blogs, about us, admin panel, and contact us form.
- 2) *Registering Complain Form:* The register application form will fill information of the victim details, photos and the registrar details this will store the information in the database and the photos will be send along with the details of the photo to the ALGORITHM for training the image.

- 3) *Check Status*: When the user wants to get the detail of the application then can check the application status by validating the registered mobile no with the application number.
- 4) *Upload Sighted Person Form*: Here the details of the sighted person along with the images are store in the database to classify the image. The form will also fetch the user location, which will use to track the person of the respected faces.
- 5) *Admin Panel*: The admin panel can be view by the admin of the portal, which can view the details of the missing and the track victims. This panel can also use to trace the location of sighted person. The panel will also statistics of other details.
- 6) *Blog page*: All the recent activities of the portal will be shown in the blog format.
- 7) *Contact Us*: If the user faces any problem or want to contact the help desk then it can be possible using the contact us form.
- 8) *About Us*: The page will show the details of the team member and the portals.
- 9) *Current Status*: Current status of the application along the last track position of the sighted person will be show to the user.
- 10) *Algorithm*: The algorithm will take the input image detect the face transform it into understandable format then crop the image and convert it into deep neural network then the representation will train the data classify it and found the similarity detection

V. CONCLUSIONS

The project aims at implementing the face recognition technology in tracing the victims of human trafficking. The privacy of the details that use by the algorithm and the portal will be maintained, as it was a big issue in the existing system the user can only access the details with the registered mobile number and verifying the OTP.

The project aims to provide easiest procedure free service according to the user point of view in both cases of register the missing complain and registering the sighted person details on the server. To use various API that can fetch and work with the details automatically by user permission without more intervention.

The project uses the high end advanced API library provided by Google known as TensorFlow which is an open source software library called TensorFlow. The TensorFlow software library will be used to detect and recognize the faces. The API called Facenet and inception v4 and OpenCV are used for face detection recognition and tracking.

Currently, the best performing model is an Inception-Resnet-v4 and facenet model trained on CASIA-Webface aligned with MTCNN. The accuracy on LFW for the model 20170512110547 is 0.992+-0.003.

The implementation of the original algorithm on project use case will require some modification to the original algorithm but the accuracy of the algorithm will not change the accuracy of the algorithm.

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