Innefu's POC at Kankaria Carnival 2018

Face Recognition Solution

26th -27th Dec 2018

Objective

Video Analytics and face recognition on a data set of Criminal and Police Staff provided by the police commissioner office

Innefu Introduction

Innefu is an Information Security R&D startup, providing cutting edge Information Security & Data Analytics solutions. We count among our clients the biggest corporate entity in the country apart from some of the most sensitive and critical organizations in Government of India. With more than 100+ customers using our Information Security and Data Analytics solutions, the company has become a leading player in the space of Artificial Intelligence for Data Analytics and Unified Authentication Solution.

Our Biometric and Facial Authentication solutions are being used in multiple organizations in India and Middle East while our Data Analytics solution and Machine Learning solutions are in use in multiple Law Enforcement Agencies in South East Asia. Furthermore, these solutions were used in tracking a ring of international cyber criminals spread across three countries. Our Board of Investors includes Academicians, Ex-Paramilitary officers and Cyber security experts with more than 10 years of experience behind them.

Innefu has three major Products

- ***AuthShield*** is a Unified Authentication Solution which integrates the state of art Biometric Authentication models with standard Two Factor Authentication. We are the first ones in the country to introduce Facial Biometrics with an accuracy of 97.1% and our solutions are being used in three of the top ten corporate in the country, apart from some sensitive and critical installations in Defense Research & Development Organization (DRDO) to name a few.
- ***Prophecy*** is the Big Data Analytical framework using state of the art Machine Learning models for Text analytics, Image Analytics and Predictive Intelligence specifically trained for Law Enforcement Agencies and Financial Fraud Analytics. The framework is successfully used in multiple Law Enforcement Agencies in South East Asia and augments the internal data of the client with sources including news feeds, open source databases, journals, magazines, social media etc.
- ***AI Vision*** is Next Gen Video Analytics Solution which is based on Machine Learning algorithms that uses Artificial Intelligence. It comes with the capability of automatically analyzing video to detect and determine temporal and spatial events. This technical capability can be used as wide range of features such as face recognition, Intrusion detection, Fire/Smoke Detection, Safety management, traffic and parking management etc. Many of State Police are using AI Vision for face recognition.

Agenda for the POC

The implementation of **Face Recognition solution** named **AI VISION** provided by **Innefu Labs** is highly accurate & fast even on Live Feed, the agenda was to help Ahmedabad Police to identify suspects with their **Criminal Database** or any such suspicious activity happened in the **Kankaria Carnival 2018**. During this time Criminal activities are on high pace thus required a reliable security system which can identify and generates an alert if any suspect found near the entry area or any desired location.

Technology Introduction

Every action taken leaves a pattern and data, and while data is often available, the sheer volume and frequency can be overwhelming for the respective enterprise to form a complete picture. Turning it into and actionable insight lies the real challenge.

The solution analyses rapidly the video data, detects human face, captures the face image, matches it with database of registered faces, and sends real time alarm based on a successful match (face recognized) or mismatch (face not recognized). The face recognition application can also run on any previously recorded video and images.

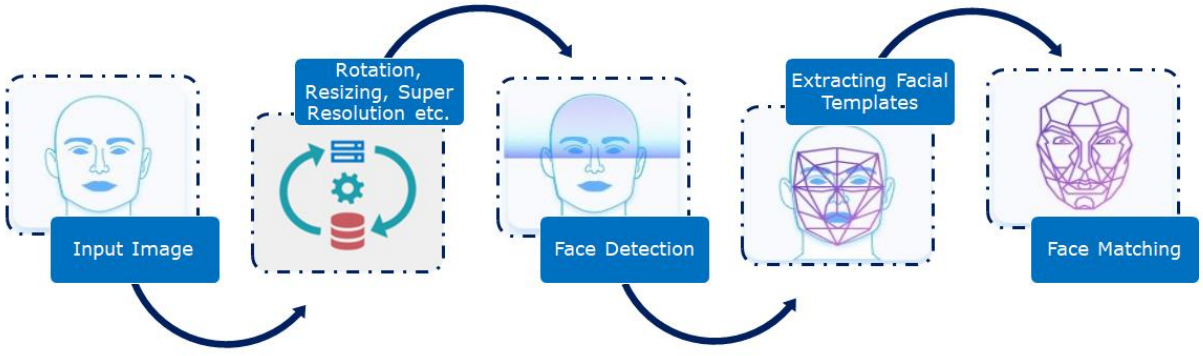
Video & Image Processing

Video processing is a technique of achieving intelligence in the computer vision field. Like humans computers have eyes to, through cameras though, but they lack the ability to understand the world as we humans do. With video image processing we can bridge the gap.

How it is achieved is by considering video frames as images and processes those images using image processing techniques where we can see video processing as a collection of image processing tasks. For example, the background can be subtracted from the foreground by considering a sequence of N video frames as images and by taking the statistical average of the continuous image sequence.

Video processing is not one task, but a result of a collection of subtasks. In video processing, a video will be read frame by frame, and for each frame, image processing will be applied to extract the features from that frame. To extract features, many filters have to be applied to the image. All these tasks are performed as mathematical functions.

Face Recognition system works in multiple steps. First the faces are identified in the frame by using a pre trained model trained on thousands of images.



After face detection pose estimation on each image is done to make sure we get a good frontal face. After making sure we are getting a good view of the front face the key points on the faces are identified. These points are eyes, nose, lips and jaw line. These points help us to identify a person.

For each person identified in the frame we compare each person's facial points with points of the individuals in the database. Since these points are decimals thus thousands of comparisons can be done in a matter of milliseconds.

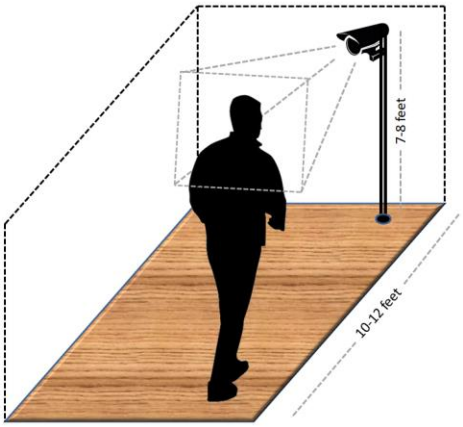
Our system can be used to identify people in images, prerecorded videos (uploading on dashboard) and live videos. The output from the camera is connected to the Command &Control Centre. We connect to the C&CC network and further connect with the live feed of the camera through the IP of the camera. Once we start getting the live feed, the object and character (Human) matching begins. The software is constantly comparing the feed with the trained models (Criminals, missing children, Guns, bags, sticks etc.). Every match is stored and on a predefined protocol, the alerts can be customized.

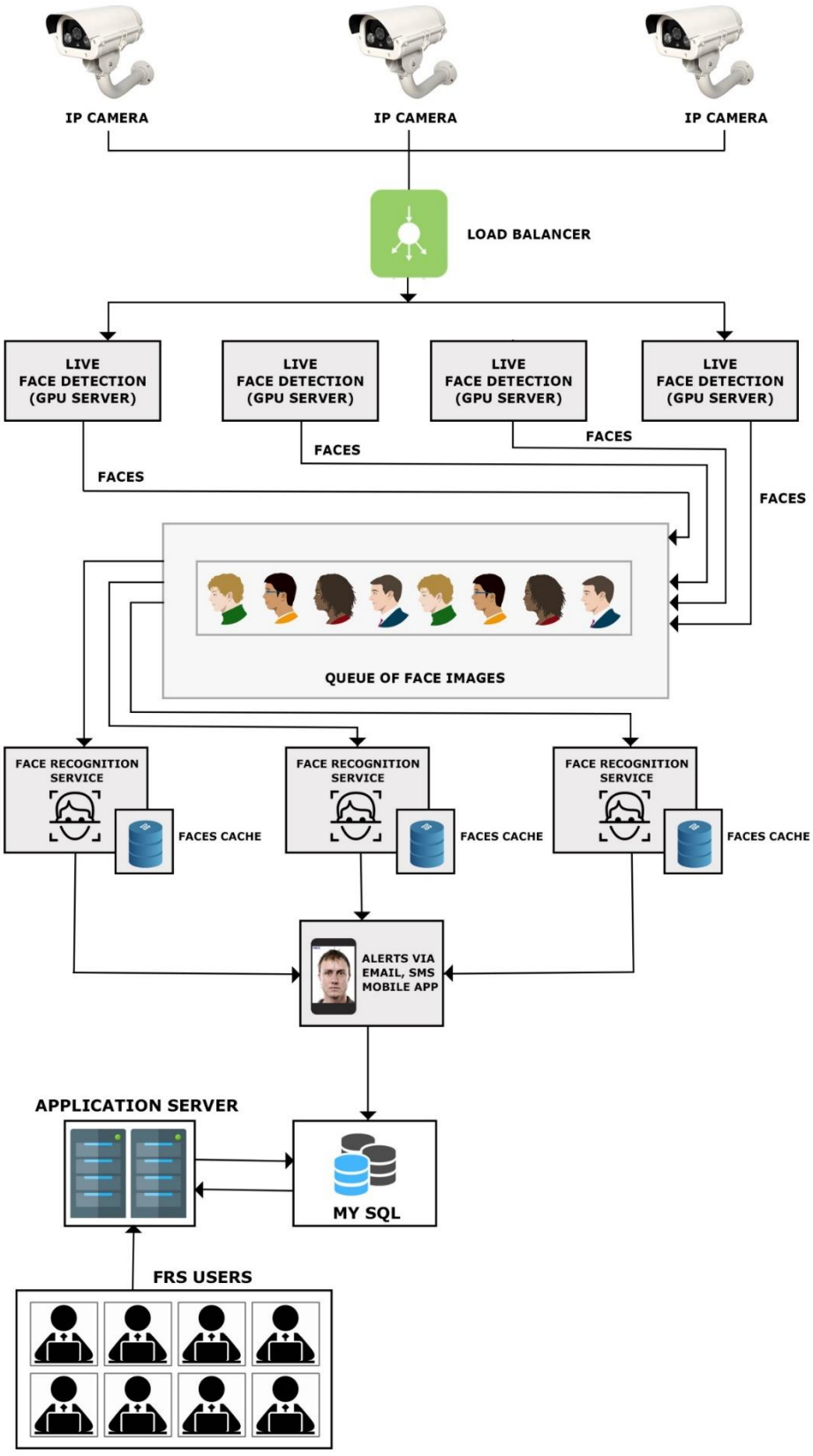
Installation and Architecture

AI VISION work independent of VMS as a stand-alone application, it takes the video feed directly from IP camera and performs facial recognition/analytics on the set rules for all of the things for which the user wishes to be alerted. After analyzing user will get real time alerts on their web/mobile app or through SMS/emails.

Camera Installation Scenario for Face Recognition

- Generic IP cameras with good quality shall be installed at Angular direction, at a height of about 1.7 m facing the region where people can walk towards camera. Height of installation should be at eye Level to capture the real face.
- The camera should be installed at a proper position so that there is not much Back Light. If there is back light or low light, it should be uniform. The exact installation scenario should be tested before final installation.
- The important facial features such as eyes, nose and mouth should not have any occlusion. The lighting should be proper enough so that those facial features are discernible.
- The face of the subject must be visible and without significant shadow that may compromise the ability of the camera to capture the image with correct exposure. Lighting on the subject face should therefore be uniform. The illumination should be above 200 lux. Good constant illumination should be maintained throughout the day.

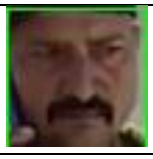
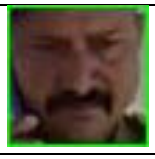



IP CAMERA
IP CAMERA
IP CAMERA
LOAD BALANCER
LIVE FACE DETECTION (GPU SERVER)
LIVE FACE DETECTION (GPU SERVER)
LIVE FACE DETECTION (GPU SERVER)
LIVE FACE DETECTION (GPU SERVER)
FACES
FACES
FACES
FACES
QUEUE OF FACE IMAGES
FACE RECOGNITION SERVICE
FACES CACHE
FACE RECOGNITION SERVICE
FACES CACHE
FACE RECOGNITION SERVICE
FACES CACHE
ALERTS VIA EMAIL, SMS MOBILE APP
APPLICATION SERVER
MY SQL
FRS USERS

Result

Out of the given dataset below faces could be recognized and matched from the live feed.

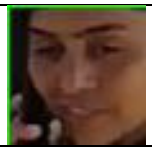
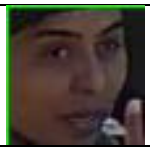
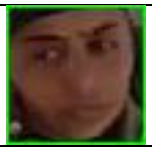
Name: - PC-PRAFULBHAI-PATIL

						
76.8%	69.2%	71.4%	68.7%	73.7%	79.6%	58.9%

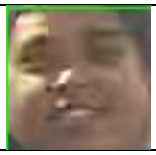
Name: - LR DASRTHSINH KANAKSINH B.N 1102

					
71.8%	55.2%	65.4%	51.7%	50.7%	50.6%

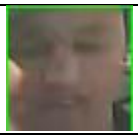
Name: - PI-M.B.ZALA

				
51.4%	59.9%	55.4%	57.9%	60.2%

Name: - PSI-H.I.RABARI

				
50.9%				

Name: - LR-DIPAKBHAI-VALAJIBHAI-B.N-1080

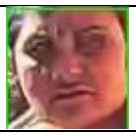
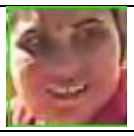
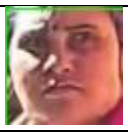
				
50.1%				

Name: - PC-RAMJIBHAI-JAGABHAI-B.N.9909

				
63.3%	59.8%			

Name: - ASI-HARISHKUMAR-DITAJI-B.N.8611

					
61.6%	57.2%	65.4%	51.7%	50.7%	50.6%

					
56.1%	50.2%	53.4%	52.7%	50.7%	55.6%

Learning's and Recommendations

Face recognition as the name implies depends on the quality of the image captured. The better the image the better are the results. The quality of the image would depend on the quality of the camera and the positioning of the camera. A good resolution PTZ cam positioned at the right angle can give an output that can be a perfect input for the FRS solution.

For any Video analytics solution a good quality camera positioned at an advised angle is an ideal scenario. A city could choose its most notorious locations and plant the cameras strategically. Our face recognition solution AI VISION could help recommending such areas and locations.

Also, **AI VISION** could help with the following

1. **Missing children identification.**
2. **Criminal identification & Profile building**
3. **Dashboards for senior officers**
4. **Traffic Management**
5. **Gesture Recognition** (crawling crouching in restricted area)
6. **Object Identification** (Gun, Lathi, Suspicious object etc.)
7. **Safety Analytics** (Fire, Smoke detection)