Innefu POC at Ahmedabad Police Commissioner Office

Objective:

Video Analytics and face recognition of a data set provided by the police commissioner office

Table of contents

1. 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 two major frameworks

- **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 Defence 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.

2. 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.

Harnessing the power of big data to enable an organization to make informed decisions, create innovative plans to resolve pain points can be achieved with intelligent insights from an existing data set.

Video Analytics coupled with data analytics is one such source that can make you proactive.

We have an omnipresent sensor that covers most of the world, the camera. Cameras are relatively inexpensive and widely deployed. If we can extract high-level information from camera feeds, we gain access into a new range of use cases from automated surveillance to patty crimes and make our cities much safer.

This POC addressed one of the most challenging aspect of the video surveillance, actually detecting faces and objects of suspicion in a huge crowd. The challenge of turning a regular camera feed which is not meant for face recognition but instead covers an entire area for observation into an additional output wherein the known faces could be detected and matched.

3. 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 process 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 thousands of comparisons can be done in a matter of milliseconds.

Object Detection : Bags, Weapons

Like face detection we have trained our model to detect bags and weapons. Since the model has been trained on different types of images so the shape, color, size and type of the object does not matter as long as the model has been trained to identify it.

4. Modus operandi

Integrated Control Centre:

Centralized Monitoring System fed by CCTV's across the city in places including –

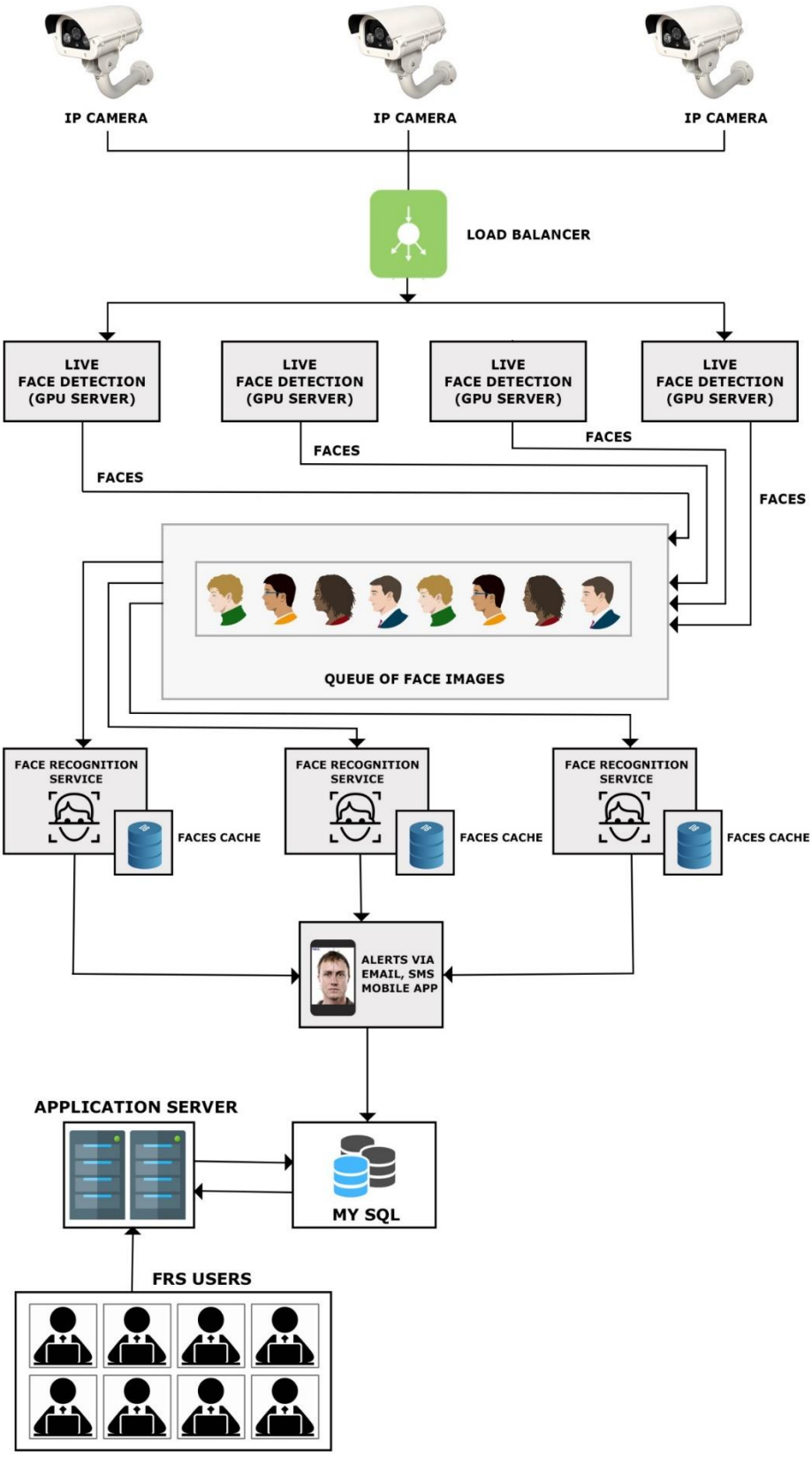
- Schools / Colleges
- Parks
- Malls
- Major markets and crossings

Analytics –

Video and Image Analytics to generate real time alerts with special focus on chain snatching, women harassment and loot

Data Analytics – Integrating Dial 100, 1090, CCTNS for identification

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.


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
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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

5. Result

Out of the given dataset 5 faces could be recognized and matched.


Jagannath Mandir
Hon. CM-Guj.jpg


Jagnath Mandir Saras


Jagannath Mandir
Hon. Ministe


Jagannath Mandir
Shri A-K-Si

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 big data analytics solution Prophecy could help recommending such areas and locations.

Also, **Prophecy** could help with the following

1. **Missing children identification.**
2. **Criminal Profile building**
3. **Dashboards for senior officers**
4. **Sentiment analysis**
5. **Geo mapping**
6. **Crowd formation**