Safety and Security in Smart Cities Using Artificial Intelligence

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Abstract - A smart city is a city that uses technological facilities to provide services and solve city problems. AI is what makes a city 'smart'. As civilization progressed within the digital age, a requirement for human establishments to remain up with this progress arose. With this objective, solutions to problems in cities got to be 'smart'. The foremost recent advancements of AI have revolutionized smart solutions. This development in AI has enhanced the way cities combat the crucial threats to safety and security. This paper presents a number of those smart solutions in developing smart cities. The Proposed system ensures the security and security of citizens during a smart city at different angles. This technique is beneficial in helping the police, medical teams and, first responders make the simplest decision possible when handling emergencies. The proposed system includes a face recognition system, criminal person identification system, and missing child identification system. Thereby we could ensure sustainable development of future smart cities.

*Key Words***: AI (Artificial Intelligence), Safety and Security, Image processing, Neural Network, Face Encoding, Deep Learning**

1. INTRODUCTION

The Smart City initiative by the government of India has opened doors for AI research in India and found out whole new technology standards for Indians. The Smart City as envisioned has been stratified into four layers, namely - The infrastructure, the energy, the transportation, and thus the lifestyle of people. By collecting and sharing knowledge more effectively amongst all the four sectors, and linking the network layers will support urban life more effectively and can strengthen the material of society. Knowledge and Communication Technologies (ICT) and AI are important digital tools for developing a smart city. Artificial intelligence refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions, mainly improvising the intellectual skills of machines and thus

designing Intelligent Agents. These intelligent machines perceive the encompassing environment and take such action which maximizes their chances of success. An outsized number of tools are utilized in AI, including versions of search, mathematical optimization, logic, algorithms, and methods supported probability and economics. Human reasoning and mechanical manipulation of symbols culminated into the invention of the programmable computer, possibly building an Electronic Brain. Progress in AI has since continued, despite the increase and fall of its reputation within the eyes of the state and venture capitalists. Successful commercial products in AI are not anymore a dream now; these are

• Face Recognition System

• Criminal Person Identification System

• Missing Child Identification

These three functions are added to the proposed system which can make sure safety and security in smart cities. A CCTV placed in a public place within the smart city captures the faces and classifies them accordingly with higher accuracy.

2. METHODOLOGY

A machine-led system that understands only logic and patterns may be a double-edged sword. As dependence on AI increases, smart cities became smarter and safer. These success stories are replicated everywhere in the world. Authorities are adopting and relying completely on new techniques to form their cities secure. Within this proposed system, a CCTV is placed in a public area that contains the subsequent three systems implemented in it. In this proposed system we use deep learning, haar cascade algorithm, and vgg16 architecture. Deep learning techniques can leverage a very dataset of faces and learn the rich and compact representation of faces, allowing modern models to first perform as well and later to

outperform the face recognition capabilities of humans. Deep learning through neural networks with multi-hidden layers and massive training data, aims to learn the essential feature representation of data by building high-level features from the low-level pixels. Deep learning techniques have significant advances in face recognition with 97.35% accuracy. VGG16 architecture is a very deep convolutional network for large-scale image recognition. This network is characterized by its simplicity, using only 3*3 convolutional layers stacked on top of every other in increasing depth. Decreases volume size is handled by max pooling. Haar Cascade algorithm used to identify faces in an image or real-time videos. The algorithm makes use of edge or line detection features.
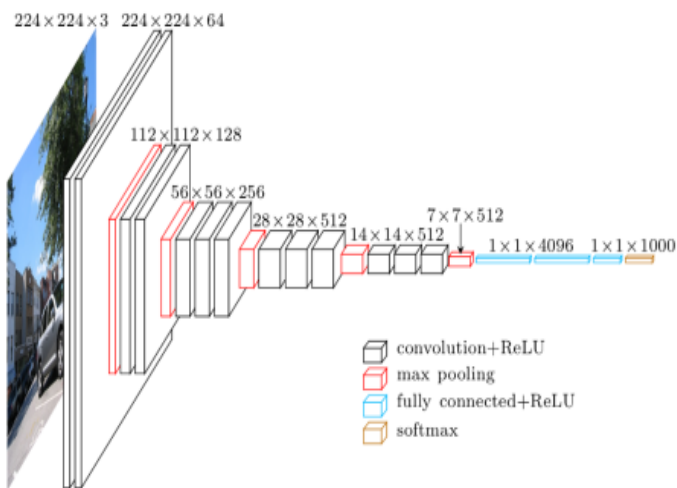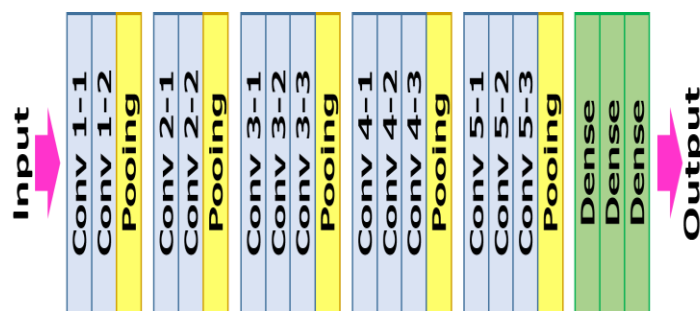

Fig −1: Standard VGG-16 architecture
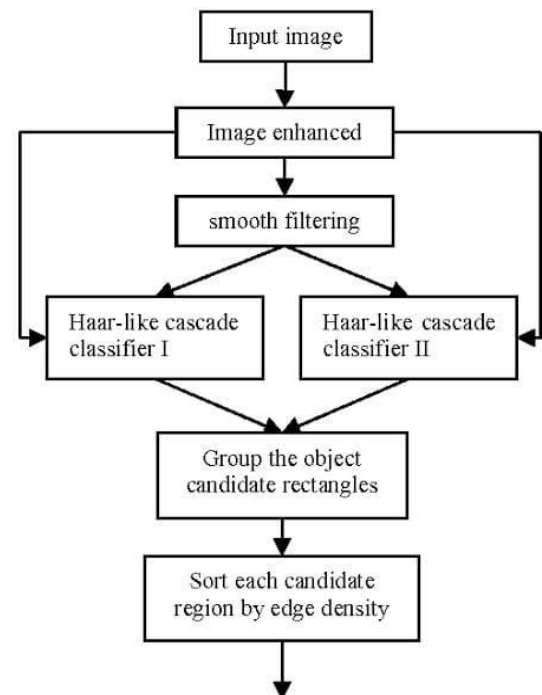

Fig-2: *VGG-16 architecture map*

Fig-3: Haar Cascade algorithm flow chart

(a) Edge Feature (b) Line Feature (c) Edge Feature (d) Line Feature (e) Four-Rectangle Feature
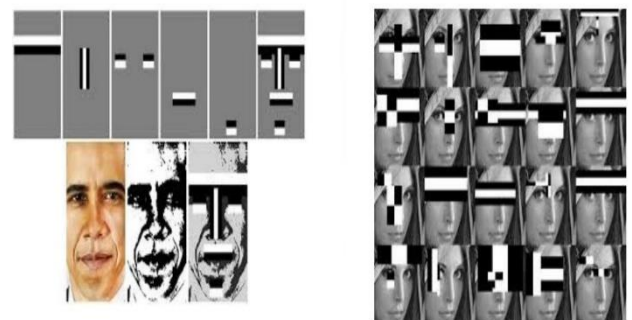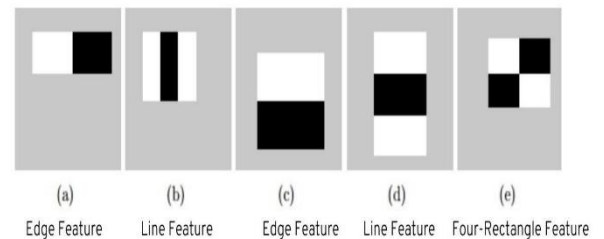

Fig-4: Haar Cascade classifier

2.1 Face Recognition System

The approach we are getting to use for face recognition is fairly simple. The key here is to urge a deep neural network to supply a bunch of numbers that describe a face (known as face encoding). When you pass in two different

images of an equivalent person, the network should return similar outputs (i.e. closer numbers) for both images, whereas once you pass in images of two different people, the network should return very different outputs for the t images. This means that the neural network must be trained to automatically identify different features of faces and calculate numbers supported that. The output of the neural network are often thought of as an identifier for a specific person's face if you pass in several images of an equivalent person, the output of the neural network are going to be very similar/close, whereas if you pass in images of a special person, the output is going to be very different.
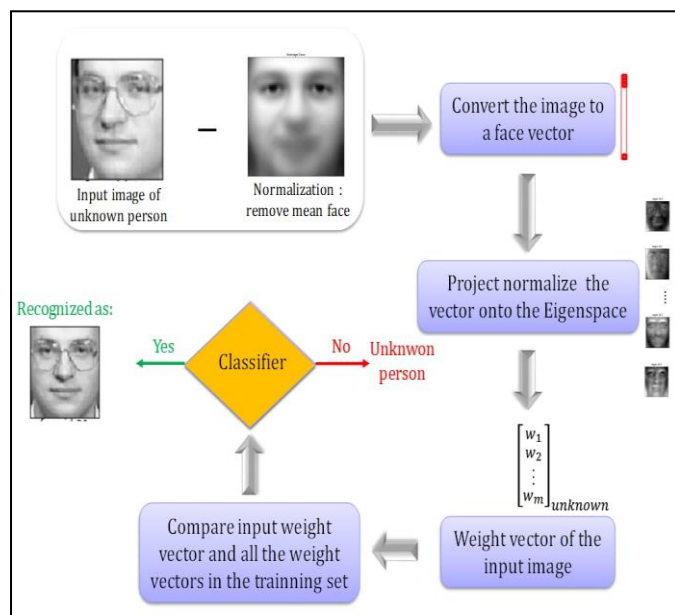

Fig 5-: Face recognition system

2.2 Criminal Person Identification System

There is an abnormal increase within the rate and also the amount of criminals is increasing, this leads towards an excellent concern about the safety issues. Crime preventions and criminal identification are the first issues before the police personnel since property and lives protection are the essential concerns of the police but to combat the crime, the availability of police personnel is limited. With the arrival of security technology, cameras especially CCTV is installed in many public and personal areas to supply surveillance activities. The footage of the CCTV is often wont to identify suspects on scene. In this paper, an automatic face identification system for the culprit database was proposed using a known Haar feature-based cascade classifier. This system is going to be ready to detect faces and recognize faces automatically in

real-time. An accurate location of the face remains a challenging task. Face detection classifiers are shared by public communities.

This paper is aimed to spot the criminals in any investigation department. Here the technique is we already store some images of the criminals in our database, where images are segmented into many slices say eyes, hairs, lips, nose, etc along with his details. These images are saved again in another database record to spot any criminals; eyewitnesses will see the pictures or slices that appear on the screen and by using it we can develop the face, which can or might not be matched with our images. If an image is matched up to 99% then we predict that he's only the criminal. Thus using this project provides a really friendly environment for both operator and eyewitness to simply design any face and can identify criminals very easily.
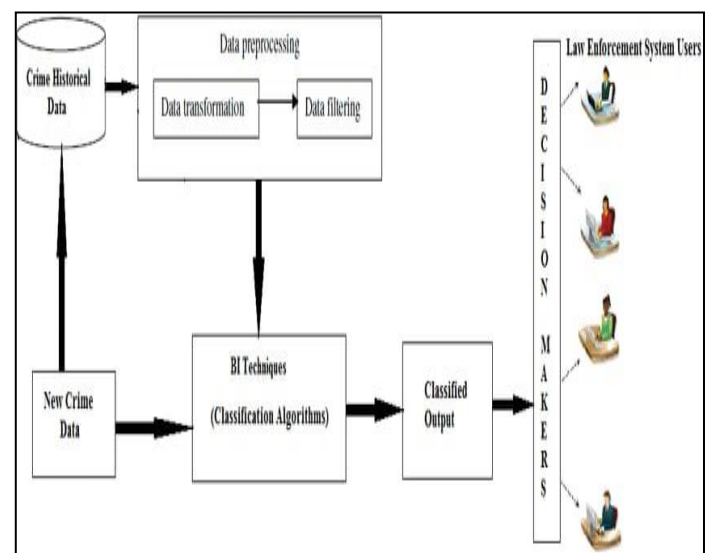

Fig- 6: Criminal Person Identification system

2.3. Missing Child Identification System

The proposed system presents the use of a deep learning methodology for identifying the reported missing child from the photos of a multitude of kids available, with the help of face recognition. The public can upload photographs of a suspicious child into a standard portal with landmarks and remarks. The photos are becoming to be automatically compared with the registered photos of the missing child from the repository. Classification of the input child image is performed and photos with the best match are getting to be selected from the database of missing children. A database is created by the facial images uploaded by the overall public. In our system, a

deep learning model is trained to properly recognize the missing child from the missing child image database. A highly effective deep learning method called the Convolutional Neural Network (CNN) for image-based applications is adopted here for face identification. Compared with normal deep learning applications, our algorithm uses a convolution network only as a high-level feature extractor, and therefore the child recognition is completed by the trained SVM classifier. The classification performance attained for the child identification system is 99.41%.

We are using the SWF-SIFT algorithm for comparing two images, the system makes sure that 70-80 per result on basis of compared images. We are using four modules User, Police, Compliant holder, Admin for getting appropriate outcomes. Admin continuously Update the database and Delete unnecessary data. The proposed system helps to seek out a particular person in minimum timeless and hard work.
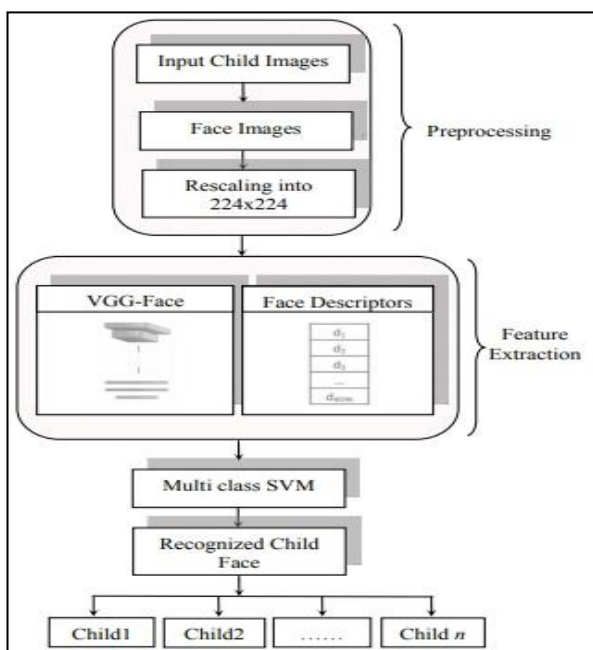

Fig -7: Missing Child Identification system

3. RESULTS

Technology plays important role in today's world. Also this we should always make sure the safety and security for the lives of individuals. It's important and also crucial to seek out and classify the pictures that are seen within the surveillance camera. The proposed system is predicated on model training and learning. The trained model is tested and matched with the three domains. This ensures face recognition, criminal identification, and finding missing children. Cross-validation and transfer learning ensure the highest accuracy for the results obtained. The result is the highly accurate classification of images. This will be an excellent help to the police officials, hospital management, and other authorities to make sure the security and security of individuals within the smart city.

4. CONCLUSION AND FUTURE WORK

This paper presents a number of those smart solutions already established in developing smart cities. In our project, we've studied worked on both face recognition and detection techniques and developed algorithms for them. Even under robust conditions like complex backgrounds and different face positions, these techniques work well. These algorithms give different rates of accuracy under different conditions as observed experimentally. In face detection, we've developed an algorithm that will detect human faces from a picture. We've taken complexion as a tool for detection. This system works well for Indian faces which have a selected complexion varying under a certain range. The tactic of face recognition used is fast, robust, reasonably simple, and accurate with a comparatively simple and straightforward to know algorithms and technique.

The proposed system may be a model of systems we will use to enhance safety and security. The real-time application comes into the picture when this technique is implemented into the surveillance camera placed in a smart city. The cameras with these systems can make sure safety and security in a smart city.

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