Mask and Helmet Recognition based on Machine Learning for ATM Security

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***Abstract*— ATM plays an important role in modern economic activity. Unfortunately, it provides a convenient way for criminals to get illegal money. For safety reasons, each ATM is equipped with a surveillance system to record customer's face information. When criminals use the ATM to withdraw illegal money, they usually hide their faces with something to avoid the surveillance system recording their face information. Due to this the efficiency of the surveillance system is decreased. In this project the process of ATM transaction will be finetuned so that a person can't proceed in the transaction without removing the mask and helmet. With each transaction the image of the person along with the transaction details will be stored.**

Keywords—Helmet; mask; Machine learning; Image processing

I. INTRODUCTION

According to today's world, pollution, infectious diseases, and climate change are all having an impact on humans. Wearing a mask in public places has become a need for people to avoid these issues. Thieves and intruders may use circumstances to their advantage so they can commit crimes without being seen on cameras and CCTV. Many people use ATMs to withdraw cash while hiding their faces. These actions lead to miscommunication between the customer and the bank. The proposed approach uses machine learning, and OpenCV used to detect face masks, which is resource efficient and can be used in embedded devices. The technique has an accuracy score of 0.9264 and an F1 score of 0.93, which can be used for further advanced models. Face recognition is a biometric technology used to authenticate individual identities. It involves two phases: face detection and recognition. Face detection and recognition technology has become increasingly important in our lives, making life easier and faster and adding a touch of technology fun. Sensors can be combined with many technologies to form smart sensors, but early vision measurement technology is expensive, has low performance indicators, and has high failure rates. Processing efficiency is not high. Face Detection is a part of computer technology and AI. It determines the positions and sizes of human faces in arbitrary video and images. It is used in a variety of application that identifies the human face with the help of regular web camera, human face by identifying the face location Identifies by matching digital images present in Database. It is a simple technology for face perception and Human Machine interaction. This can be seen in technical foresight. So, we have to be securing, to catch thief, to find someone who loses, and more. It has become a popular subject of lookup due to demand for protection and the rapid improvement of cellular devices. It can be used to gain access to control, identity verify, security surveillance systems like atm. To solve the Atm security problem, it is important to show the person's face in the bank ATM camera when they conduct an ATM transaction. Image processing will be used to accomplish this, and the system will be able to distinguish between those wearing masks and helmet.

The basic idea behind the paper is to develop a system which is automated and provides the most advanced security features in places like ATM. The paper aims to give access to ATM's for only those who follow the rules of the ATM usage that is preventing access to ATM for those wearing helmet. Background Subtraction Algorithm is used for identification like carrying any weapon, wearing helmet and mask identifications. To solve this problem, we try to promote cameras in atm that gives an alarm if they detect someone with helmet or mask. They can only enter the ATM after removing their helmet and masks. This way we can easily read the faces of people and store in our database. This atm camera also makes sure that the transaction is not carried out until the person removes the helmet or mask.

II. RELATED WORK

Use a technique like TensorFlow and Open CV to detect face masks on humans. When a face is found, a bounding box is drawn around it to determine whether the person is wearing a mask or not. The name of the person who is not wearing a mask will be discovered if their face is saved in the database, and an email warning will be sent and images will be stored in cloud [1]. A face detection technique utilizes a single shot multibox detector and a mobile device called MobileV2 that is small and can be integrated to detect real-time masks. The entire procedure is referred to as SSDMNV2.This method is used to evaluate the accuracy, which is 0.9264, and the F1 score, which is 0.93[2].

The model is separated into two phases: the first phase detects faces, with the exception of situations where the item is held at a distance, and the second phase detects faces as individuals. The procedure is repeated with assistance from the face model utilized in biometric technologies today [3].

Presented a few of the most recent image processing programs used in a cloud setting. There is also a review of some well-known cloud-based image processing software [4].

Using a small number of the hardware available, we classify images on a small scale. SVM is utilized in this paper to deliver excellent accuracy of 93%. SVM is a powerful approach that can be used to attain great accuracy [5]. A technology that will aid in the real-time capture of the human face. Numerous software programs, including those for smart phones, machines, and other devices, implement face detection [6].

A system for detecting faces that uses computer learning, particularly Open CV. Face detection is a necessary step that must be performed, and we accomplished this using Python and a widely used step called the haar-cascade frontal face default classifier [7]. A face detection method based on an algorithm for computer vision. The facial recognition technology is being improved using the Seetaface and YouTu methods. The experiment of detection and recognition is conducted simultaneously under three distinct conditions, including occlusion detection, face detection, and facial exaggeration, which are compared and each have improved accuracy [8].

They consider the query, which centers on the idea of face recognition with insufficient facial data. The experiment relies on the effective classification and identification of faces using OPENCV (Open Computer Vision) and the Object-Oriented Programming Language (OOP) [9]. To train the system to recognize static photos, one characteristic is used to detect and identify the face in the downward position. This procedure is carried out using a trained system that incorporates classification. The algorithm used to acknowledge and recognize the face image [10].

SI No.	Literature	Author	Advantages	Disadvantages
1	Cloud Computing Based Face Mask and Helmet Facial Detection for ATM Security Using Image Processing	B. Veena and S. Babu, "	Use of TensorFlow and OpenCV.	Email warnings is only sent.
2	SSDMNV2: A real time DNN-based face mask detection system using single shot multibox detector and MobileNetV2	Nagrath P, Jain R, Madan A, Arora R, Kataria P, Hemanth J.	Face detection using single shot multidetector and MobileV2.	Evaluation of accuracy is only done.
3	Face Detection and Recognition System using Digital Image Processing	G. Singh and A. K. Goel	Uses digital image processing to recognize face.	Has only 90% accuracy.
4	A Review on Cloud based Image Processing Services	N. K. Pandey and M. Diwakar	Image processing services in cloud computing is summarized.	Security in cloud environment is a big issue.
5	"Image Classification using SVM and CNN	S. Y. Chaganti, I. Nanda, K. R. Pandi, T. G. N. R. S. N. Prudhvith and N. Kumar	Using a small number of the hardware we have available; we classify images on a small scale.	To performing SVM it achieved an accuracy of 82%, a significant decrease. Unsatisfied with the results, on implementing CNN it achieved an accuracy of a staggering 93.57%.

Table 1. Literature Survey

III. SYSTEM ARCHITECTURE

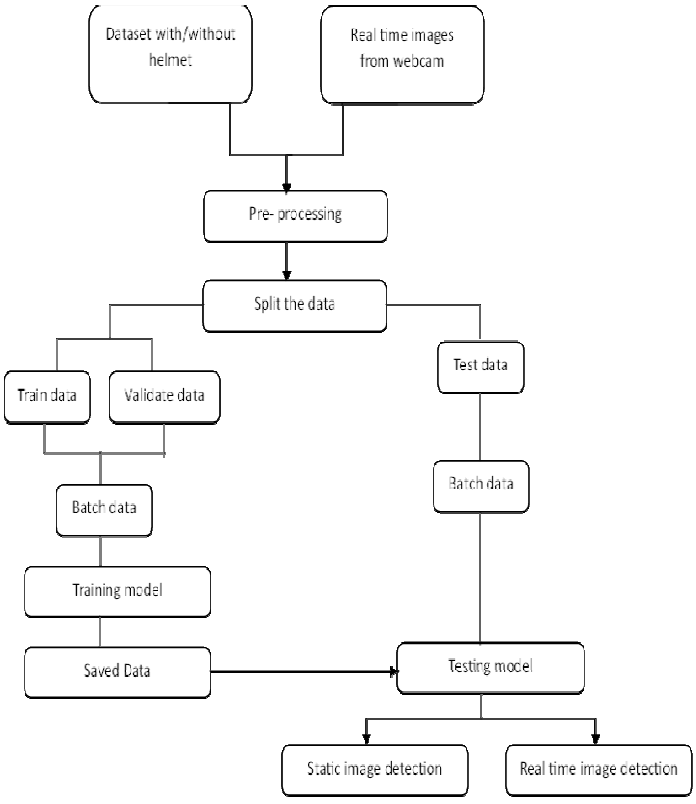

Fig 1. System Architecture

Input data is taken from the live video streaming and this data is compared with the dataset. Dataset contains images with and without helmet and mask. This data is compared with the input.

IV. DATA FLOW DIAGRAM

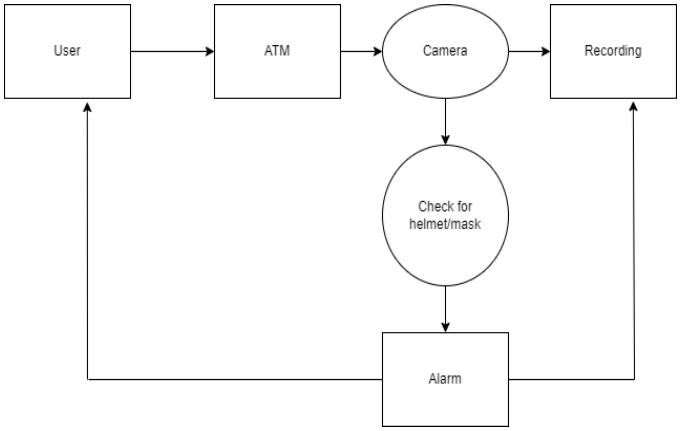

Fig 2. Level 0 DFD

In level 0 DFD, overall structure of the paper is shown. When a person enters ATM and initiates transaction live video streaming starts. Simultaneously it checks whether the person is wearing mask/helmet and keeps the recording. If mask/helmet is found Alarm will be initiated.

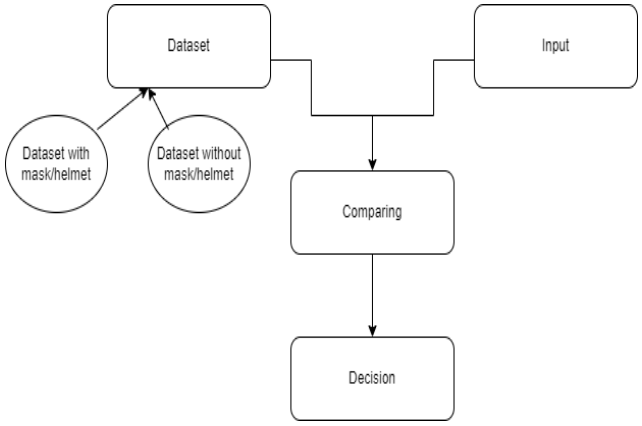

Fig 3. Level 1 DFD for static image detection

Static image detection uses datasets that contain images with and without mask and helmet. This is taken as to train the system. Input images from real time image detection is compared with this so as to take decision.

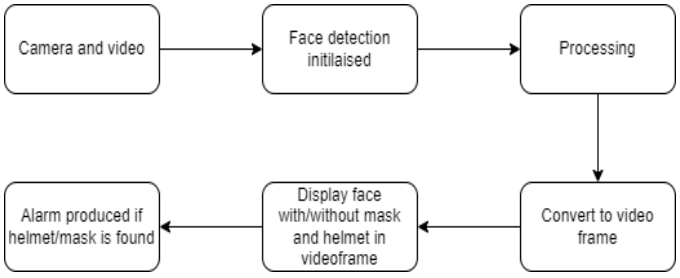

Fig 4. Level 1 DFD for real time image detection

Real time image detection uses live video streaming in order to obtain input which is then compared with dataset. After processing, the face is displayed within the video frame and alarm is produced if helmet/mask is found.

V. PROPOSED WORK

Primary goal of thus paper is to have authorized and secure ATM transaction processing. If we achieve this, no customer will be taken advantage of, and there won't be any misunderstandings between the bank and its clients. And if we have an accurate count of the number of customers and the precise person doing the transaction, then if a problem arises in the future, we can use these as a reference to find the issue.

VI. METHODOLOGY

A. Background Subtraction

BackgroundSubtractorMOG () algorithm: It uses the concept of gaussian mixture.
BackgroundSubtractorMOG2() algorithm: It provides stability in high light intensity condition. It also provides stability while identifying the shadows in each frame.
Geometric multigrid: It makes uses of statistical method and per pixel Bayesian segmentation algorithm.

The process becomes more complicated when there is a shadow without the actual image or appearance of the object. Simple background subtraction algorithms will consider the moving or still shadows as foreground which reduces the accuracy of the system. The solution for above complications will be solved openCV.js which can simple and easy to use.

The cv2.createBackgroundSubstractorMOG2() takes in 3 contentions:
1.Detectsshadows: Now this calculation can likewise recognize shadows on the off chance that we pass in detect shadows = true argument in the construct. The capacity to identify and dispose of shadows will give us smooth and powerful outcomes. Empowering shadow discovery somewhat diminishes speed.
2. History: This is the quantity of edges that is utilized to make the foundation model, increment this number if your objective item frequently stops or stops briefly.
3. VA Threshold: This edge will help you sift through Commotions present in the casing, increment this number if there are heap of White spots in the edge. In spite of the fact that we will likewise utilize morphemically activities like disintegration to dispose of the commotion.

B. Modules

1) Touch modules in helmet detection.
Touch modules are not typically used in helmet detection systems. Helmet detection systems are designed to detect whether a person is wearing a helmet or not, typically using computer vision algorithms and sensors such as cameras and depth sensors. The system analyzes the visual characteristics

of the person's head, such as its shape, size, and color, to determine whether a helmet is present. Touch modules, on the other hand, are typically used to detect physical contact or pressure. They are often found in devices such as smartphones and tablets, where they are used to detect user inputs such as taps, swipes, and pinches.

While touch modules could potentially be used in a helmet detection system, they are not well-suited to this task, as they would not be able to differentiate between a helmet and other types of headgear, or between a person's bare head and a head covered by hair or a hat. As such, touch modules are not commonly used in helmet detection systems, which rely primarily on computer vision algorithms and sensors.

2) OpenCV
OpenCV is a module/library of python that helps us use camera and its different features in our program.

3) SSD
Single Shot Detector model is a python api used to classify images.

4) Tkinter
It is module/library that contains many functions that can be used to create front end using python alone.

5) Yaml
YAML module is a human-readable data serialization format that is often used for configuration files and data exchange between applications. It is not typically used in helmet detection systems themselves, but it may be used to configure or specify parameters for the helmet detection system.

6) Tqdm module
The tqdm module is a Python library that provides a progress bar for long-running operations in the console. It is not directly related to helmet detection, but it can be used to display the progress of a helmet detection operation in the console, making it easier for users to track the status of the operation.

7) Math module
The math module is a Python library that provides a set of mathematical functions, such as trigonometric functions, logarithms, and statistical functions. While the math module is not directly related to helmet detection, it may be used in the implementation of certain algorithms used in helmet detection.

8) OS module
The OS module is a Python library that provides a way to interact with the operating system. While the OS module is not directly related to helmet detection, it may be used in the implementation of a helmet detection system.

9) Argparse module
The argparse module is a Python library that provides a way to parse command-line arguments. It is not directly related to helmet detection, but it may be used in the implementation of a helmet detection system to provide a command-line interface for configuring and running the system.

10) Random module
The random module is a Python library that provides functions for generating random numbers and random selections from sequences. While the random module is not directly related to helmet detection, it may be used in the implementation of certain algorithms used in helmet detection.

11) Time module
The time module is a Python library that provides functions for working with time and time-related data. While the time module is not directly related to helmet detection, it may be used in the implementation of a helmet detection system for various tasks.

12) Pathlib module
The pathlib module is a Python library that provides an object-oriented interface for working with file system paths. While the pathlib module is not directly related to helmet detection, it may be used in the implementation of a helmet detection system for managing image or video data that is input to the system.

13) NumPy module
The NumPy module is a Python library that provides a powerful array-processing package for numerical computing. NumPy is commonly used in many scientific and engineering applications, including computer vision and image processing, which are central to helmet detection.

14) Json module
The json module is a Python library that provides functions for encoding and decoding JSON data. While the json module is not directly related to helmet detection, it may be used in the implementation of a helmet detection system for exchanging data between different components of the system.

15) YOLO dataset
YOLO (You Only Look Once) is a popular object detection model that can be used for helmet detection. To train a YOLO model for helmet detection, a dataset of images and their corresponding annotations indicating the presence and location of helmets in the images is required.

VII. RESULT

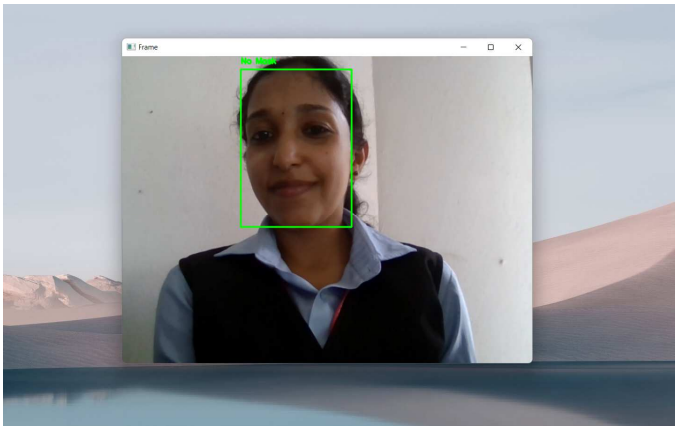

Fig 5. Without mask

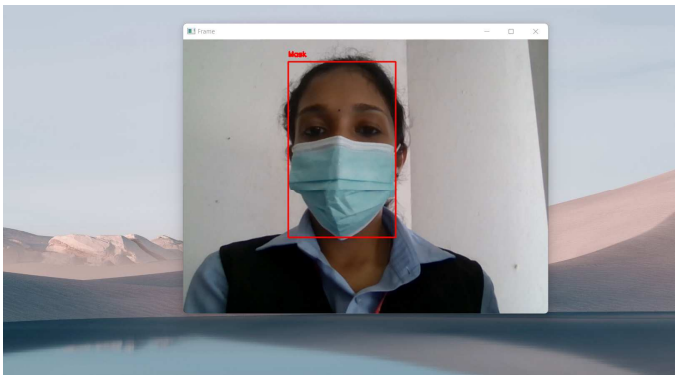

Fig 6. With mask

VIII. CONCLUSIONS

The primary goal of this paper is to provide secure and authorized ATM transaction processing. Because of some illicit transactions taking place in ATMs while wearing masks and helmets, which causes customers to be defrauded and causes miscommunication between the bank and clients. Therefore, if a problem arises, they are unable to identify the specific person; as a result, only the face mask facial detection using image processing has been suggested. So long as transactions go smoothly, there won't be any ATM robberies. This paper focuses on providing efficient ATM transactions using facial recognition.

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