CRIMINAL FACIAL DETECTION USING DEEP LEARNING

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ABSTRACT

Deep learning models have enhanced picture-based semantic pattern identification. Facial photos can assess a person's emotional state and character traits. Due to this motive, we are applying a variety of deep learning architectures to try to infer criminal tendency from face pictures. This study used a simple convolutional neural network (CNN) architecture and multiple pre-trained CNN designs, including VGG-16, VGG-19, and InceptionV3. We compared these systems' effectiveness in identifying criminal traits from human faces. Deep learning models were tested using the National Institute of Standards and Technology's public database. (NIST). Our initiative only used men's images to avoid misunderstanding. VGG CNN models performed best, even with low data, detecting criminal faces with 99.5% accuracy. This index includes Image Classification, Facial Images, Personality Traits, Semantic Pattern Recognition, Deep Learning, and Image Processing.

INTRODUCTION

Biometrics uses a person's physical or behavioral tendencies for authentication or identification. Biometric technology has made fingerprint scanners ubiquitous on smartphones and other affordable electronics. More services and applications need excellent security and a smooth user experience. Biometric authentication is replacing other methods. Biometric identification is most advanced with facial recognition.

Face recognition is highly crucial. Faces identify people. Facial recognition is difficult but has many uses, including financial services and security system verification, searching, identifying people, and more. A human can easily identify the individual, but the computer must follow a different process. Face recognition is a simple daily activity. The general availability of wonderful and least effort-work area and integrated registering frameworks has inspired programmers to produce computerized photographs and recordings for employment in various applications. Biometric verification, observation, human-PC connection, and sight and sound control are examples. Programmable face recognition research continues. A face recognition system should automatically detect faces in images and videos. It may do facial verification, identification, or both. (or recognition). The face check procedure entails matching a black-and-white grayscale image to a format face (datasets) whose characteristics are being obtained. Face recognized evidence uses one-to-multiple matches to match an inquiry face photo or video to all format photographs in the database. A watch-list check matches an inquiry face to a list of suspects. (one-to-few matches). Face recognition research is driven by real-time

applications that might simplify the identification system. Face recognition motivates researchers by challenging them to identify faces.

Due to its simplicity, facial recognition is the most used biometric technique. The approach is important since digital cameras are cheap and safety is a concern. Face recognition is non-invasive, natural, and easy to use compared to other biometric methods.

This study might lead to the creation of a cyber-forensic branch to fight crime by predicting and recognizing illegal conduct. This study might lead to the creation of a cyber-forensic branch to fight crime by predicting and recognizing illegal conduct.

This work's disclaimer emphasizes that it only discusses technical and analytical elements of the issue since social aspects demand a high degree of care and monitoring. A large, diverse data collection might improve our analysis. Large corpora will also aid this study's disclaimer, which indicates that it solely examines technical and analytical issues since social factors demand extraordinary caution and monitoring. This research needs many and varied data sets to progress.

LITERATURESURVEY

Character recognition is an old problem with roots in pre-computer systems. The original optical character recognition systems were mechanical devices that identified characters slowly and inaccurately. In 1951, M. GISMO, Sheppard's reading and robot, was the first modern optical character recognition [1]. GISMO can read musical notations and page text. However, it only recognizes 23 characters. The gadget also copies typewritten pages. 1954 J. Rainbow created a technology that reads uppercase typewritten English characters one per minute. Early OCR systems had a high error rate and slow recognition speed. This limited research in the 1960s and 1970s. Only government organizations and large firms like banks, newspapers, and airlines made progress.

Three OCR fonts were chosen to simplify OCR recognition. Recognition difficulty led to this conclusion. Thus, in 1970, ANSI and EMCA created OCRA and OCRB, which had acceptable recognition rates[2].

OCR has been extensively studied for 30 years. Document image analysis (DIA), omni-font, multi-lingual, and handwritten optical character recognition software have produced [2]. Despite extensive research, the machine's text-reading accuracy is far from human. Thus, contemporary OCR research aims to enhance accuracy and speed for a broad range of document types printed or produced in unrestricted environments. Complex languages like Urdu and Sindhi have no open-source or commercial software.

Skew detection and correction are crucial to offline character recognition. Most document analysis and recognition systems need this pre-processing phase for scanned documents. Skew detection and correction are crucial to offline character recognition. This study [5] uses horizontal and vertical projection profile analysis to identify and rectify skew in Assamese-language scanned document images. Background photos cause OCR errors. A non-linear modification improves channel picture contrast. Experimental results show that identification accuracy improves after removing background photographs [7]. The Fourier Transform pre-processes. This transform divides an image into increasing-frequency sine and cosine waves. The Fourier transform converts geographical data to frequency data,

which may be analyzed [1]. Reading photo-embedded text is tough. They applied new machine learning methods to automatically learn attributes from unlabeled data. They evaluated a scalable feature learning algorithm-based text detection and recognition system utilizing pictures of real text [8]. Their system recognized the text. Machine-readable Chinese and English characters have been in development for years. This paper included search and quick match methodologies. A powerful Chinese/English OCR engine creates a large vocabulary. They gathered 1862 text lines from newspapers, magazines, journals, books, and more [9]. H. Wang, J. Kangas [10] proposed discovering regions that resemble characters to automatically extract and detect characters in natural color scene pictures. Connected component extraction evaluates block candidates. Prioritization adaptive segmentation (PAS) is utilized to get character foreground pixels in each block. The study [11] presented an open-source OCR-based text extraction approach. The system tests TVs. J. uses phase congruency and local energy. Diaz-Escobar [12] proposed a unique method for detecting content-less characters in damaged images. Local energy model. Non-uniform illumination and modest geometric distortions do not alter the suggested phase characteristics. Degraded pictures were compared to SIFT-generated photographs for recognition. Another article technique [13]. The intricate background, changing font size, different style, uncertain arrangement, poor quality and blurring, location, viewing angle, and so on might make scene text difficult to recover from photographs and movies. Text extraction uses region-related methods. An artificial neural network (ANN) classifies text from non-text.

A grid-based Optical Character Recognition (OCR) system analyzes document images and processes paper-to-electronic document formats. This system streamlines these tasks. This improves character recognition accuracy during document processing compared to several other character recognition systems. In this scenario, OCR retrieves character meaning and font properties from bit-mapped characters. Character recognition speed during document processing is the main goal. This allows the system to handle many papers quickly, saving time. Our grid-based character recognition identifies heterogeneous characters from multiple worldwide languages utilizing three font properties and alignments. Grid structure allows this.

Despite OCR research, Arabic, Sindhi, and Urdu character recognition remains a challenge. We will review OCR algorithms for many languages in a future paper. Multilingual character recognition systems are another important topic. Finally, real-world OCR system deployment is still under study.

EXISTINGSYSTEM:

The current system uses datasets with real criminal activity to identify geographical and temporal crime hotspots. We'll try to pinpoint crime hotspots and times. We'll also guess the next crime in a given location at a given time. In conclusion, we want to analyze a crime dataset's demographics and outcomes. Criminal activity research is extensive. Large datasets have been examined for crime location and kind to let people track law enforcement. Many crime hotspot detection methods have used these datasets. Many mapping systems show crime locations and types by city.

DIS-ADVANTAGE:

Even if crime scenes are uncovered, there is no information on the date, time, or techniques to predict future crimes.

PROPOSEDSYSTEM

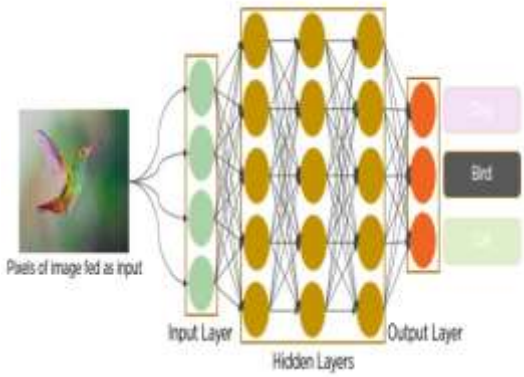
Modern criminal prevention, identification, and surveillance software requires cutting-edge machine learning algorithms. Most criminal research nowadays uses machine learning. Machine learning can diagnose female crime rates. The crime was predicted using historical data. This technique uses picture capture and video stream to identify unlawful acts by capturing the person by the person via earlier database records. DCNN, RNN, and other CNN designs have been used to analyze video frames and discover anomalies. The HDL technique may help the DCNN identify frame features. Videos, still photos, and an alert that may be forwarded to a nearby police station can identify a criminal in real time. This study utilizes pre-trained deep learning models like VGG-19. This suggested system application alerts police officers to real-time incidents and provides criminal identify and crime history information. Real-time criminal detection utilizing machine learning and deep learning helps police officers avoid crime.

ADVANTAGE:

If criminals could be identified in large groups or anticipated before they committed crimes, it would be easy and fast. Face recognition and identification of the culprit throughout the investigation is helpful.

METHODLOGY

CNN: A convolutional neural network (CNN) is a deep neural network used in deep learning to analyze visual input. ConvNet does not use matrix multiplications, unlike other neural networks. Convolution does this. In mathematics, convolution is an operation that produces a third function that shows how one function is changed by the shape of the other.



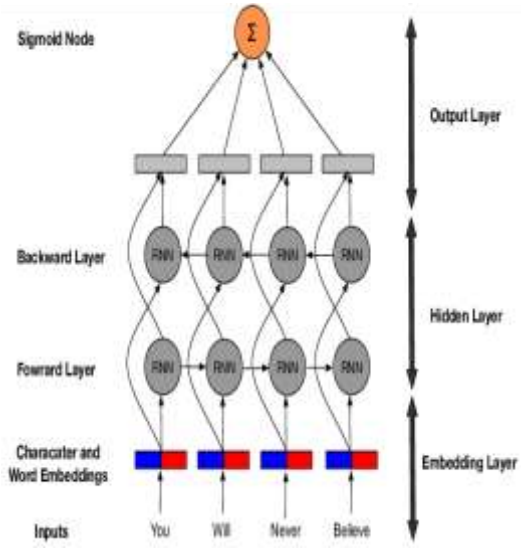
CNN Architecture

Recurrent neural networks (RNNs) are very reliable and work very well. This is because they are the only kind of neural network that can store information on their own.

Recurrent neural networks have been around for a long time, just like many other types of deep learning. Even though they were first made in the 1980s, we are just now starting to understand their full potential. RNNs have become very popular since the development of long short-term memory (LSTM) in the 1990s, as well as the rise in processing power and the availability of huge amounts of data.

RNNs can make very accurate guesses because they remember important

information about the data they are given. This lets them learn from the data they are given. When handling data in a certain order, it is very helpful to use these methods. Time series, speech data, text data, money data, audio/video data, and weather data are all examples of this type of data. A recurrent neural network knows much more about a process and the context in which it happens than other programs do.



RNN Architecture

Data communications, often known as DCCN, refers to the process of exchanging digital information between computers. Data networks are a subset of the internet that enable individual computers to communicate and share data with one another. These data networks are also often referred to as computer networks. Either wired or wireless media must be used in order for computers that are part of a network to be able to communicate with one another. The Internet is by far the most well-known and widely used network of connected computers.

During this class, you will explore the foundations of Data Communication and Computer Network (DCN) as well as be introduced to some advanced ideas in this field.

The following are some applications of DCCN:

A network is made up of all of the computers and other electronic devices that are able to connect with one another. Utilizing them comes with a number of benefits, including the following:

The sharing of resources like printers and storage devices across many locations

When exchanging data via the Internet, e-mails and file transfer protocols (FTP) are the most common methods employed.

EXAMINATION MODELS

Tests of units

It is necessary to construct test cases for unit testing in order to guarantee that the logic that lies behind the surface of the program is accurate and that valid inputs will result in valid outputs. It is important to do a comprehensive analysis of the program's logic as well as the decision-making procedures. The process of determining whether or not separate pieces of software operate as intended is known as "software unit testing."It is finished after each component is finished, but before the assembly process begins. The examination of the building is going to be quite in-depth, and we will need particular information about its structure. Unit tests are short, uncomplicated tests that concentrate on a particular business function, piece of code, or configuration of a larger system. Unit tests may be run independently of one another or in conjunction with other tests. Unit tests are used to check the inputs and outputs of a business process to guarantee that the process operates as intended.

The testing of integration

When designing software, it is essential to check and double-check that all of its individual parts can work

in concert to produce a coherent whole. The overall functioning of screens and fields, as opposed to the functionality of their individual parts, is what the testing is primarily focused on. Even if each component worked well on its own, as seen by exhaustive unit testing, integration tests show that all components work together as planned. The purpose of integration testing is to unearth problems that manifest themselves when many components are brought together.

Evaluation of Functionality

Functional tests are what offer the proof that the features that are being assessed are available as they are specified in the system documentation, user manuals, and business and technology standards. This evidence is structured.

The following are the essential building blocks of functional testing:

legal Input: We need all of the different sorts of legal input that have been defined.

It is essential to do input filtering that eliminates identified types of erroneous data.

responsibilities: It is necessary to carry out each and every responsibility that has been given.

Verifying the many kinds of outcomes that a software generates is a vital step in the process.

Systems/Processes: It is necessary to call into action any systems or procedures that need collaboration.

The objectives, key activities, or one-of-a-kind test cases that serve as the foundation for the design and implementation of a functional test. During testing, there should be a focus on comprehensively covering all aspects, including business process flows, data fields, set procedures, and following processes. Before starting functional testing, the first actions that need to be taken are to look for new tests and evaluate the value of the ones that already exist.

Analysis of the System

We are able to ascertain whether or not the software is up to par by doing an evaluation of the "system" as a whole. This method puts a system through its paces to see whether or not the results can be predicted. The configuration-based system integration test is an example of a system test that may be performed. During system testing, which is based on process models and flows, priority is given to already-established linkages and interaction points.

Evaluations Done Inside the White Box

Box in the Black Testing may start after a software tester has an understanding of the architecture, language, and purpose of the program being tested. The reasoning behind it is sound. It is applied for the purpose of inspecting locations that could not be reached with only a black box alone.

"Black Box" Technique

Box in the Black Testing is the process of assessing software without having a grasp of its internals, design, or the programming language that it was written in. A well-defined starting point, such as a specification or a set of rules, is necessary for black box testing, just as it is for the vast majority of other kinds of testing. In this form of testing, the code that is being tested does not undergo any kind of in-depth inspection. Data is supplied, and both the data and the results of the test are analyzed, but the test does not study the inner workings of the program.

Tests of units

In most cases, the process of developing software will include two distinct phases: the coding phase and the testing phase. However, carrying out coding and unit testing at

the same time has become standard practice.

Both the testing technique and the actual implementation In-depth testing of the functionality will be carried out manually out in the field.

The Aims of the Examination

It is imperative that each and every sector is operating effectively.

You will not be able to access the page in any other way than by clicking the link that has been supplied. It shouldn't take too much time for the input screen, the messages, or the answers.

IntegrationTesting

By progressively integrating and testing a large number of software components on a single platform, the purpose of software integration testing is to determine any problems that may exist with the user interface of the product.

An integration test's primary objective is to ensure that all of the software components, subsystems, or even enterprise-wide systems being evaluated work together without any hiccups.

The aforementioned testing scenarios were all successful, passing with flying colors. There were not even the slightest bit of problems.

User acceptability testing (UAT) is a process that has to be carried out with significant input from the target demographic in order for a project to be successful. It ensures that the system functions exactly as it was designed to.

The aforementioned testing scenarios were all successful, passing with flying colors. There were not even the slightest bit of problems.

RESULTS:

8.1 OUTPUT SCREENS:

Use python home.py command on the command prompt of Project folder

Fig 8.1.1. Command used to obtain Criminal Detection GUI

Fig 8.1.2. GUI of Criminal Detection

We get the above GUI with the following Three options:

1.Register Criminal

2.Detect Criminal

3.Video SurveillFig

8.1.3. Enter the Criminal Details

Fig 8.1.3:Enter Criminal details

In the above screen we enter the details of the Criminal such as Name Crimes Done etc. to Register the Criminal in the Database the Star mark Indicates Mandatory details.

Fig 8.1.4 Select five Images of appropriate size

Images should be selected and those of the same size and the person with clear enhanced facial features.

Fig 8.1.5. Click on RegisterButton

Click on Register. Dialogue box appears with a Message "Criminal Registered Successfully".

Fig 8.1.6. Detection of Criminal

Select an Image from the database and click on Recognize button to detect the criminal.

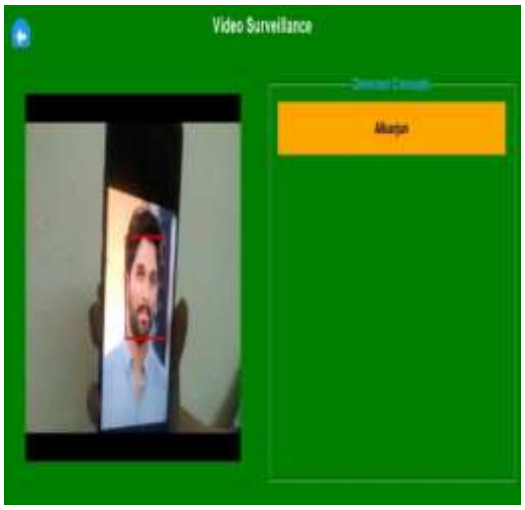


Fig 8.1.7. Video Surveillance.

Go back to the GUI and select video surveillance option. Now place the Image/person in front of the Camera for detection.

Fig 8.1.8. Details of the Criminal

Click on name of the criminal to get the details.

CONCLUSION :

We may draw the conclusion that this research has the makings of a new cyber-forensics division that can forecast, identify, and uncover the specifics of database-based offenders. The term "cyber-forensics" describes this section. Face recognition and criminal identification help in criminal investigations. In a huge gathering, it would be easy and quick to identify or anticipate potential culprits.

Future focus: Onward and upward Anyone has to be put into a category, but criminals and suspects need a lot more detail and seriousness. Due of the serious consequences of wrong categorisation, this research may have flaws. Claiming that CNN's reliability of 99 percent is adequate would be unfair and naïve. Classification may be challenging because of the small sample size and the potential that not all images were taken under the same lighting circumstances. Since most face photographs are sorted according to expression and age, we started by getting rid of the expressionless, elderly, and newborn pictures. We utilized haarcascade and eliminated characteristics from the pictures to try to mitigate this bias, but our analysis showed that both strategies were mostly ineffective.We need to assess the many previously stated elements and concentrate on finding new personality traits and features if we are to increase the amount of data we have collected.

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