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A REVIEW ON FACE MASK DETECTION USING ARTIFICIAL INTELLIGENCE

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Abstract: The COVID-19 pandemic has quickly interrupted our daily routines, impacting global commerce and air travel. The current recommendation is to shield yourself by using a face mask. Some government-funded organizations may soon need their customers to put on suitable masks to be able to use the products they offer. As a result, detecting face masks has become essential to progressing humanity.The present article offers a straightforward method for achieving this goal with the help of certain essential artificial intelligence technologies, including TensorFlow, Keras, and OpenCV. Using masks has become increasingly important for each person during those shifts. Because of the wide range of individuals that the coronavirus pandemic has spawned, it might be difficult to identify those who lack protective masks. Image processing and deep understanding are used in the method of identifying individual faces or dividing between two categories: those who are wearing masks and those who don't. There are several packages for Python, including Keras and Tensor Flow, as well as OpenCV. The frameworks utilized for the current study are trained using a kind of deep neural network called convolutional neural networks in the field of deep learning.

Keywords: Artificial Intelligence, Coronavirus, Covid-19, Convolutional Neural Network, Keras, OpenCV, Face Mask Detection.

1. INTRODUCTION

The most recent worldwide outbreak viral to affect humanity in the previous generations isCovid-19. The year 2020 saw the World Health Organization (WHO) designate COVID-19 as a global pandemic because of the speed with which the virus spreads. In less than six months, COVID-19 affected approximately 5 million patients in 188 different nations. The virus spreads through close encounters with others in congested, densely populated locations. The widespread outbreak of the corona has caused a previously unthinkable degree of international collaboration in science. The use of computational sciences to enable both machine learning and deep learning will help combat COVID-19 through a number of approaches. Artificial intelligence evaluates vast amounts of data to predict the COVID-19 spread, identifypopulations at risk, and operate as a means of alerting drivers for possible outbreaks of disease.The past few years have seen tremendous advancements in the research field of artificial intelligence (AI), particularly in the discipline of machine learning (ML). AI is an acronym that cannot be separated from any other recently discovered technology. These days, it seems nearly impossible to achieve any kind of substantial breakthrough in terms of technical innovation without AI. Artificial intelligence is regarded as the next great technology that will drastically alter the planet. The use of neuroscience in marketing studies is a relatively new topic with a lot of potential. However, it needs an area of study that is typically absent from marketing research businesses and calls for prohibitively priced equipment and extensive knowledge. The process of identifying a mask involves locating the face and then figuring out
that it is covered in a facial mask. The problem is closely related to broad identifying items in terms of identifying entity types. Recognition of faces is the process of uniquely identifying a certain class of things, or faces. It may be used for a wide range of tasks, including monitoring, teaching, and self-driving vehicles. The current research uses fundamental artificial intelligence (AI) tools, including TensorFlow, Keras, OpenCV, and Scikit- Learn, to fulfil the previously stated goal in away that is easy to understand. In this section, we present a neural network and machine vision-based facial maskidentification approach. The model suggested may be used with surveillance cameras to prevent the spread of COVID-19 by recognizing individuals who're wearing masks but don't have facial masks. The framework combines OpenCV, Tensor Flow, and Keras with deep learning and

traditional artificial intelligence approaches. Through learning and being identified, we can attain the best performance in the shortest amount of time.

Fig. Face Mask Detection

2. LITERATURE REVIEW

M. Rahman, S. Mahmud, J. Kim, Md. M. Manik, and Md. M. Islam In research paper [1]. "Building a Method for Determining Whether a Person Uses a Mask or Not and Informing the Appropriate Government in the Smart Cities Networks" was released in 2020. For taking face photos, it records a variety of urban locations in continuous recording. The previously mask-wearing individuals have been identified using their facial photos that were taken from this clip. Characteristics are extracted from pictures using the convolutional neural system (CNN) acquisition technique, and then these characteristics are taught via a series of submerged layers. If a person is recognized by architectural elements not wearing a face mask, the relevant authority is notified via the town's networking so that suitable action may be taken.

P. Gupta, N. Saxena, M. Sharma, and J. Tripathi (2018) In research paper [2].” A system of deep neural networks”, which is a different kind of neural networking. Rather than supplying raw pixel values as an input, the suggested method just provides the derived face characteristics. As an alternative to using plain pixel information, face characteristics are sent to the Haar Cascade to determine the characteristics of the face. Amemory network-based identification framework's difficulty decreases with a reductionin the quantity of duplicated data being input

R. Bhuiyan, S. Khushbu, and S. Islam (2020) In research paper [3]. for instance, describes a suggested method that uses the highly sophisticated YOLOv3 structure to create features and seeks to recognize the masks that are present. The convolutional neural network, or CNN, is a reinforcement learning method usedby YOLO (You Only Look Once). YOLO meansit connects to CNN via layers that are concealed, studies, simple technique extraction, or the ability to recognize and retrieve any kind of picture. In order to provide action-level estimates, a simulator is first trained using 30 distinct photos from the collection of images. It provides positive recognition and outstanding outcomes from imagery. This representation isused on a stream of live footage to assess the frame-per-second rate of the model throughout the stream, along with the accuracy of its two-layer masked and unmasked recognition.

Francesca Nonis et al(2019) In research paper [4] difficulties of a face identification system (FRS), with the objective of assisting the writers in conveying feelings that humans experience. Mehrabian et al. stated that out of every detail on the face, fifty-five percent are used for conveyingsentiments or traits. Diminished emotions on the face and an avoided strong gaze represent some of the few signs of sadness. According to Ekman's classification, a variety of emotions, including joy, annoyance, sorrow, shock, disapproval, etc., represent completely distinct glances. Applications for the security of drivers include neuroscience, webinars, Visa confirmation tiredness recognition, face movement synthesizing for the film and television industry, and sensitivity evaluation during health.

J. Sunny, S. George, and J. Kizhakkethottam (2015) In research paper

[5] sheds light on the application of smart gadget detectors as an alternate for the recognition of human actions (HAR).One of the most important fields of study in modern smartphone technology

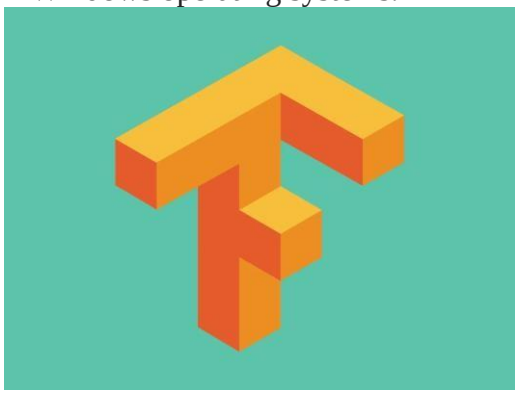
and the study of human-computer interaction (HCI) is automatic physical activity detection, or people movement detection (HAR). Providing information on user behaviour that enables computer systems to proactively support individuals in performing their duties constitutes one of the primary goals of movement monitoring. Constant methods for classification originating from statistics and neural network approaches are necessary for the automatic detection of actual human behaviours. A majority of the time, however, labelled data—that is, input pertaining to a particular group or activity—is employed in guided or semi supervised educational methods.

3. Methodology

TensorFlow, CNN, and scripted Python were utilized as the framework for AI learning to create an effective network for face-mask recognition. The purpose of this course is to teach a CNN model with specific training to identify the possibility that an individual is wearing a mask. With every perspective, the effort is able to instantly identify the mask- wearing face. A RGB feed picture in every direction can produce results. The function's main duty is to identify the group to which the attributes correspond by extracting these elements from photos. The technique for extracting features is more effective than the initial photograph because it simply outlines the original and creates another image from it. Photographic complexity is condensed into aneffective

1. TensorFlow Framework-

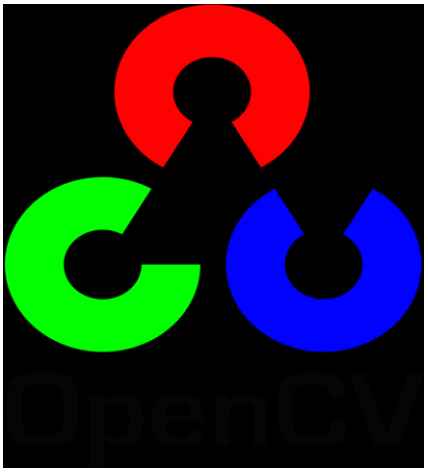
An open-source software library is called Tensor Flow. Scientists and professionals in engineering were the ones who first created tensor flow. It operates on machine learning and deep neural network development on the Google Brain Research Team, which is part of Google's computer intelligence study group. Deep learning and other statistical and predictive analytics workloads may be executed on this freely available platform. This The Python programming language facilitates a wide range of regression and classifier techniques, as well as neural networks in general. A free and open-source software library for distinguishable computation and data circulation in a variety of applications is called TensorFlow. Tensor Flow is compatible with handheld computers as well as 64-bit Linux and macOS, as well as all Windows operating systems.



2. OpenCV

1. an incredible framework for all platforms that lets us create artificial intelligence apps in an instantaneous fashion.
2. It also mainly concentrates on footage collection or examination, image manipulation, and features such as subject recognition of faces.
3. The Open CV application is at present accessible on several systems, such as Windows, Linux, OS X, Android, and iOS. It implements a broad range of languages used for programming, such as C++, Python, Java, etc.
4. Regarding fast-speed GPU activities, APIs built on the CUDA and OpenCL platforms are also actively being developed. The Python programming language API for Open CV is called Open CV-Python.
5. It combines the greatest features of the programming language Python with the features of OpenCV C++, the Application Programming Interface.

6. The practical application of machine learning can be seen in the following applications: recognizing facial features and recognition; object identification; classification of actions performed by people in footage; tracking for camera motions; extraction of 3D representations of items; production of point clouds with three dimensions from surround soundcameras; stitching of pictures to create a high resolution (HR) picture representinga scene; finding comparable pictures to a picture database; removal of eyes that arered to flash-taken pictures; tracking ofeye motions; recognition of theenvironment and establishment ofmarkers to overlay it with augmented reality, etc.



3. Keras -

Inspired by the artificial intelligence platform of TensorFlow, Keras serves as a Python neural network application programming interface. Its development focused on making quick experiments possible. The secret for carrying out effective investigation is to proceed as quickly as humanly possible between concept to outcome.

What Keras is? -

Neither straightforward, yet easy. By lowering the psychological strain on developers, Keras allows you to focus on thecrucial aspects of the issue in question.

Flexible—Keras embraces the idea of progressive disclosure of difficulty, which states that although arbitrary sophisticated tasks must be achievable through an obvious process that build around prior knowledge, simple workflows should be quick and straightforward.

Strong – Keras offers adaptability and speedthat rivals that of the profession; NASA's space agency, YouTube, and Waymo are justa few of the businesses that employ software.

4. Convolutional Neural Network -

One of the most common architectural applications is image categorization. CNNs are widely used in machine translation of languages, systems for recommendation, and movie and image identification. The following undertaking will use a machine recognition instance as described in the preceding section. But the basic theory stays identical and works with any additional use case! Similar to neural systems, CNNs consist of transistors that have preferences and parameters that may be learned. The

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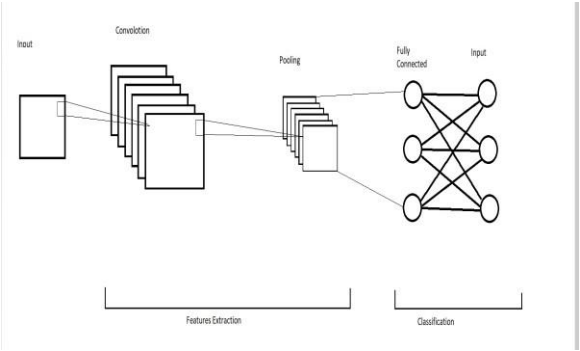
nerve cell gets multiple supplies, adds everything up, runs the total via a mechanism for activation, then produces a response.

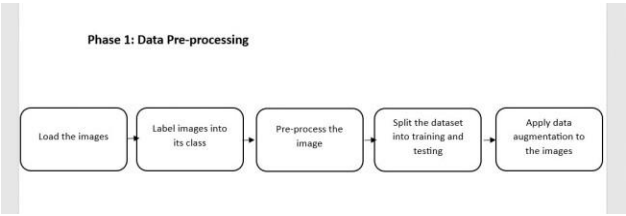
Each network component includes lost operations, and each of the approachespreviously created for artificial neural networks continues to be effective for CNNs.



Convolutional Neural Network Model

Phase 1 -

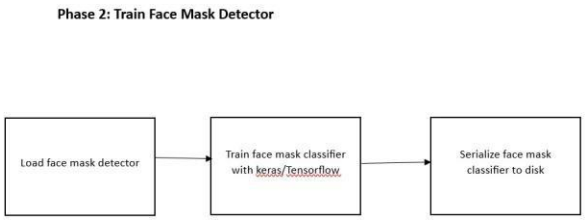
The following step concentrates on identifying and measuring one or more faces inside a picture, irrespective of whether the individuals are mask-wearing or not. The area that constitutes the area that is relevant (ROI), including information that includesthe orientation, breadth, and height of the face, is identified by using the OpenCV Neural Learning-based facial recognition algorithm to calculate purpose.



Phase 1 – Data Pre-processing

Phase 2 –

The initial image depicts a schematic view of the way the next phase operates. In this instance, the machine learning model is trained to distinguish between individuals that have masks as opposed to those that don't. The GitHub repository "Real- World-Masked-Face-Dataset" is utilized for this purpose. Upon extracting the documents, a multitude of pictures featuring individuals of Asian descent donning masks became accessible.The classifier in the first step undergoes training using this repository of data.



Phase 3 -

During the final phase, involving the recognition of facial features after the individual's visage is successfully detected, an accumulation of individual data is employed. These insights are constructed using the facial features of different people. Equal representation between both sexes is aimed at in choosing the pictures provided by observers. And the saved model will start to detect faces using OpenCV and pass the information to the detection model for identification of the face mask.

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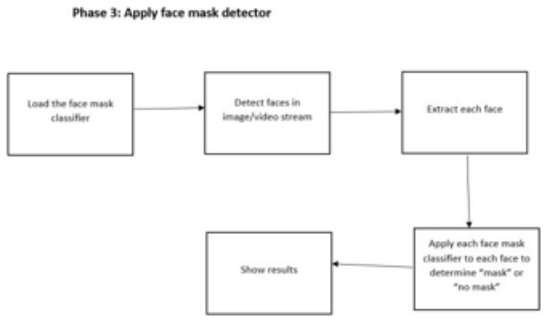

4. Flow Chart

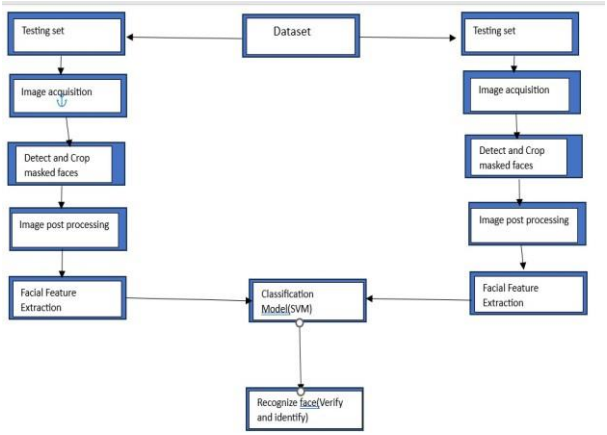

Fig. System Architecture

- Representation of Data.
- Enhancement of Data.
- Dividing the information.
- Information and Labeling.
- Adding a facial recognizing module.

5 . Results

Experiments are conducted utilizing the recall metrics, Precision, F1-score, and the accompanying macroeconomic average and weighted average results in order to illustrate the system's capacity for usage. The purpose of employing these metrics is to assess the framework through many angles. The system's recalls or accuracy show how well it can identify genuine results. Recall additionally takes into account the total amount pf incorrect findings and the precisionwith which the framework detects positives that are not true. In this particular case of facedetection using masks, negative results happen whenever a thing is identified as a human face. In this case, although it's untrue claiming a living thing has a face that ispositive, the methodology portrays a plant ashaving a face ma

6. DISCUSSION

The models created by CNN might not always bevery accurate, they might cause privacy issues, they might have trouble conquering variances in performance and disguises, and they might even pose dangers to security.

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Using Python packages like OpenCV, TensorFlow, and Keras, the models were trained using DNNs, or deep neural networks.

These libraries have limited variability and computational complexity. It requires large data and

models can be computational expensive and real-time face mask detection can be challenging. Frameworks used are TensorFlow, CNN, Open CV, Keras, SMTP (Simple Mail Transfer Protocol) and SSL (Secure Socket Layer).GANs are challenging to maintain training instability. GANs are also prone to mode collapse and GRUs are vulnerable to the vanishing gradient problem.
The CNN approach proved effective with 99% accuracy in detecting mask individuals. The quality of CXR images can be vary and it can also affect model's performance. MobileNetMask and ResNet-50, are computationally intensive. Datasets used for evaluation are imbalanced and training data may be overfitting. CNN model is biased or unrepresentative of real-world

7. FUTURE SCOPE

Despite the fact that several case studies have been included to illustrate COVID-19, aproblem in the present moment, it is very challenging to set up the technology in thepresent moment. Creating an approach that can adapt to any situation or environment is getting harder. The suggested gadget may be used to closely monitor individuals in busy places. Taking into account the venture's estimated implementation costs, we can nearlysay that it won't be necessary because most major cities already have cameras placed in public areas. The one primary criterion of the suggested approach, a film camera, has previously met Our neural network simulation has been built on this.
A computer neural network, which is also sometimes known as a neural network made up of computers, is an arrangement called a system of brains composed of artificially generated neurons or nodes. Artificial Neural Networks (ANN), Convolutional Neural Networks (CNN), and Recurrent Neural Networks (RNN) represent a few of the significant varieties of neural networks in use today. The development of artificial neural networks has been influenced by a variety of disciplines, notably physics, mathematics, and neurology. Synthetic neural networks' initial motivation was greatly influenced by neurology. The success of biologically inspired convolutional neural networks (CNN) in the recent past is worth considering.

8. Conclusion

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