ANALYSIS OF FACE MASK DETECTION DURING COVID-19 PANDEMIC

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ABSTRACT

Coronavirus disease 2019 has become a major health problem. It is spreading very widely due to its contact transparent behavior. So WHO declared wearing the mask in crowded areas as a prevention method. In some of the areas, the diseases become widely spread out due to improper wearing of facial masks. So to overcome this problem we required an efficient mask monitoring system. We propose a high-precision and effective MobileFaceMask face-mask detector in this article. It is used in MobileFaceMask is consisting with the Pyramid network, that combines high-quality semantic information, multi-function maps, and a new PC module for facial mask detection. Besides, we propose a new algorithm for the removal of cross-class objects to reject low-confidence predictions and high union intersection. Experiments show that MobileFaceMask delivers good results with 2.3% and 1.5% detection accuracy, while 11.0% and 5.9% more baselines, respectively, are used in a world face mask input dataset. Furthermore, discuss the possibility of deploying MobileFaceMask for embedded or mobile devices with the lightweight MobileNet neural network.

I. INTRODUCTION

Face mask detection is a challenging task. It has been receiving more and more attention in this era due to the spreading of coronavirus disease. Hence many countries following the rule like “No entry without a mask”. Face mask detection is a very important issue for security purposes and Covid-19 prevention. In the case of a medical career, the mask decreases the likelihood of an infectious person’s future exposure to symptoms. Face mask detection is used in Airports, Hospitals, Offices, and Educational Departments, etc. So face mask detection is become a very critical and challenging issue. Face recognition without the mask is easier but face recognition with a mask is a critical one because feature extraction of the masked face is very complicated than a normal face. That is so many face features such as nose, mouth, and chin are absent in the masked face. In medicine, masks minimize the possible risk of exposure of an infected individual to symptoms. So many face mask detection can be concentrated in two steps.

1) Face Recognition
2) Feature Extraction

The first step is to recognize the face; here the face of an image must be detected. Mainly there is a problem such as detecting the multiple masks and unmasked faces in an image.

The 2019 coronaviral disease (COVID-19) has affected around million people worldwide and leaded 180,000 deaths in the 96 situation survey of the worldwide health organization (WHO). Several similar major respiratory disorders have occurred, such as registered a higher COVID-19 reproductive number than SARS. As a result, growing numbers of people care about their wellbeing, and public health is seen as the government's highest have shown that coronaviral spread can be minimized by surgical masks. WHO is currently advising to wear facial masks while people are suffering from respiratory symptoms or treatment for those with symptoms[7]. Besides, many providers of public services only require consumers to use masks[5]. Facial mask capturing has thus done a critical task in computer vision to support the global community, but research into facial mask detection is minimal.
MobileFaceMask, a novel facial mask detector that can detect facial masks and contribute to public health. MobileFaceMask is one of the first dedicated facial mask detectors to the best of our knowledge. MobileFaceMask uses several feature maps for the network architecture and uses FPN (Functional Pyramid Network) to merge high-level semantic knowledge into the network. We suggest a background attention detection head and an algorithm to delete artifacts to improve detection capacity to achieve better detection. Furthermore, we use our own dataset which we work with for similar facial recognition tasks on a large dataset, as the mask is a small dataset with features that can be advanced to extract. The approach is evaluated on a face mask set[8], which can be found in the examples in dataset contains several face pictures, masked or unmasked, including masked faces, maskless faces, maskless faces, picture faces, and masks and confusing images. Results from the studies reveal that MobileFaceMask provides cutting-edge result are quiet percent higher and are 11.0 percent and 5.9 percent higher than the baseline.

Objectives
To build a real-time system using Artificial Intelligence algorithms to detect whether the consumer on the webcam is has an mask present or not.

This project can efficiently detect the presence of masks in front of the webcam.

II. VARIOUS FACE MASK DETECTION TECHNIQUES

In 2012, Face Detection using CNN and GR Filters [1] proposed by BodanKwolek used to detecting facial regions by composing a Gabor Filters and a convolutional neural network. Gabor Filter is concentrated on extract the intrinsic facial features. The main advantages of the Gabor Filter allow the signal analysis at different scales and resolutions. The convolutional neural network layer consists of one or more planes. Totally 6 convolutional neural networks are used here. As a result, it showed providing better recognition and a high rate in face detection than the alone performance of CNN.

In 2015 intelligent face mask detection system [2] proposed by N. Ozkaya, S. Sagiroglu was used for the generation of face masks from its fingerprint. To develop an intelligent system for obtains masked faces from fingerprints without having any knowledge about their faces. The multi-model database contains 120 persons. The IFPSF contains 4 modules including Data Enrollment and MMDB module (Multi-Model Biometric Data Base).

The Face Reconstruction Module consists of pre-processing and post-processing steps. Here ANN (Artificial Neural network).

In 2016, the study of masked face detection approach in video analytics [3] proposed by Gayatri Deora and Ramakrishna, here video analytic approach is used for detection. When face detection can be triggered by calculating the distance between a person and the camera. Viola-Jones Algorithm used for facial part detection, such as detection of eyes, nose, and mouth, etc. As a result, poor image quality leads to a high false detection rate.

In 2016, Face recognition and detection were proposed by Naveen’s, Dr.R.S Moni. Here introduce for the detection and elimination of masks. The local and global facial features are used to realize a real face and masked face. A data- based 3DMAD used here by the combination and BSIF (Binarized Statistical Image Features) extract textures for face authentication. The steps are included here Feature extraction finds out the global and
local features for the face region. The nose and eye region features are included in local features. By the classification of these features, finds the

III. METHODOLOGY

3.1 Network Architecture
The proposed MobileFaceMask is presented in the fig. We use an object detection system, which provides a detection community, to build an efficient network for mask detection. The backbone refers to an extractor of general functions consisting of coevolutionary networks, which gives information in images. In MobileFaceMask, ResNet is used as a default but we integrate as a backbone for confrontation and device reduction as well. In terms of the spine, the backbone and the head are an intermediate part, which can strengthen with a coefficient in the previous layer characteristics. In conclusion, heads are classifiers, predictors, estimators, etc, capable of achieving the network's ultimate objectives. We follow a multi-scale detection strategy similar to SSD in MobileFaceMask to predict many FPN feature maps, as different receptive fields can be used to detect different object sizes. MobileFaceMask uses three function maps, which are fed into a detection head. In particular. We add a contextual attention module within every detection head to change the receptive field size and focus on unique fields that are close. Instead of a connected network, the performance of the detection head decreases further. We call it MobileFaceMask, which follows RetinaNet's architecture, containing an SSD and an FPN, and is capable of detecting small face masks.

3.2 Transfer Learning
Because of its small scale, it is difficult to learn better features for learning algorithms. As profound methods of learning frequently involve greater datasets, learning transfers to an associated task are suggested. learning has, according to, led to learning considerably as long as it is related closely. In our work, the network is composed of 32203 images and 393,703 annotated facets pre-trained on a broad face detection dataset - Broader Face (Wider Face). With MobileFaceMask only the back and neck parameters from face transported, with method initializing the heads. Also, pretrained picture weights are used in fundamental cases as a normal initialization of our backbones.

3.3 Context Attention
Module MobileFaceMask provides a new background attention module as its detection head to increase the detection efficiency for face masks (Fig. 1). We use a different kernel size to construct a block similar to the context module in SSH. You can get various reception fields from the same characteristic map so that through concatenation operations, you can integrate different object sizes. The original context module does not however take face, therefore, we cascade a CBAM so that MobileFaceMask can concentrate on conscious part contains some subsections, one of which is 3×3, two of which is 3×3, and three of which each has 3×3 kernels individually. Then channel attention is drawn to the concatenated function maps into CBAM, which through a several layer focus on important areas.

Figure 1: Context Attention Detection Head
IV. SYSTEM ARCHITECTURE

Description

- The detection of objects using hair functional classifiers is a method proposed by scientist for effective detection. It is a master-learning approach where many positive and negative images form a cascade function. The faces are detected with this.
- Classification of facial masks for each ROI face is applied
- To summarise the entire work, a blob is constructed, detects faces

How can we achieve these objects are

1. Haar Cascade classifier is used to detect the faces.
2. Build the neural network. the neural network cannot be trained from scratch. Instead, a pre-trained network called MobileNetV2 which is trained on the Imagenet dataset is finetuned.
3. The next step is to compile the model and train it on the augmented data.
4. Tensorflow, PyTorch, and Keras libraries are used for preprocessing.
5. MobileNetV2 is used to predict the presence of a mask

![System Architecture Diagram](image-url)
System Architecture Implemented Modules

1. Imports: Tensorflow and Keras libraries are imported.
2. Call the pre-trained network called MobileNetV2
3. Image Data Generation/Augmentation
4. Train the model
5. Run the project

V. CONCLUSION

We proposed mask detector that can potentially help to public health, namely MobileFaceMask., FP Net form the architecture of MobileFaceMask. For both high and low calculation scenarios, the strong backbone ResNet and the light backbone MobileNet can be used. We use the weights of a task facing detection large data set, to bring robust features. We have also proposed a new focus module on face and mask characteristics. ORCC attempting remove less reliable and IoU objects. The new approach for a consumer mask dataset with an overall accuracy of 2.3% and 1.5% above the baseline and 11.0% and 5.9% above the base level for retrieval.

REFERENCES


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