Real Time Face Mask Detection with Alert System

Prof. Shah S. N.[1], Sanchita Pawar [2], Sujata Jagtap [3]

Prof., Computer Department, SPCOET Someshwar Nagar, Baramati, India
Student, Computer Department, SPCOET Someshwar Nagar, Baramati, India
Student, Computer Department, SPCOET Someshwar Nagar, Baramati, India

---

Abstract - Last years of COVID shows that mask-wearing is important thing in stopping the COVID-19 spreading. By the time of this article, most states have recovered from COVID pandemic but mask wearing is needed for personal safety of person. That's why, Real-time face mask detection with alert system becomes a very important part of spread of the pandemic as well as number of viral infections. This study will present a face mask detection with alert system that can detect and monitor mask-wearing a person or not from camera and gives alert alarm when the person is not wearing mask. Using CNN algorithm. we can detect the person is wearing mask or not. Increasing number of cases all over the world, this system is replaced humans to check masks. people are wearing a mask or not needed and also detection. This system fulfils all those needs.

Our system can be used in public places like airport entry and railway station. This system is very useful in many companies where there are lot of peoples are worked. We have used basic concepts of convolutional neural network algorithm to state the mask wearing position. Results shows that our model performs well on the test data with 100 percent and 99 percent precision and recall, respectively. Our system will be python and machine learning based. Our system is very helpful because it is worked on Real-Time and gives output in seconds and will very easily find the people who are not wearing the mask or not and gives the temperature of person if he or she is wearing mask. If the person is not wearing the mask the system gives alert message. This system saves the precious time of person because it is work on real time bases.

***Key Words*:** Machine Learning, CNN Algorithm, python, face mask detection, alert system.

1.INTRODUCTION

According to recent research on COVID-19, every 10% increase in mask-wearing means the spread of virus is decreased which results the stopping the breakout in a community and other public places. Wearing the face mask is important and essential. At the time of this article, most states in tall over the world have wear the mask before they are going to public places. The face mask detector is an algorithm that finds the mask-wearing status of a person. Using a face mask detection, we can easily find out the person is wearing mask or not. If that person is wearing mask, then system allow to person enter in particular area. If the person is not wearing the mask, then our system gives alert alarm. Benefit of our system is it does not require humans to detect the person is wearing mask or not. The applications of face mask detection make it a popular research topic. A popular algorithm for face mask detection is the CNN algorithm. This algorithm is useful for detecting the face mask position. Another benefit of our system is it gives result in seconds. The CNN algorithm is used for image recognition. It has many features like it require less training parameters. The serializer is used for face detection. This is one of the most important applications of machine learning Nowadays there is a great use of face masks publicly due to the increase of the number of Covid19 cases as well as other viral infections which is reported in around the world. From a recent survey, we came to know that people don't wear a face mask to protect their health condition from air pollution but rather they use to hide their emotions from the general public who try to watch their current activities. But now a day it is becoming very mandatory for each and every one has to wear a facemask to protect from spreading the corona virus and other viral infections from one person to another. This infection is increased day by day across 180 countries. This virus and other viral infection are mainly spread through close contact of persons who are packed in certain public areas or inside a closed room through the air. Hence the usage of face masks is becoming more and more mandated to prevent the fast-spreading of this virus disease.

2. PROBLEM STATEMENT

To create "Real Time Face Mask Detection with Alert System" using python to detect person is wearing mask or not. If that person is wearing a mask, then that person

is allowed to enter in area else that person is not wearing a mask it gives alert message like alarm will ringing. when alarm will ring then it is very effective to detecting person is wearing mask or not.

3. LITERATURE SURVE

A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews use secondary sources, and do not report new or original experimental work.

1.Paper name: "Satellite image classification with deep learning,"
Author: M. Pritt and G. Chern

Satellite imagery is important for many applications including disaster response, law enforcement, and environmental monitoring. These applications require the manual identification of objects and facilities in the imagery. Because the geographic expanses to be covered are great and the analysts available to conduct the searches are few, automation is required. Yet traditional object detection and classification algorithms are too inaccurate and unreliable to solve the problem. Deep learning is a family of machine learning algorithms that have shown promise for the automation of such tasks.It has achieved success in image understanding by means of convolutional neural networks.

2.Paper name: "Human object detection in forest with deep learning based on drone's vision,

Author: S.-P. Yong and Y.-C. Yeong

The current advances in drone technology provoked significant changes in enabling drones to perform a wide range of missions with increasing level of complexity. Missions such as search and rescue or forest surveillance require a large camera coverage and thus making drone a suitable tool to perform advanced tasks. Meanwhile, the increasing trend of deep learning applications in computer vision "Brain tumor detection and tissue classification using machine learning algorithm" provides a remarkable insight into the initiative of this project. This paper presents a technique which allows detecting the existence of human in forestry environment with human object detection algorithm using deep learning framework.

3.Paper name: THERMAL FACE RECOGNITION USING MACHINE LEARNING

Author: Vivekanand Thakare1, Yash Lande2, Pallavi Moundekar, Priya Chamat4, Shrushti Sangode 5.

Any normal face image is a dense pattern consisting of hair, forehead, eyebrow, eyes, nose, ears, cheeks, mouth, lips, teeth, skin, and chin. Human face has more additional features like expression, appearance, adornments, beard, moustache etc. The face is the quality which best describes a person, and there are special areas of the human brain, such as the identical face area , which when get harmed prevent the recognition of the faces of even close family associates. The categories of certain structures such as the eyes or parts thereof are utilized in biometric recognition to entirely identify people. Artificial neural network is very useful method for face recognition. The face recognition method absolutely separates the face for which the method is already accomplished

4.Paper name: Face Mask Detector Using Machine Learning Applications

Author: Anchal Gupta1, Anjali Gupta2, Dr Sarika Saxena3, Dr. Raji Kaliyaperumal4, Divya Upreti5, Dr. Abbas Kazim6.

Facial recognition, as a biometric system, is a crucial tool for the identification procedures. When using facial recognition, an individual's identity is identified using their unique facial features. Biometric authentication system helps in identifying individuals using their physiological and behavioral features. Physiological biometrics utilize human features such as faces, irises, and fingerprints. In contrast, behavioral biometric rely on features that humans do, such as voice and handwritings. Facial recognition has been widely used for security and other law enforcement purposes. However, since COVID-19 pandemic, many people around the world had to wear face masks.

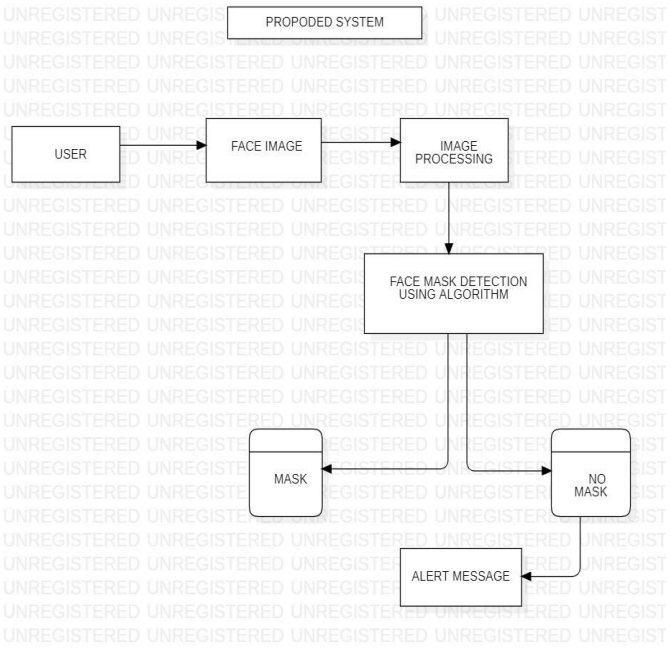
5. Paper name: Progressive Learning for Face Recognition with Mask Bias

Author: Baojin Huang, Zhongyuan Wang, Guangcheng Wang, Kui D.G.I.E,F.O.E 7 Dept of Computer Engg 2019-20 “Brain tumor detection and tissue classification using machine learning algorithm” Jiang, Zhen Han, Tao Lu, Chao Liang

1. In recent years, Convolutional Neural Networks (CNNs) are widely used in the field of computer vision owing to their powerful feature representation capabilities. Great progress has been made in face recognition system. For face recognition based on deep learning, existing CNNs supervised by margin-based loss functions show the ability to fit large-scale face recognition data sets, but they have been almost carried out on fully exposed faces. This results in great difficulties for masked face recognition (MFR) since people usually wear masks to prevent infection during COVID-19. At present, current popular face recognition training sets, such as Web Face, MS1MV3, etc., contain tens of millions of normal face images with millions of identities. Whereas, it is challenging to collect large-scale masked images with identity information.

4.PROPOSED SYSTEM

The face images taken as input and that image performs the pre-processing operation after the pre-processing segmentation using the CNN algorithm and on that segmented area, we perform the operation feature extraction using algorithm serialize process. Then on that extracted area we perform optimization using genetic algorithm and lastly classify the person is wore the mask or not and give alert alarm and give alert message if person is not wearing mask using the classification CNN.



5.METHODOLOGY

As shown in proposed system, the architecture depicts the workflow of the System. First, the System is loading the dataset, then train that data set using Kera’s. After that Serialize Facemask Classifier, Apply Face Mask, to load classifier form disk, the camera of system is appearing. Detect Faces in Streams after that it check weather that person is wearing a mask or not. If that person is wearing a mask that person is allow to enter in specific area else those persons are not allowed to enter in the specific area. The features used in developing the project are Anaconda-Spider tool is used and Python programming language. Anaconda-Spider tool is the platform where the complete programming of the project is done. Python libraries are used to create and compile packages. Python is the programming language which helps in system development.

6.SYSTEM ARCHITECTURE

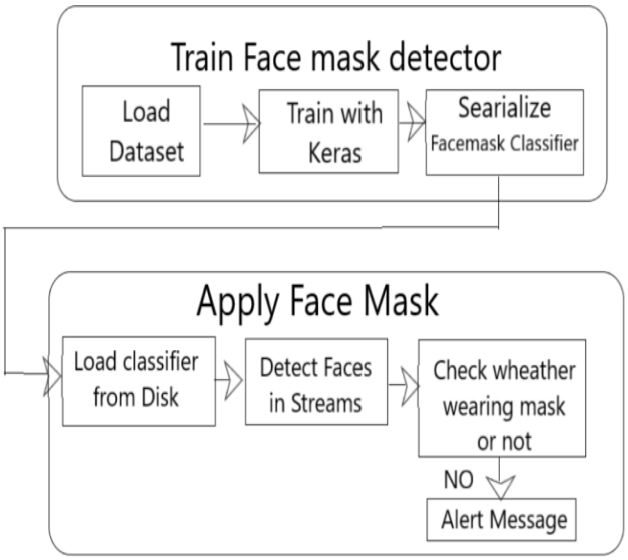


Fig. 1. Architecture of proposed system

7.ALGORITHM

CNN Algorithm –

CNN is a powerful algorithm used for image processing. These algorithms are in daily life the best algorithms we have for the automating processing of the objects images. Many companies use these algorithms to check the objects in an image.

Three Layers of CNN

Convolutional Neural Networks specialized for applications in image recognition & video recognition. CNN is mainly used for image analysis tasks like Images recognition, Object detection & Segmentation.

There are three types of layers in the Convolutional Neural Networks:

1) Convolutional Layer: In a convolutional neural network each input neuron is connected to all next hidden layer. In CNN, only a small region of the input layer neurons connects to the neuron hidden layer.

2) Pooling Layer: The pooling layer is used for reducing the dimensionality of the feature map. There will be multiple activations & pooling layers inside the hidden layer of the CNN.

3) Fully-Connected layer: Fully Connected Layers form the lasts few layers in the convolutional neural network. The input to the fully connected layer is the output from the final Pooling layer or Convolutional Layer, which is flattened and at last then fed into the fully connected layer.

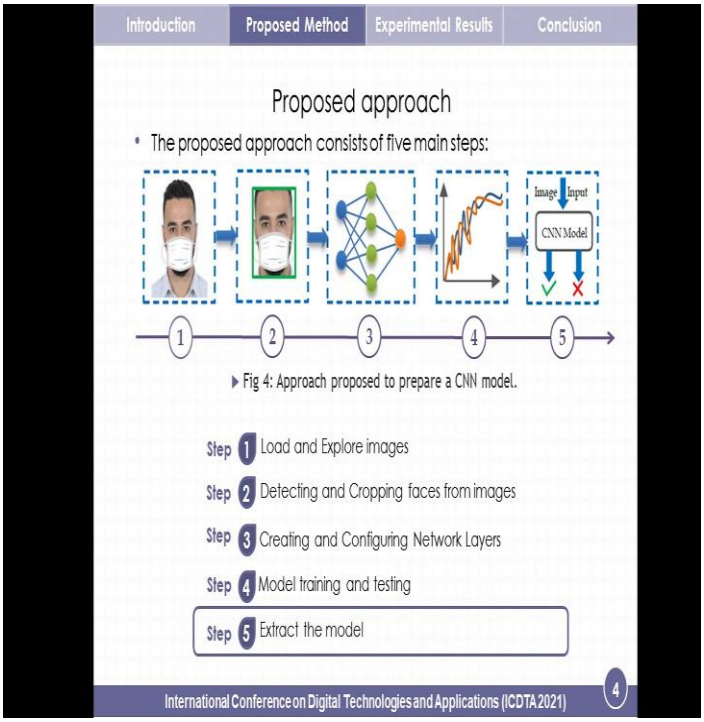
The algorithm will categorize in to the items k groups of similarities. To calculate that similarities, we will use the Euclidean distance as measurements. The algorithm works as follows: Convolutional Neural Network, also known as CNN, is a well-known method in computer vision applications. It is a class of deep neural networks that are used to detect objects, analyze visual imagery. This type of architecture is dominant to recognize objects from a picture or video. It is used in applications like image or video recognition, segmentation neural language processing, There are three components of a Convolution

STEPS OF CNN

1. Image capturing.
2. Image segmentation.
3. Classification.
4. Transformation.
5. Detection.

The algorithm will categorize the items into k groups of similarity. To calculate that similarity, we will use the Euclidean distance as measurement. The algorithm works as follows: Convolutional Neural Network, also known as CNN, is a well-known method in computer vision applications. It is a class of deep neural networks that are used to analyze visual imagery. This type of architecture is dominant to recognize objects from a picture or video. It is used in applications like image or video recognition, neural language processing, There are three components of a Convolution

The purpose of the convolution is to extract the features of the object on the image locally. It means the network will learn specific patterns within the picture and will be able to recognize it everywhere in the picture. Convolution is an element-wise multiplication. The concept is easy to understand.



The computer will scan a part of the image, usually with a dimension of 3×3 and multiplies it to a filter. The output of the element-wise multiplication is called a feature map. This step is repeated until all the image is scanned. Note that, after the convolution, the size of the image is reduced.

8.RELETED WORK

Due to the viral transmission in the air number of countries introduces Face mask. That masks is mandatory to use for protecting against viral infection.

Two main reasons to wearing a mask-

1.First one is to prevent viral infection in air.

2.protecting from small and tiny particles are present in air.

So, our project motive is related to first reason. Due to the viral infection people suffering from number of disease so we are preventing those problems.

9.ADVANTAGES OF SYSTEM

1. Fully Automatic Detection.
2. Automatic Detection no workers requirement.
3. Security purpose.
4. With the help of this system, we save number of people.
5. It does not require large space on the floor.

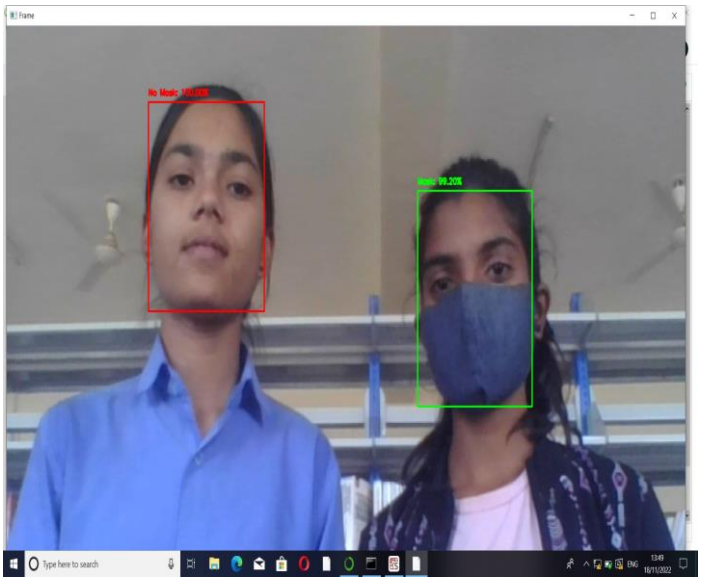
10.DESIGN GOAL

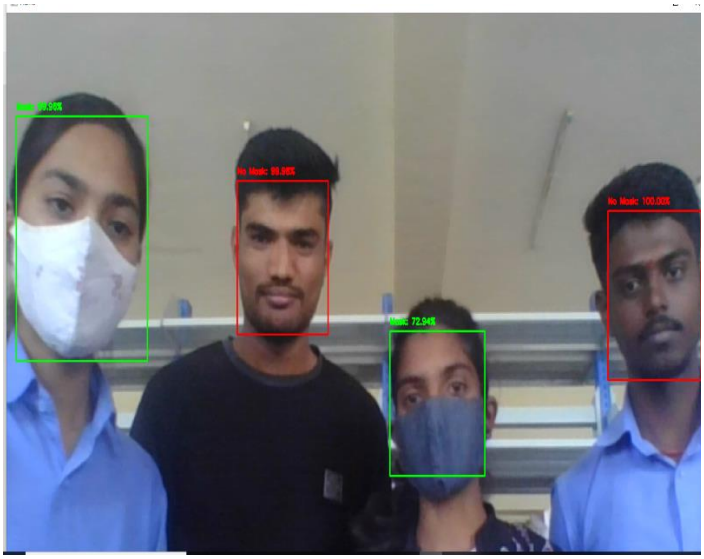
1. Save human life.
2. Low worker requirement.
3. Preventing from viral infection.
4. It gives alert alarm.

11.APPLICATIONS

1. Healthcare.
2. Air-Port.
3. Railways Entry.
4. Office Entry.
5. Museums and Amusement Park.
6. Other Public Places.

RESULTS





12. CONCLUSIONS

From the analysis This project purpose is to detect that person face, person is wearing a mask or not. If person is wearing mask, then allow by system to enter in specific area else person is not wearing mask alarm system is ringing. This is very desire to wearing mask in public area so we are constructing that project. Number of times we have to Successfully detected the masks and alert in res time if anyone is fount without a mask. This helps us easily identify whether the customers wearing masks, this project is also applicable to real-time face mask detection. Provide appropriate model The utilization of the CNN Algorithm.

13.FUTURE SCOPE

1. As we all know that in the last few years, the corona crisis has hit our country and during that time it was very important to wear a mask.
2. Entry was not allowed anywhere without checking people wear mask or not. In future Covid-19 also other viral infection disease are occurred that time this system is very useful.
3. It gives a faster result and the people does not need to check every person is wear a mask or not system will detect itself.

14.REFERENCES

[1] B. Blocken, F. Malizia, T. V. Druenen, and T. Marchal, “Towards aerodynamically equivalent COVID19 1.5 m social distancing for walking and running,” Preprint, pp. 112, Aug. 2020.

[2] C. Affonso, A. L. D. Rossi, F. H. A. Vieira, and A. C. P. de Leon Ferreira, “Deep learning for biological image classication,” Expert Syst. Appl.,vol. 85, pp. 114122, Nov. 2017.

[3] M. Pritt and G. Chern, “Satellite image classication with deep learning,” in Proc. IEEE Appl. Imag. Pattern Recognit. Workshop (AIPR), Oct. 2017,pp. 17.

[4] Y. Hou, “Breast cancer pathological image classication based on deep learning,” J. X-Ray Sci. Technol., vol. 28, no. 4, pp. 727738, Aug. 2020.

[5] W. Budiharto, A. A. S. Gunawan, J. S. Suroso, A. Chowanda, A. Patrik, and G. Utama, “Fast object detection for quadcopter drone using deep learning,” in Proc. 3rd Int. Conf. Comput. Commun. Syst. (ICCCS), Apr. 2018, pp. 192195.

[6] F. Deng, X. Zhu, and J. Ren, “Object detection on panoramic images based on deep learning,” in Proc. 3rd Int. Conf. Control, Autom. Robot. (ICCAR), Apr. 2017, pp. 375380.

[7] A. Boukerche and Z. Hou, “Object detection using deep learning methods in trafc scenarios,” ACM Comput. Surv., vol. 54, no. 2, pp. 135, Mar. 2022.

[8] S.-P. Yong and Y.-C. Yeong, “Human object detection in forest with deep learning based on drone’s vision,” in Proc. 4th Int. Conf. Comput. Inf. Sci. (ICCOINS), Aug. 2018, pp. 15. 49 “Brain tumor detection and tissue classification using machine learning algorithm”

[9] S. Wang, D. M. Yang, R. Rong, X. Zhan, and G. Xiao, “Pathology image analysis using segmentation deep learning algorithms,” Amer. J. Pathol., vol. 189, no. 9, pp. 16861698, Sep. 2019.

[10] Z. Guo, X. Li, H. Huang, N. Guo, and Q. Li, “Deep learning-based image segmentation on multimodal medical imaging,” IEEE Trans. Radiat. Plasma Med. Sci., vol. 3, no. 2, pp. 162169, Mar. 2019.

[11] X. Qu, T. Wei, C. Peng, and P. Du, “A fast face recognition system based on deep learning,” in Proc. 11th Int. SymP Comput. Intell. Design (ISCID), vol. 1, Dec. 2018, pp. 289292.

[12] M. Coskun, A. Ucar, O. Yildirim, and Y. Demir, “Face recognition based on convolutional neural

network," in Proc. Int. Conf. Mod. Electr. Energy Syst. (MEES), Nov. 2017, pp. 376379.

[13] C. Karri and M. S. R. Naidu, "Deep learning algorithms for secure robot face recognition in cloud environments," in Proc. IEEE Int. Conf. Parallel Distrib. Process. Appl., Big Data Cloud Comput., Sustain. Comput. Com- mun., Social Comput. Netw. (ISPA/BDCloud/SocialCom/SustainCom), Dec. 2020, pp. 10211028.

[14] S. Manna, S. Ghildiyal, and K. Bhimani, "Face recognition from video using deep learning," in Proc. 5th Int. Conf. Commun. Electron. Syst. (ICCES), Jun. 2020, pp. 11011106.

[15] X. Wang and X. Tang, "Random sampling LDA for face recognition," in Proc. IEEE Comput. Soc. Conf. Comput. Vis Pattern Recognit. (CVPR), vol. 2, Jun./Jul. 2004, pp. 17.

[16] R. Gottumukkal and V. K. Asari, "An improved face recognition technique based on modular PCA approach," Pattern Recognit. Lett., vol. 25, no. 4, pp. 429436, 2004. D.G.I.E,F.O.E 50 Dept of Computer Engg 2019-20"Brain tumor detection and tissue classification using machine learning algorithm"

[17] M. S. Ejaz and M. R. Islam, "Masked face recognition using convolutional neural network," in Proc. Int. Conf Sustain. Technol. Ind. 4.0 (STI), Dec. 2019, pp. 16.

[18] M. O. Faruqe and M. A. M. Hasan, "Face recognition using PCA and SVM," in Proc. 3rd Int. Conf. AntiCounterfeiting, Secur., Identicat. Commun., Aug. 2009, pp. 97101.

[19] A. Chavda, J. Dsouza, S. Badgujar, and A. Damani, "Multi-stage CNN architecture for face mask detection," in Proc. 6th Int. Conf. Converg. Technol. (I2CT), Apr. 2021, pp.18. S. Sethi, M. Kathuria, and T. Kaushik, "Face mask detection using deep learning: An approach to reduce risk of corona virus spread," J. Biomed. Informat., vol. 120, Aug. 2021,Art. no. 103848.

[20] M. Loey, G. Manogaran, and N. E. M. Khalifa, "A deep transfer learning model with classical data augmentation and CGAN to detect COVID- 19 from chest CT radiography digital Appl., pp. 113, Oct. 2020.

[21] X. An, X. Zhu,Y. Gao,Y. Xiao,Y. Zhao, Z. Feng, L.Wu, B. Qin, M. Zhang,D. Zhang, and Y. Fu, ``Partial FC: Training 10 million identities on a single machine," in *Proc. IEEE/CVF Int. Conf. Comput. Vis. Workshops (ICCVW)*, Oct. 2021, pp. 14451449.

[22] Z. Liu, P. Luo, X. Wang, and X. Tang, ``Deep learning face attributes in the wild," in *Proc. IEEE Int. Conf. Comput. Vis. (ICCV)*, Dec. 2015, pp. 37303738.

[23] F. Ding, P. Peng, Y. Huang, M. Geng, and Y. Tian, ``Masked face recognition with latent part detection," in *Proc. 28th ACM Int. Conf. Multimedia*,Oct. 2020, pp. 22812289.

[24] S. Li, X. Ning, L. Yu, L. Zhang, X. Dong, Y. Shi, andW. He, ``Multi-angle head pose classication when wearing the mask for face recognition under the COVID-19 coronavirus epidemic," in *Proc. Int. Conf. High Perform. Big Data Intell. Syst.*, May 2020, pp. 15.

[25] C. Qi and L. Yang, ``Face recognition in the scene of wearing a mask,'' in *Proc. Int. Conf. Advance Ambient Comput. Intell. (ICAACI)*, Sep. 2020, pp. 7780.