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RECOGNITION OF PERSON WEARING MASK OR NOT

Nagendrakumar Motilal Jaiswar[*1]

[*1]UG, Department Of Information Technology, B.K Birla College Kalyan,
(Empowered Autonomous Status), India.

ABSTRACT

This research explores the fusion of computer vision, machine learning, and facial recognition algorithms to create a robust system capable of accurately detecting the presence or absence of a mask on an individual's face. The results showcase the model's efficacy in accurately recognizing individuals with or without masks, demonstrating its potential for deployment in public spaces, transportation hubs, and healthcare facilities. By developing a robust and accurate system, this study lays the groundwork for the integration of mask recognition technology into diverse sectors, fostering a safer and more secure environment for individuals worldwide. The real-world applications of mask recognition extend beyond the public health domain. Security systems, public transportation, and commercial establishments are increasingly integrating mask detection technologies to ensure compliance with health regulations. As the world continues to navigate through unprecedented times, the integration of mask recognition technologies stands as a testament to the adaptability and innovation within the intersection of technology and public health.

Keywords: Detection, Convolutional Neural Network (CNN), Deep Learning, Analysis.

I. INTRODUCTION

The recognition of whether a person is wearing a mask or not has emerged as a pivotal area of technological innovation with far-reaching implications. The wearing of face masks, long established in healthcare settings, has now permeated into the broader spectrum of public life. Consequently, the ability to recognize whether a person is wearing a mask or not has risen to the forefront of technological innovation, offering solutions for public health enforcement, safety assurance, and security enhancement. This paper endeavors to provide a comprehensive review and analysis of the recognition of a person wearing a mask.

The aim to scrutinize the methodologies, technologies, and ethical considerations that underpin mask recognition systems, shedding light on the challenges and opportunities presented by this evolving field.

Additionally, ethical concerns regarding privacy, consent, and the potential for algorithmic biases have surfaced as central issues that demand thoughtful consideration in the deployment of mask recognition technology. As the technology continues to evolve and adapt to the ever-changing landscape of global health, it is imperative to navigate the intricate balance between harnessing the potential of mask recognition for the greater good and safeguarding individual rights and liberties.

This paper aims to provide an informed and comprehensive perspective on the recognition of whether a person is wearing a mask or not, highlighting the multifaceted aspects of this technology. By addressing the scientific, ethical, and societal dimensions of this field, it seeks to contribute to the ongoing discourse on the responsible and effective deployment of mask detection technologies in a world grappling with unprecedented challenges. In doing so, it underscores the adaptability and innovation at the intersection of technology and public health, a testament to human resilience in the face of adversity.

The remainder of the document is structured as follows:

Next part after this consist, related work, Section II about data set and methodology, Section III modelling and their analysis, Section IV Result and Discussion, section V Future work and then conclusion and at the end references.

II. RELATED WORK

Numerous studies use CNNs to detect mask-wearing leveraging extensive datasets and diverse CNN architectures they target real-time wide-ranging applications including public spaces healthcare and wearables providing immediate mask usage feedback using computer vision. The model, built on custom deep learning and computer vision techniques, excels at discerning whether an individual is wearing a mask. Notably, our dataset comprises only authentic images, devoid of any morphed or fabricated masks. Leveraging the

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MobileNetV2 architecture has not only enhanced accuracy but also optimized computational efficiency, making it suitable for deployment on embedded systems. ResNet-50 was chosen due to its deep architecture, which enables it to learn intricate features and patterns within images. This was especially crucial in our quest for precise mask detection, as identifying masks, whether worn or not, requires a detailed analysis of facial features. The training ResNet-50 model on an extensive dataset comprising thousands of images with and without masks. The model underwent a rigorous training process spanning multiple epochs, allowing it to learn the nuances of mask-wearing.

III. METHODOLOGY

For face recognition of a person wearing mask or not uses many algorithms like Convolutional Neural Network CNN, Artificial Neural Network (ANN), LeNet. In this paper, CNN has been used which is very good for recognition of faces and their accuracy is also good and other algorithms results are not much better. This is an algorithm of deep learning. Image processing or analysis is done using this algorithm. CNN is very good which automatically learns patterns from pixel data. These multiple layers use convolutional and pooling to capture hierarchical features which make them more effective in image recognition or image classification. To train the model for recognition of person wearing mask or not, here used the Kaggle dataset which contains approximately 8000 images. A dataset consist images both with mask and without mask. For processing of images first resize all the images to fixed size and normalizing pixel values to standard range.

The model was trained using a binary classification approach, with 'mask' and 'no-mask' as the two classes. the model is trained with 100 epochs. A training-validation split to monitor the model's performance and prevent overfitting. The loss function, optimizer, and learning rate were selected through experimentation to achieve optimal results. Software where used that is Google Colaboratory for software environment, TensorFlow library for CNN implementation, and Keras as a high-level neural network library built on top of TensorFlow, which is versatile for various machine learning tasks.

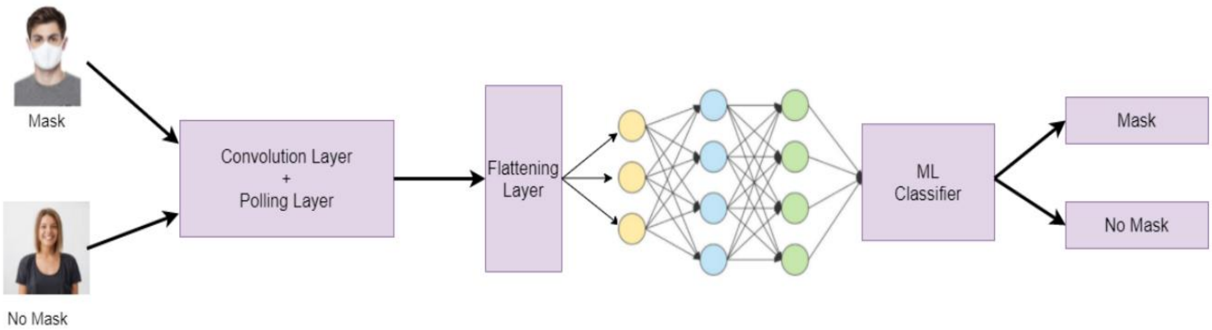

Figure 1: Recognition of person Wearing Mask or Not.

IV. MODELING AND ANALYSIS

In this research, uses a many sets of deep learning models, including Convolutional Neural Networks (CNN), AlexNet, MobileNetV2, and ResNet-50, to address the task of face mask detection. Each model was chosen for its specific architecture and capabilities, and they were trained and evaluated to assess their effectiveness in the given context. A validation set was employed to monitor the models' performance and prevent overfitting. The models were evaluated using standard performance metrics, including accuracy, precision, recall, to gauge their ability to accurately detect mask-wearing individuals. These metrics were calculated to assess the models' precision and ability to avoid false positives and negatives.

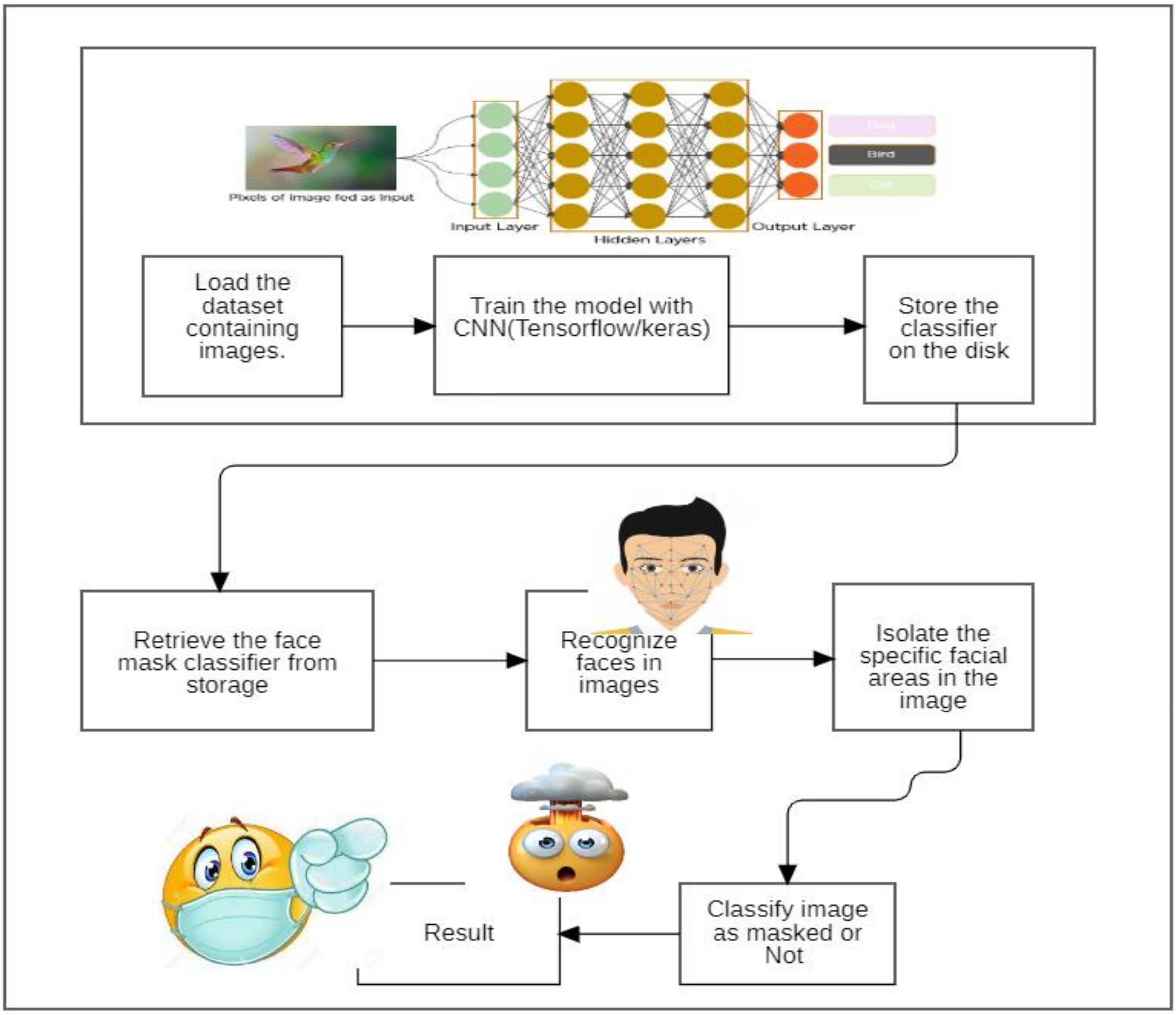

Figure 2: Flowchart view of the Model.

V. RESULTS AND DISCUSSION

In this paper, a diverse set of models has been extensively utilized, with a particular focus on models demonstrating robust performance. All models were rigorously trained over 100 epochs, and their accuracy has been meticulously documented in tables for reference. To validate their real-time applicability, also tested on live images, yielding consistently high accuracy. The exceptional results achieved across these models underscore their reliability in practical scenarios. Moreover, the paper showcases the superior performance of the selected models, affirming their suitability for real-time face mask detection.

Table 1. Training Statics of face mask Classifier

SN	Model Type	Accuracy Test (%)
1	CNN	94.00
2	MobileNet V2	99.30
3	ResNet-50	98.90

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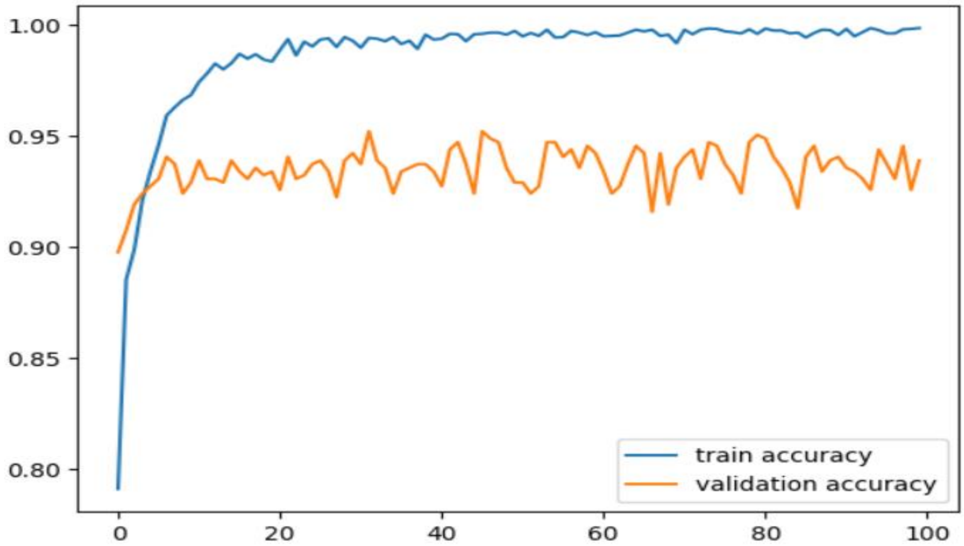

Figure 3: Graph of Training and Validation Accuracy using CNN

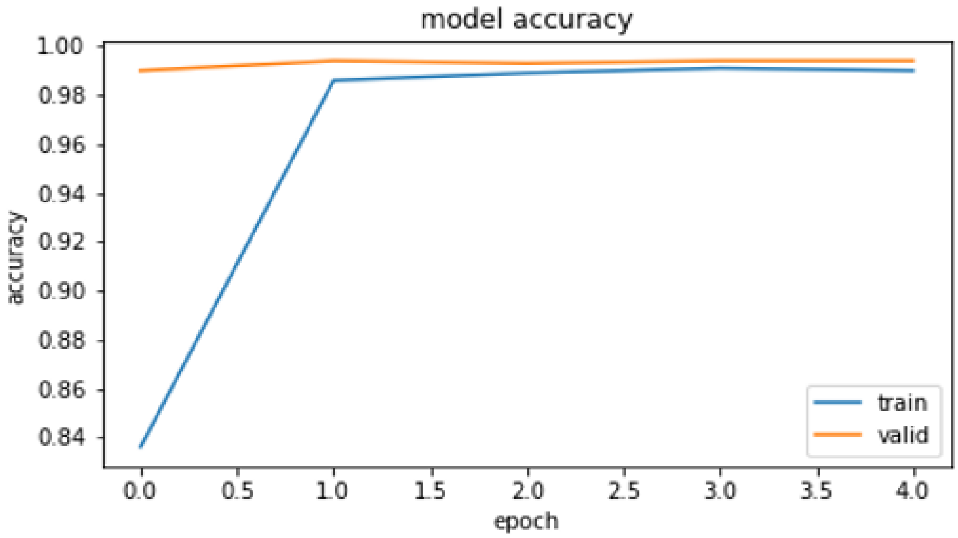

Figure 4: Graph of Training and Validation Loss using Resnet-50

VI. FUTURE WORK

Wearable Technology by integrating face mask detection into wearables such as smart glasses or smart masks, we can monitor mask usage in public spaces. Healthcare Applications this technology can be applied in healthcare settings to verify if patients are wearing masks, which can be crucial for security and safety in hospitals and clinics.

VII. CONCLUSION

The advent of advanced technology and emerging trends has paved the way for the practical detection of face masks leveraging these innovations a highly efficient face mask detection system has been developed guided by the MobileNet V2 architecture this system excels in various computational scenarios and boasts robust features having been meticulously trained on a diverse and augmented dataset. The pursuit of efficiency and optimization including hyperparameter tuning has been central to its development promising significant societal contributions in the fight against the ongoing pandemic to address the pressing need for controlling the spread of covid's like viruses. The face mask recognition system has emerged as a powerful and efficient solution as a result it is set to play a significant role in public healthcare and can be extended to detect proper mask usage and identify mask types in the future making it an invaluable tool during the ongoing pandemic.

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