# Pune Vidyarthi Griha's
## College of Engineering & SSD IOM, Nashik

Project on

## "Face Mask Detection System Using AI"

Presented by

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# Contents

1. Introduction

2. Problem Definition

3. Existing System

4. System Architecture

5. Proposed System

6. Algorithms

7. Technologies

8. Techniques

9. Mathematical Model and Equation

10. Tools

11. Advantages

12. Applications

13. Conclusion

# Introduction

- The 209th report of the world health organization (WHO) published on 16th August 2020 reported that coronavirus disease ,And coronavirus spread by avoiding forward distance travelled by a person's exhaled breath by more than 90%.

- Face mask detection refers to detect whether a person is wearing a mask or not.

- In fact, the problem is reverse engineering of face detection where the face is detected using different machine learning algorithms for the purpose of security, authentication and surveillance.

- Face detection is a key area in the field of Computer Vision and Pattern Recognition. A significant body of research has contributed sophisticated to algorithms for face detection in past.

# Problem Definition

Wearing a mask in public settings is an effective way to keep the communities safe as a response to the covid-19 pandemic, We open-sourced a face mask detection application that uses AI detect if people are wearing masks or not. Focused on making our face mask detector ready for real-world applications, such as CCTV cameras, where faces are small, blurry, and far from the camera.

# **Existing system**

- Existing system uses ANN Algorithm To detect the face mask.

- This algorithm treats local pixels same as pixels for apart.

- It is sensitive to location of an object in an image.

- It needs lot more computation to predict the output.

- Existing process is more time consuming as well as having the less accuracy.

- Existing process gives output only Red and Green square on respected to Not wearied and wearied mask persons.
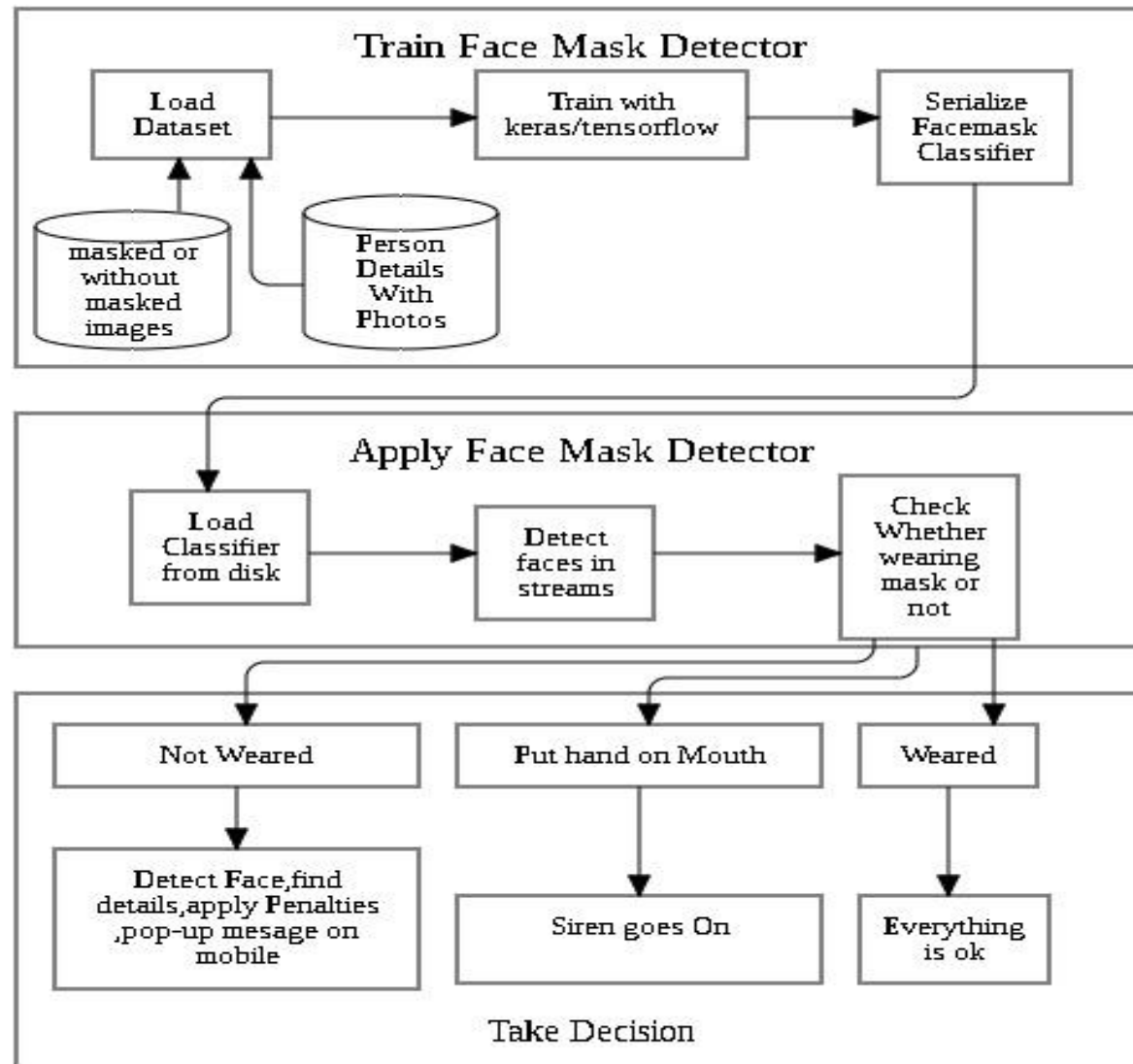
# System Architecture



**Fig. 1 . Proposed system Architecture**

# Proposed system

- We detect face mask using CNN, It will solve the problem of more computations using feature extraction techniques and classification techniques.

- We build a system which get the images from the CCTV and after capturing it will detect the face mask is present or not through following condition

- If the person wearing a mask then everything is Ok.

- If the person wearing a hand on face then alarm goes on.

- If the person not wearing mask then system detect face of that person from the database and  imposed some penalties and then pop up message on mobile of that person

# Algorithms

## 1. CNN Algorithm:

A convolutional neural network (CNN) is a type of artificial neural network used in image recognition and processing that is specifically designed to process pixel data. A CNN uses a system much like a multilayer perceptron that has been designed for reduced processing requirements.

- Convolution Operation- Convolution has the nice property of being translational invariant.

- ReLU Layer- ReLU is an activation function.

- Pooling- In this layer we shrink the image stack into a smaller size,

- Flattening

- Full Connection

## 2. SVM Algorithm:

A support vector machine (SVM) is machine learning algorithm that analyses data for classification and regression analysis. SVM is a supervised learning method that looks at data and sorts it into one of two categories.

1. Import the dataset.

2. Explore the data to figure out what they look like.

3. Pre-process the data.

4. Split the data into attributes and labels.

5. Divide the data into training and testing sets.

6. Train the SVM algorithm.

7. Make some predictions

# Technologies

**Artificial Intelligence**

  Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert system, natural language processing, speech recognition and machine vision

**Deep Learning**

  The field of artificial intelligence is essentially when machines can do tasks that typically require human intelligence. It encompasses machine learning, where machines can learn by experience and acquire skills without human involvement.

# Techniques

- Face mask monitoring

- Kernel

- Stride

# Mathematical Model and Equation

we take a small matrix of numbers (called kernel or filter), pass it over our image, and transform it based on the values from the filter.

$$G\,[m,n]=(f\times h)\,[m,n]=\Sigma j\Sigma i\; h\,[j,k]\; f\,[m-j,n-k]$$

Since our image shrinks every time, we perform convolution, we can do it only a limited number of times before our image disappears completely.

$$P=(f-1)/2$$

Instead of shifting the kernel by one pixel, we can increase the number of steps. So, step length is also treated as one of the convolution layer hyper parameters.

$$\text{nout}= floor\left(1+\frac{n+2p-f}{s}\right)$$

The filter and the image you want to apply it to must have the same number of channels.

$$[n,n,nc]\times[f,f,nc]=\left[\text{floor}\left(1+\frac{n+2p-f}{s}\right),floor\left(1+\frac{n+2p-f}{s}\right),nf\right]$$

# Example

| | | |
|---|---|---|
| 1 | 7 | 2 |
| 11 | 1 | 23 |
| 2 | 2 | 2 |

Input

| | |
|---|---|
| 1 | 1 |
| 0 | 1 |

Kernel

| | |
|---|---|
| 9 | 32 |
| 14 | 26 |

Output

**O=[i-k]+1**

(1x1 + 7x1 + 11x0 + 1x1) = 9
(7x1 + 2x1 + 1x0 + 23x1) = 32
(11x1 + 1x1 + 2x0 + 2x1) = 14
(1x1 + 23x1 + 2x0 + 2x1) = 26

# Tools

- Keras

- Tensorflow

- MATLAB®

- Pytorch

# Advantages

- Cost effective.

- Curb Covid-19 Pandemic.

- Mostly used in public places like Hospitals etc.

- The system is easy to implement in any existing organizational system.

- The system can be used easily with any camera or hardware like surveillance area.

- Life Saving.

# **Applications**

- School/Colleges

- Company

- Hospitals

- Bank

- Bus Station

- Railway Station

- Airport

# **Conclusion**

With the help of this proposed system, we are able to contribute in public healthcare and welfare. Using basic ML tools and simplified techniques the method has achieved reasonably high accuracy.

# References

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# Thank You !