##### Annexure-1 (A typical Specimen of Title Page)

**Detecting Face Mask using Artificial Intelligence, Machine Learning and Deep Learning for COVID-19 Prevention**

### A Project Work Synopsis

*Submitted in the partial fulfillment for the award of the degree of*

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### IN AIML

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## List of Symbols

*Symbol Description*

***Ast Asc Asv b d d’***

***fc,ave fsc***

##### fy Sv xu

***~~x~~***

*τ* ***c***

*Area of steel reinforcement bars on tension face*

*Area Of steel reinforcement bars on compression face Area of two legs of the closed stirrups*

*Breadth of rectangular beam section Effective depth of rectangular beam section Effective cover on compression face Average compressive stress in concrete Stress in steel on the compression side*

*Characteristic strength of steel reinforcement bars Spacing of the stirrups*

*Depth of neutral axis from compression face*

*Depth of centroid of the compression block in concrete Shear strength offered by concrete*

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# INTRODUCTION

#### 1.1 The COVID-19 pandemic emerged in December 2019 in metropolis town within the Hubei province of central China. Perceptive the virus’s growth and unfold among humans, the World Health Organization declared the corona virus (i.e., Sars-CoV-2) to be a world pandemic in March 2020. This pandemic has devastating effects on societies and economies round the world inflicting a world health crisis. It's associate degree rising metastasis communicable disease caused by Severe Acute metastasis Syndrome Coronavirus2. Everywhere on the planet, particularly within the third wave, COVID-19 has been a major health care challenge. Several shutdowns in numerous industries are caused by this pandemic. According to the centers for Disease Control and Prevention (CDC), corona viral infection is transmitted predominantely by respiratory droplets made once individuals breathe, talk, cough, or sneeze with common drop size 5–10’m however aerosol emission will increase once humans speak and shout loudly. People with COVID-19 have had a good scope of symptoms reported like shortness of breath or issue in respiratory. Elder individuals having respiratory organ unwellness are at higher risk of obtaining corona virus than most. Therefore, to forestall speedy COVID-19 infection, several solutions, like confinement and lockdowns, are recommended by the bulk of the world’s governments. It's true that COVID-19 could be a world pandemic and have an effect on many domains. The importance of sporting masks be reducing vulnerability of risk from a pestilent individual throughout the “pre-symptomatic” amount to restrain the spreading of the virus.

**1.2** **A mask detector system is enforced to envision this. mask detection means that to spot whether or not someone is sporting a mask or not. the primary step to acknowledge the presence of a mask on the face is to observe the face, that makes the strategy divided into 2 parts: to observe faces and to observe masks on those faces. Deep learning has been won’t to establish UN agency isn't sporting the facial mask mistreatment Convolutional neural network. It's various applications, like autonomous driving, education, police work, and so on. The approach is ascendable, safe to execute, and provides a much bigger image of mask usage within the world. There are several detector systems developed round the world and being enforced. However, all this science desires optimization; a stronger, a lot of precise Detector, as a result of the world cannot afford to any extent further increase in corona cases. Considering AI legal issues and advantages in combating COVID-19 pandemic, AI technique-based solutions are still associate degree open window for development and legal interpretation. the sphere of AI (AI) analysis has advanced considerably in recent years, particularly within the space of machine learning. Any fresh developed technology is indivisible from the term AI. While not AI it's terribly tough today to form any vital progress in terms of technical innovation. AI is being thought of because the next huge issue that may amendment the world hugely.**

**1.3 Laptop with Internet Connection, Smartphone**

**1.4 Software Specification:**

**1.4.1 Jupyter:** was developed by Fernando Perez as a web based front end to IPython kernel. As an effort to make an integrated interactive computing environment for multiple language, Notebook project was shifted under Project Jupyter providing front end for programming environments Juila and R in addition to Python. A notebook document consists of rich text elements with HTML formatted text, figures, mathematical equations etc. The notebook is also an executable document consisting of code blocks in Python or other supporting languages. Jupyter notebook is a client-server application. The application starts the server on local machine and opens the notebook interface in web browser where it can be edited and run from. The notebook is saved as ipynb file and can be exported as html, pdf and LaTex files.

**1.4.2 QT Designer-** Qt Designer is the Qt tool for designing and building graphical user interfaces (GUIs) with Qt Widgets. You can compose and customize your windows or dialogs in a what-you-see-is-what-you-get (WYSIWYG) manner, and test them using different styles and resolutions. Widgets and forms created with Qt Designer integrate seamlessly with programmed code, using Qt's signals and slots mechanism, so that you can easily assign behavior to graphical elements. All properties set in Qt Designer can be changed dynamically within the code. Furthermore, features like widget promotion and custom plugins allow you to use your own components with Qt Designer.

# LITERATURE REVIEW

Gagandeep Kaur, Ritesh Sinha, Puneet Kumar Tiwari, Srijan Kumar Yadav, Prabhash Pandey, Rohit Raj, Anshu Vashisth, Manik Rakhra (2021) has revealed a paper on mask recognition system using CNN model []. This technique is often enforced within the retail retailers and therefore the result is often seen on the digital and promotional screens. Though many case studies are listed to demonstrate the period situation of the COVID-19 issue, the preparation of the systems in period is extraordinarily tough. Developing a system that's adaptative to any or all contexts and surroundings is turning into a problem. If we have a tendency to contemplate the price estimation for implementing the project, it'll be virtually of no price as most of the metropolitan cities have already got cameras put in publicly places. Camera; that is the solely main demand of the planned model is already on the market. Their model is predicated on neural networks. A neural network may be a network OR circuit of neurons, that is additionally referred to as an artificial neural network and is formed of artificial neurons or nodes. This model is often used for various functions associated with image process in neurobiology mistreatment dataset containing pictures associated with that task. This approach provides not solely helps in achieving high exactness however additionally enhance the face detection tempo significantly. The system is often applied in several areas like subway stations, markets, schools, railway stations and lots of alternative huddled places to observe the group and to confirm that each one is sporting mask. Finally, this work is often used for future researchers and enthusiasts. Firstly, this model is often employed in any high-definition camcorders, this can check that that this model isn't restricted to solely mask detection system. Secondly, this will be used for biometric scans with a mask on the face. Abd El-Aziz, Nesrine A. Azim, Mahmood A. Mahmood and Hamoud Alshammari has revealed a paper on deep learning model for mask detection (2021) [2]. The system will expeditiously discover faces that area unit partly occluded (either with a mask or hair or hand). Supported the occlusion degree of 4 regions (nose, mouth, chin and eye) it differentiates between annotated mask and face lined by hand. Therefore, a mask covering the face absolutely together with nose and chin can solely be treated as “with mask” by the model. The most challenges two-faced by the tactic primarily comprise of variable angles and lack of clarity. The movement of blurry faces within the video stream makes it tougher. However, following the trajectories of many frames of the video helps to form a far better call – “with mask” or “without mask”. In this paper, they in brief explained the motivation of the work 1st. Then, they illustrated the educational and performance task of the model. Using basic ML tools and simplified techniques the tactic has achieved fairly high accuracy. In future, the model is often extended to discover if an individual can wear the mask properly (as educated by WHO) and additionally to discover the sort of mask. Safa Teboulbi, Seifeddine Messaoud, Mohamed Ali Hajjaji and Abdellatif Mtibaa (2021) has planned a paper on period Implementation of AI-Based mask Detection and Social Distancing measuring System for COVID-19 prevention [3]. This work reviewed, firstly, several Analysis works that obtain to surround COVID-19 natural event. Then, it processed the essential ideas of deep CNN models. After that, this paper reproduced the coaching and testing of the foremost used deep pretrained-based CNN models (DenseNet, InceptionV3, MobileNet, MobileNetV2, ResNet-50, VGG-16, and VGG-19) on the mask dataset. Finally, and when evaluated the numerical results, best models are tested on an embedded vision system consisted of Raspberry Pi board and digital camera where efficient real-time deep learning-based techniques are implemented with a social distancing task to change the method of detective work cloaked faces and desecrated or maintained distance between peoples. This embedded application are often employed in any operating atmosphere like public place, station, company atmosphere, streets, searching malls, and ex- amination centers, wherever accuracy and exactness are extremely desired to serve the aim. In future works, they're going to exploit this system on good sensors or connected RP nodes that may be thought-about as an Edge Cloud to gather multimedia system knowledge, e.g., an autonomous drone system, which may give capture (by the camera) of the detected objects from totally different angles and send them to the Edge Cloud system to be analyzed. Eashan Adhikarla and Brian D. Davison (2021) has planned a paper on mask Detection on Real-World Webcam images [4]. They conferred a new webcam-based dataset that reflects real-world complexness. They tested 12 totally different models to know their effectivity. They additionally used 3 models to label the remaining knowledge to match foreseen mask usage trends and with another supply of information. The WFM dataset is efficacious for potential COVID-19 connected studies and offers diversity for AI-related datasets as this is often the primary digital camera dataset with face masks that has been collected. The dataset provides a real-world challenge for developing higher AI models, incorporating real-world masks for face detection and face mask detection tasks, and may be a collection of 10 months of captured pictures, a tiny low portion of that has been hand-labeled. Normally mask detection algorithms area unit divided in 2 tasks; (1) detective work the faces in an exceedingly given image, and (2) then classifying the image as a cloaked or no-masked face that's a binary classification task. They have a tendency to outline a further third category to replicate uncertainty or once the mask isn't worn properly. This work may be a kind of image classification and extraction. Their system is often employed in any public place, restaurant, airport etc. Mr.Kalla.Kiran, Bokka Vamsi Kiran, Devarapalli Cheswanth Sai , Gaggala Vijay Vamsi, Pitta Rani Salomi (2021) has planned a paper on mask detection using machine learning [5]. The experimental analysis shows that the planned technique will be with success exploited for mask violation detection. It's a true time package application which may be deployed in good cc tv police investigation, public areas like airports, malls, etc. wherever mask is dominant. Simply, the package will be extensible to figure together with different IOT devices to deny allow or closing doors at company workplace. What is more, we have a tendency to highlight that it's operating additionally on device with restricted machine capability and it's able to method in real time pictures and video streams, creating their proposal applicable within the world. Taking in to account higher than mentioned details, they will build the conclusion that the Mask detection project works in real time and be terribly helpful in gift scenario. This application is put up using python, python IDLE. The project proposed by us use OpenCV, Tensor Flow and deep learning to detect the face mask. Our goal is to create a custom deep learning model to detect whether a person is wearing a mask or not. This system first detect the image of a person. Then it will detect the COVID-19 face mask on the person’s face. The classifier that obtained is ~99% accurate. Then it will classify whether the person is wearing a mask or not. If not then it will generate an alert. This system can be used at any public place, restaurant, streets and airports etc.

### Literature Review Summary

Table 2.1: Literature review summary

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year and citation** | **Article Title** | **Purpose of the study** | **Tools/ Software used** | **Comparison of technique done** | **Source (Journal/ Conference)** | **Findings** | **Data set (if used)** | **Evaluation parameters** |
| 2021 | Face mask recognition system using CNN model | Mask Detection | Python Script, TensorFlow and CNN | Comparison of Deep Neural Network Models of Face Mask Detection in Multi-Angle Head Pose | Kaggle, LinkedIn, Google | They investigate optimal parameter values for the CNN Model to identify of Masks accurately without generating overfitting | Kaggle, Prajna Bhandari’s Data Set | Evaluation done on basis of Face features to tell apart mask wearers. |
|  | A Deep Learning Model for Face Mask Detection |  | TensorFlow, Keras, CNN, OpenCV |  |  | effective model for real-time monitoring using CNN |  |  |
|  | Real-Time Implementation of AI-Based Face Mask Detection and Social Distancing Measuring System for COVID-19 Prevention |  | CNN Model |  |  | implementing a Face Mask and Social Distancing Detection model as an embedded vision system |  |  |
|  | Face Mask Detection on Real-World Webcam Images |  | CNN, R-CNN,  SVM |  |  | implement state-of-the-art object detection algorithms to understand their effectiveness in such a real-world application. |  |  |
|  | FACE MASK DETECTION USING MACHINE LEARNING |  | Pycharm, Notepad++, Jupyter(Python) |  |  | it is working also on device with limited computational capability and it is able to process in real time images and video streams, making our proposal applicable in the real world. |  |  |
|  |  |  |  |  |  |  |  |  |

# PROBLEM FORMULATION

Since the infectious coronavirus sickness (COVID- 19) was initial rumored in urban center. The COVID-19 pandemic has been one in every of the most important health crisis. COVID-19 epidemic has fleetly discontinued our every-day lives’ moving the international trade and movements. However, carrying a mask that stops the transmission of droplets within the air associated maintaining an acceptable physical distance between folks, and reducing shut contact with one another will still be useful in combating this pandemic. However, guaranteeing all folks wear facemask isn't a straightforward task. So, for the same issue we came up with the idea of making this project. The purpose of the project “Detecting Face Mask using Artificial Intelligence, Machine Learning and Deep Learning for COVID-19 prevention” is to create a tool that identifies the image of a human that can calculate the probability that he/she wearing a mask or not, using tools like TensorFlow, Kera, OpenCV and Scikit-Learn.

From the literature review, it is observed that studies highlight the need of efficient and scalable approach for detecting mask on peoples face. The existing techniques are not precise enough for doing the same. We proposed our project with Machine Learning, Artificial Intelligence and Deep Learning.

# OBJECTIVES

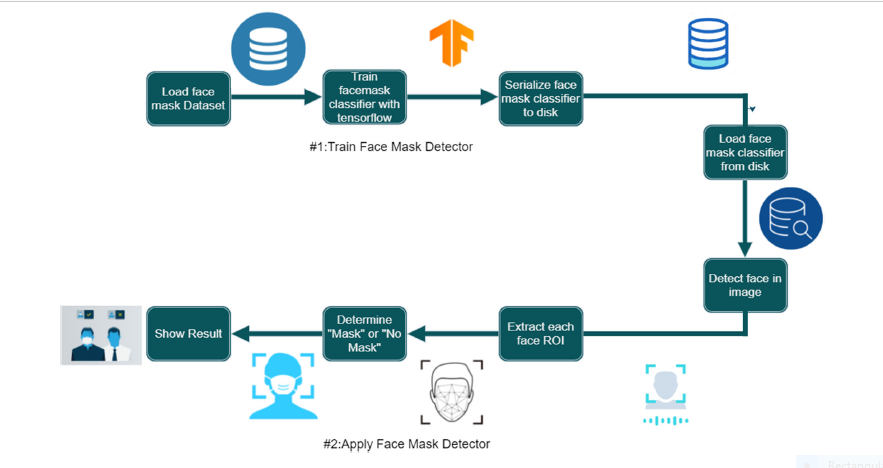
The proposed work is aimed to carry out work leading to the development of an approach for Detection of Mask. The proposed aim will be achieved by dividing the work into following objectives:

1. To load mask dataset and train facemask classifier with TensorFlow then serializing it to disk followed by loading it up from disk to detect face in image.
2. Extracting each face ROI to determine “Mask” or “No Mask”.
3. To learn various machine learning, deep learning techniques. And to enhance our knowledge in this aspect.
4. To use clean data for more accurate results.
5. To analyze our data without any bias.
6. To gain knowledge of various python libraries and show Result..

# METHODOLOGY

The following methodology will be followed to achieve the objectives defined for proposed research work:

1. Training- We load our face mask detection dataset from disk, train a model by using Keras/TensorFlow on this dataset, and then serializing the face mask detector to disk.
2. Deployment: Once the face mask detector is trained, we can then move on to loading the mask detector, performing face detection, and then classifying each face as with mask or without mask



The above figure depicts the training and deployment phases of our face detection model. The dataset is loaded first in the training phase. Training and modeling are streamlined during the training phase. After serializing face mask classifier to the disk, model is loaded to detect the face mask on the images or real-time video. The model will calculate the ROI (Region of Interest) for the determination. We then compute bounding box value for a particular face and ensure that the box falls within the boundaries of the image. We then determine the class label based on predictions returned by the mask detector model and colors are assigned for interpretation. Once all detection is executed, we will display the output.

1. **TENTATIVE CHAPTER PLAN FOR THE PROPOSED WORK**

#### CHAPTER 1: INTRODUCTION

This chapter will cover the overview of Mask Detection System.

#### CHAPTER 2: LITERATURE REVIEW

This chapter include the literature available for Mask Detection System. The findings of the

researchers will be highlighted which will become basis of current implementation.

#### CHAPTER 2: BACKGROUND OF PROPOSED METHOD

This chapter will provide introduction to the concepts which are necessary to understand the proposed system.

#### CHAPTER 4: METHODOLOGY

This chapter will cover the technical details of the proposed approach.

#### CHAPTER 5: EXPERIMENTAL SETUP

This chapter will provide information about the subject system and tools used for evaluation of proposed method.

#### CHAPTER 6: RESULTS AND DISCUSSION

The result of proposed technique will be discussed in this chapter.

#### CHAPTER 7: CONCLUSION AND FUTURE SCOPE

The major finding of the work will be presented in this chapter. Also directions for extending the current study will be discussed.

#### PUBLICATIONS (Optional)

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# REFERENCES

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