

A REPORT

ON

AI BASED ATTENDANCE SYSTEM

By

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ID No.(s)

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AT

(Multigraphics ERP)

A Practice School I Station of

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

(May-July, 2022)

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Title of the Project: AI Based Attendance System

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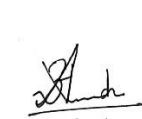
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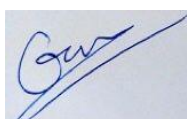
Key Words: Artificial Intelligence, Machine learning approach, face detection, Attendance monitoring

Project Areas: AI/ML

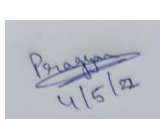
Abstract: An attendance monitoring system is essential in all organizations and its not an easy task to keep a check on presence of each and every student. The traditional way of attendance has been manually signing on a register or having a roll call of each student. This technique is complex, hectic, and prone to errors and forgery. In this paper we are using face detection and recognition framework where the system detects a face compares it with the already present database and marks the attendance. This attendance is marked n an excel sheet and a report is generated monthly indicating the attendance. We use the concept of artificial intelligence incorporating machine learning approach and marks the attendance.



Anirudh Mishra



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Date 18th July, 2022

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1. INTRODUCTION

1.1 About the Organization

MULTIGRAPHICS Group is a private company, who was incorporated on dated 1-Mar-1995. Multigraphics is an e-learning and software development company having corporate office in Okhla, Delhi. It was founded by Mr. Abhay Sharma and Mr. Praveen Sharma. Multigraphics group is a leading tech-driven e-learning software development company providing many services such as mobile app's development, edu-tech, training and development, digital marketing solutions, etc. Multigraphics Group is the best and main safety provider of printing domain specialised in safety and customised marksheet, certificates, Omr Sheets for Exams & Admissions, Registrations, Political Survey, providing in India & Abroad. They are the primary enterprise in India imparting Simplified Omr Based Exams through growing the Oscan Omr Software, changing the traditional & complicated Omr Sheet Scanning through Omr Machines & Scanners. All the Government Recruitment Exams Like UPSC, IAS, SSC, Railway, Banks, Defence Police & Entrance Exams, Practice Test for IIT, JEE, NEET are performed the usage of the Oscan Omr Software Technology. In 1995 they introduced the OMR technology in Indian education system which is used for automation of exams. In 2005 they launched OMR technology based reading software OSCAN and in 2010 they incorporated the digitalised the exams with question bank management. Later in 2015 they introduced Learning management system(LMS) to spread education everywhere. Multigraphics has over 2000+ clients worldwide in education segment, government institutions, MMCs and other industries for which they have built technology and customized software's for the betterment of those industries.

1.2 DIFFERENT PRODUCTS OF THE ORGANISATION MG EDINSO

MG EDINSO is a vision and a segment of Multigraphics Group which focuses on the transformation of the Education system through technology.

Key features of MG EDINSO

-EDINSO LMS- A Learning Management System (LMS) is popularly called as E-learning. It is an innovation-based programming application which is utilized for computerized learning to upgrade the learning procedure.

- **EDINSO ONEX**- A robust IT platform for Online Examination with in-depth Test Analytics.
- **EDINSO IMS**- An innovative campus management software which seamlessly simplifies the back-end operations of educational establishments.
- **LIVE CLASSES AND QUESTION BANK**- LMS comes with an integrated LIVE class that enables you connect to mentors on a real-time basis. Manages volumes of Question in a school and helps in effective Management and Question Paper creation.

MG TECH-

MG Tech is a custom Software and Mobile Application Development Company providing Android and iOS app development services. LMS Integration is one-of-a-kind technological upgrade which identifies the training and learning gaps. This is done with the help of analytical information & reporting. Also they have a user friendly UI with a custom learning path

MG OMR-

An OMR Sheet (Optical Mark Recognition) is a pre-printed paper document with all security highlights to stop manipulations and make the test straightforward. Multigraphics Group is a Renowned and Leading maker and printer in the field of OMR Sheet Printing & Scanning. These OMR sheets are flexible as they can be utilized for different purposes like Entrance tests, Competitive tests like IIT JEE and NEET, Recruitment tests for IAS, Judiciary tests, etc.

MG DIGI-

Digital Marketing is one which includes all marketing endeavours that utilize an electronic gadget or the internet. As an excellent Social Media Marketing Company in Delhi NCR, they draw consideration and traffic towards your website through informal communication systems, including Facebook, Twitter, Instagram, YouTube, and so on.

2. Problem Statement

Joining a company and choosing the right one can be a tough and rigorous process for which certain analysis that can aid us which are SWOT and PEST analysis. They help us understand the positioning of the company we are in as well as its future. Hence to begin with the work firstly we start with analyzing Multigraphics Limited so that we can have an idea of its status

The conventional way to mark the attendance have been passing attendance sheet or making roll calls to mark attendance of the students, which can be source of nuisance as it can disrupt the discipline of the class. Moreover, the attendance sheet is then sent to the administration where it is updated on a excel sheet for keeping digit records. This entire process is nothing but time consuming and hectic. Also, at the organization or institutes, the biometric system serves one at a time for professors or employees. So, shifting to a face recognition system which automates the attendance is not a far-fetched idea. We can integrate the systems in the classrooms, at the entry gates of the school or offices and it will mark the attendance of the desired people.

The current system used for marking attendance involves filling of attendance sheets by the professors or the teachers manually, which is an extremely time-consuming process and chances of proxy are also a drawback in this system. There are other system of attendance also exist such as RFID (Radio Frequency Identification), Biometrics etc. But in general, these processes are yet not so popular in schools or other institutions.

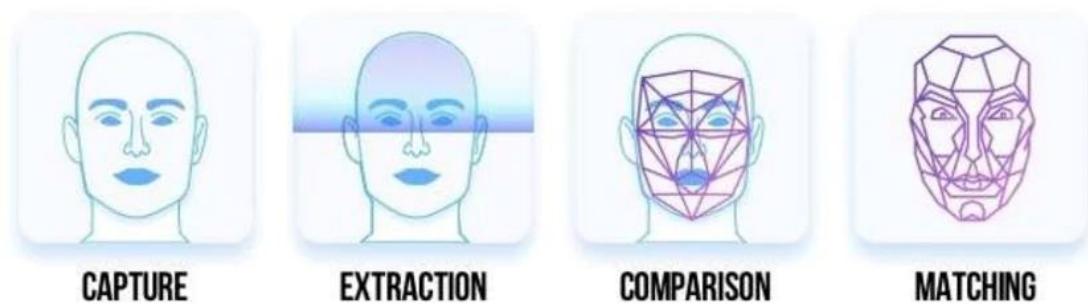
The system which is currently employed has many drawbacks, majorly the fact that it puts pressure on people to be accurate and precise every time. Along with this the other major drawbacks include the reasoning that:-

- The entire system is manual
- There is always a chance of forgery as well as error
- Manpower required for the system to be functional
- Final calculations done are generally manual hence there is a chance of error
- Maintaining a database is difficult as manual entries are to be done in it
- It is difficult to search for a particular data in this setup
- Method is prone to impersonation and the risk of losing the attendance sheet which is an important component of the system

In the current day and time owing to innovations and invention a new way to identify humans has aroused which is Biometric Identification System, which aids in verification and identification of people. Biometric is sort of identity access management and access control. Therefore, we can nonchalantly say that biometric attendance system is secure and right way ahead. The biometric

system can be fingerprint, face recognition, voice recognition, iris recognition etc. In our project, we have taken the face recognition system for biometric attendance.

The main motivation for our project has been the inefficiency and slow system that exists. So, the best we can do is make it automated so that it is fast and effective. Face detection system isn't that new of a technique it has been used by department of criminal investigation where they use CCTV footage as a source of detecting faces at the crime scenes and comparing with the database that they have. This system has become pretty common at places like China, there authorities use such systems in streets, subways and airports.



A sub utility of the face detection can be live face detection. We can further enhance it for live face mask detection. In current day and time when covid is prevailing these things are a need. By enhancing the system we can create a live face mask detector which can be installed and can aid us.

3. Methodology

So far we have done only theoretical work. We have prepared a presentation on SWOT and PEST analysis of Multigraphics Group, we have prepared another presentation on creating a system with automatic attendance marking system through facial recognition and we have written a research paper on AI REAL-TIME FACE MASK DETECTOR.

1. Swot and pest analysis

We went through the internet to find information related to multigraphics and its competitors in order to make our presentation for swot and pest analysis. We referred to were asked to use the official website of Multigraphics group to these analysis.

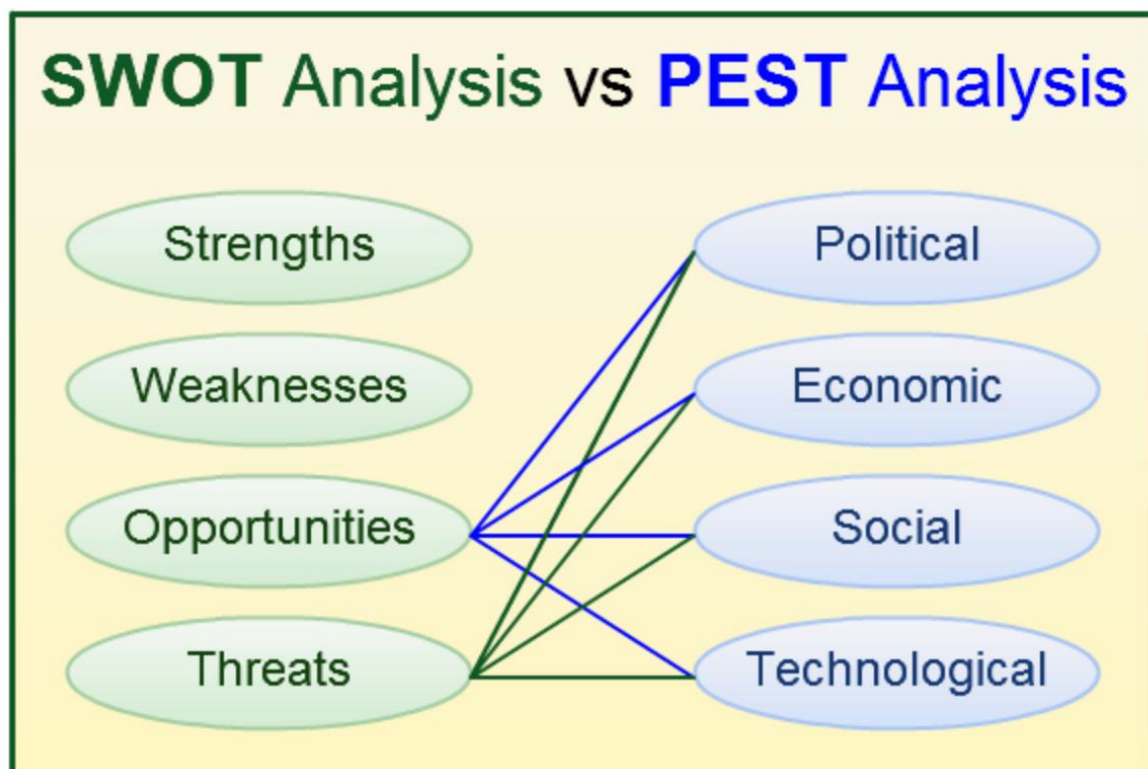


Figure 1: Components of Swot and PEST analysis.

2)AI BASED ATTENDANCE SYSTEM

We made a presentation after going through multiple research papers available. We have planned to use Facial recognition using CNN to

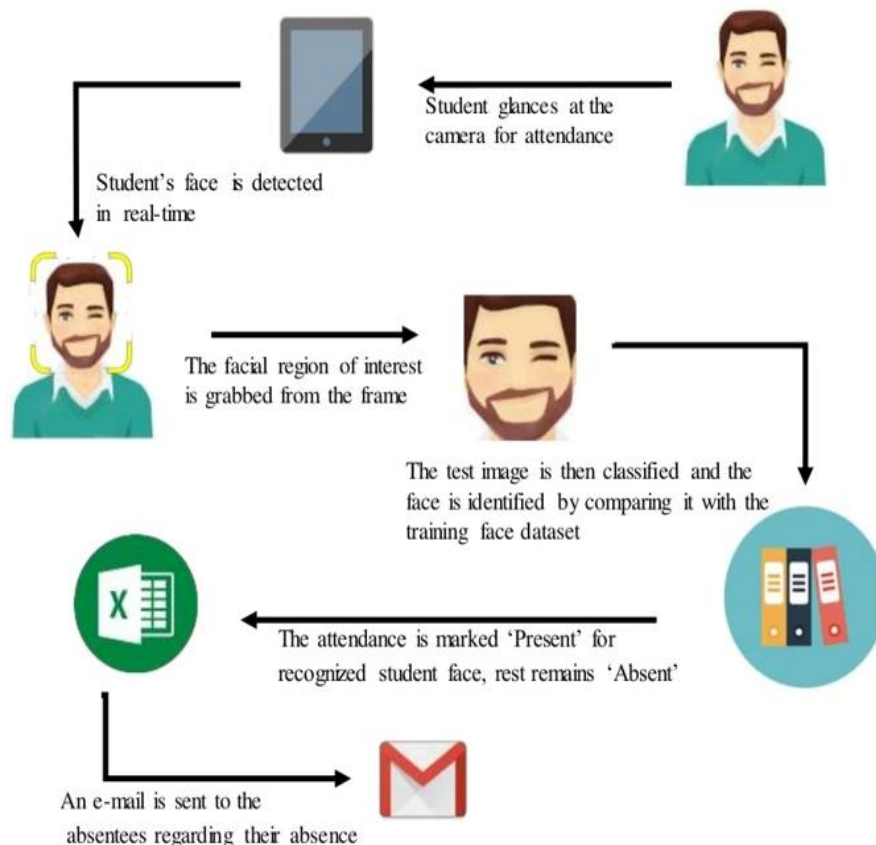
identify face of people and after recognition of the person his/her attendance would be marked on the companies database. For implementation of CNN we will be using TENSORFLOW, numpy, pandas, matplotlib for data interpretation.

We will implement 4 steps for facial recognition base attendance system which are:

1. We identify faces in the pictures
2. We consider the different pose and angles at which the face is at. We try to project that into a front view.
3. The face is encoded by the algorithm.

For this various CNNs can be used. Amongst the results for facial recognition available to us GoogleNet and Resnet gives least errors.

4. Recognizing the person from the database and marking his/her attendance which is uploaded to an excel sheet from where if there are absentees then an automated mail is generated which is sent to the person. At the end of the month a salary structure is constructed for the month if the system is incorporated into cooperate firms which is sent to both the employee and employer.



3)AI REAL-TIME FACE MASK DETECTOR

Images are scaled to a set size of 96×96 , which helps decrease machine load while training. The entire dataset is then split into training and test

data in an 8:2 ratio by randomly picking images. The basic components of the design are 2D convolutional layers (conv2D), a pooling layer, activation functions, and fully-connected layers. The size of the feature map is reduced by pooling layers. As a consequence, the number of trainable parameters is decreased.

There are two types of pooling procedures that may be performed: maximum pooling and average pooling. The choice of activation on function at both the hidden and output layers is critical since it influences the quality of model learning.

Layer(type)	Output Shape	Structure
Conv2D	96 x 96	Filters = 16, Filter Size = 3 x 3, Stride = 1
MaxPooling	48 x 48	Filters = 16, Filter Size = 2 x 2, Stride = 1
Conv2D	48 x 48	Filters = 32, Filter Size = 3 x 3, Stride = 1
MaxPooling	24 x 24	Filters = 32, Filter Size = 2 x 2, Stride = 1
Conv2D	24 x 24	Filters = 64, Filter Size = 3 x 3, Stride = 1
MaxPooling	12 x 12	Filters = 64, Filter Size = 2 x 2, Stride = 1
Conv2D	12 x 12	Filters = 128, Filter Size = 3 x 3, Stride = 1
MaxPooling	6 x 6	Filters = 128, Filter Size = 2 x 2, Stride = 1
Conv2D	6 x 6	Filters = 256, Filter Size = 3 x 3, Stride = 1
MaxPooling	3 x 3	Filters = 256, Filter Size = 2 x 2, Stride = 1
Classification Layer	–	Fully-connected, Softmax

Total params: 2,818,658

Trainable params: 2,818,658

Non-trainable params: 0

Figure 2: parameter summary of proposed model.

4. Implementation

For the implementation part of the project, we have made a working model for attendance system which is enabled by AI and is written in *Python*. The model basically has 2 parts, firstly the face recognition and secondly the attendance. To achieve this, we have used certain libraries from python which includes:

- *Python Imaging Library*- It's a free and open source additional library for python programming language which adds support for opening, manipulating and saving different image file format.
- *Numpy*- It is a library used for working with arrays. Its major use lies in linear algebraic operations.
- *Keras*- It is a powerful and easy to use free open source Python library for developing and evaluating deep learning models.
- *Pickle*- It is majorly used in serializing and deserializing a Python object structure.
- *Cv2*- It is a great tool for image processing and performing computer vision tasks.
- *Datetime*- It supplies classes to work with date and time.
- *Mtcnn.mtcnn*- It is a library used for face detection. MTCNN stands for Multi-Task Cascaded convolution neural networks.
- *Pandas*- It is a widely used Package in python. Its primary use comes in the field of data science and machine learning.

Firstly, for the model to work we need a dataset which must be preprocessed for optimal use for face recognition. To achieve this we imported certain libraries from python such as numpy , pandas , os ,pickle , keras , mtcnn etc. Then the image is read from the folder which contains the .jpeg file. After that certain coordinate for height, width is set for face detection. After that cropping of the image is done which is basically restricting the detector to concentrate only on a boxed area of the face. Following cropping, normalization is performed. Once these steps are performed the image is stored in the database.

WARNING:tensorflow:No training configuration found in the save file, so the model was "not" compiled. Compile it manually.

```
In [21]: folder='Untitled Folder/'
database={}
for i in listdir(folder):

    image_path= folder + i
    image= Image.open(image_path) #reading image from the folder
    image = image.convert('RGB')
    image=asarray(image)
    mtcnn_results = faceDetector.detect_faces(image)
    # co-ordinates, height,width of detected face
    x1, y1, width, height = mtcnn_results[0]['box']
    x1=abs(x1)
    y1=abs(y1)
    x2=x1+width
    y2=y1+height

    #cropping step
    face = image[y1:y2, x1:x2]
    face = Image.fromarray(face)
    face = face.resize((160,160)) #faceNet uses this size
    face = asarray(face)

    #normalization
    face = face.astype('float32')
    mean, std = face.mean(), face.std()
    face = (face - mean) / std

    #faceNet expect 4 dimension in order to account for multiple face but we have on 1 face per image so input should be os 1
    face = expand_dims(face, axis=0)
    signature = FaceNetModel.predict(face)

    #storing database
    database[os.path.splitext(i)[0]]=signature
```

Figure 3: Code used for creating database

Once database is made, the face recognition model is imported. The initial codes for the recognition model include the open input camera command, followed by cropping the image into boxed area for optimal comparison from the dataset and matching it if the person's face is present in database.

```
In [5]: vid_input =cv2.VideoCapture(0) #0= one camera
while(1):
    _,image= vid_input.read()
    image=cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    image_array=asarray(image)
    mtcnn_results = faceDetector.detect_faces(image)

    if mtcnn_results == []:
        continue

    x1, y1, width, height = mtcnn_results[0]['box']

    x1=abs(x1)
    y1=abs(y1)
    x2=x1+width
    y2=y1+height

    face = image[y1:y2, x1:x2]
    face = Image.fromarray(face)
    face = face.resize((160,160))
    face = asarray(face)

    face = face.astype('float32')
    mean, std = face.mean(), face.std()
    face = (face - mean) / std

    face = expand_dims(face, axis=0)
    signature = FaceNetModel.predict(face)

    min_dist=10
    identity=' '
    for key, value in database.items():
        dist = np.linalg.norm(value-signature)
        if dist < min_dist:
            min_dist = dist
            identity = key
            markAttendance(identity)

    cv2.putText(image,identity, (100,100),cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255, 0), 2, cv2.LINE_AA)
    cv2.rectangle(image,(x1,y1),(x2,y2), (0,255,0), 2)

    cv2.imshow('res',image)
    k = cv2.waitKey(5) & 0xFF
    if k == 27:
        break

cv2.destroyAllWindows()
cap.release()
```

Figure 4: Code for face recognition when taking input

Following the face recognition, we have updated the person's attendance on an excel file by making a separate method/function for it and calling it if the face matches. The attendance function takes the name from the face matching function's output and updates it into the excel file with the time of taking attendance.

```
In [4]: ▶ def markAttendance(name):  
        with open('Attendance.csv','r+') as f:  
            myDataList = f.readlines()  
            nameList = []  
            for line in myDataList:  
                entry = line.split(',')  
                nameList.append(entry[0])  
            if name not in nameList:  
                now = datetime.now()  
                dtString = now.strftime('%H:%M:%S')  
                f.writelines(f'\n{name},{dtString}')
```

Figure 5: code for making attendance

5. Conclusion

By our project we are proposing a method to automate the system of attendance which will decrease errors which occur due to manual attendance. Obviously like every system our system also have some pros and cons. Benefits of our system include the following features: -

- Its easy to use
- Helps to have time and efforts
- Using the system, we have proposed we can eliminate the proxy system
- We can even enhance the system for security purposes
- System generates an excel file which can be used directly for records or other purposes.
- Multiple face recognition

Limitation of the system we have proposed are: -

- The setup is expensive
- There is a minimum level of specification needed for the main system which controls the programming part.
- Weak camera, bad lighting can result is wrong results
- The system is unable to differentiate between identical twins

One of the live examples of implementation of such model would be the project by Assam state owned Railtel Cooperation. It incorporated attendance-based system of same nature as we suggest across 48,000 government schools in Assam. Another place where a face recognition system has been used, is in National Highway Authority of India, where the attendance of the ground staff is now being managed by a face recognition system.

Apart from these things our system can be used in other places such as banks to verify the customers or in criminal bureau for verification of criminals by checking any past records.

The paper has proposed a system for live mask recognition by static images and real-time video that automatically identifies and prompts if a person is wearing a mask or not, which helps to slow down the spread of COVID-19 pandemic. By the help of Keras, OpenCV, and CNN, the proposed model can detect if the person is wearing a face mask or not

precisely and quickly. The proposed model in theory is up to 98% accurate. By certain live experiments carried out we can confidently say that our model is better than pre-existing models such as DenseNet-121, MobileNet-V2, and Inception-V3 when compared for processing time and accuracy. This proposed system is an excellent contender for a real-time monitoring system because of the pros it has.

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