Wind power estimation using deep learning models

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**Abstract - One of the important concerns in any Educational Institutions is Attendance. Most of the Educational institutions are spending an abundance of time to mark attendance for huge number of students manually. Many technologies like Radio Frequency Identification (RFID), Biometric system were introduced to overcome the manual attendance system. But all these technologies are not automatic, smart enough and students need to be stand in queue to make them happen. To overcome such situations, in this paper attendance monitoring is achieved through Face Recognition using Deep Learning. Many Face detection techniques using like Harcascade classifier, Local Binary Patterns Histograms (LBPH), MTCNN were implemented but they are not up to the satisfactory performance. To improve the accuracy and performance of the application, Face detection and recognition is performed using Deep Learning techniques. State of art algorithms Dual shot face detector, FaceNet are used to implement in this application. The Video which taken from high resolution camera of the smartphone will be given to the Model. The Recognized faces will be verified with the faces of students stored in the Database. On matching respective student will be marked present to the class in the Database. The report of total number of students present and absent will be sent to the respective faculty. This application is accurate and efficient in monitoring Attendance system.**

***Keywords: Dual shot face Detector (DSFD), FaceNet, Softmax, Django, Attendance system.***

# INTRODUCTION

Wind power or wind energy is the use of [wind](https://en.wikipedia.org/wiki/Wind) to provide [mechanical power](https://en.wikipedia.org/wiki/Mechanical_power) through [wind turbines](https://en.wikipedia.org/wiki/Wind_turbine) to turn [electric generators](https://en.wikipedia.org/wiki/Electric_generator) for [electrical power](https://en.wikipedia.org/wiki/Electrical_power). Wind power is a popular [sustainable](https://en.wikipedia.org/wiki/Sustainable_energy), [renewable](https://en.wikipedia.org/wiki/Renewable_energy) source of power that has a much smaller [impact on the environment](https://en.wikipedia.org/wiki/Environmental_impact_of_wind_power) compared to burning [fossil fuels](https://en.wikipedia.org/wiki/Fossil_fuel).

[Wind farms](https://en.wikipedia.org/wiki/Wind_farm) consist of many individual wind turbines, which are connected to the [electric power transmission](https://en.wikipedia.org/wiki/Electric_power_transmission) [network](https://en.wikipedia.org/wiki/Electrical_grid). Onshore wind is an inexpensive source of electric power, competitive with or in many places cheaper than coal or gas plants. Onshore wind farms have a greater visual impact on the landscape than other power stations, as they need to be spread over more land and need to be built away from dense population. Offshore wind is steadier and stronger than on land and offshore farms have less visual impact, but construction and maintenance costs are significantly higher. Small onshore wind farms can feed some energy into the grid or provide power to isolated off-grid locations[1]

1. LITERATURE SURVEY
2. PROPOSED METHODOLOGY
3. RESULTS AND DISCUSSION

This model is applied over the database [20] consisting of 27 students images with various facial poses. Figure 4 shows an option of uploading already captured image using the Django web application. Figure 5 and table 1 illustrates the results of face detection using DSFD. The same image of the students sitting in the classroom is given to the various other models such as Haarcascade, LBPH, and MTCNN in which they detected the faces 21, 21, 22 respectively. The state of art DSFD model detects all the faces of the students in the classroom. These detected faces will be cropped and saved as an individual facial images. Figure 6 shows the results of the cropped individual facial images.

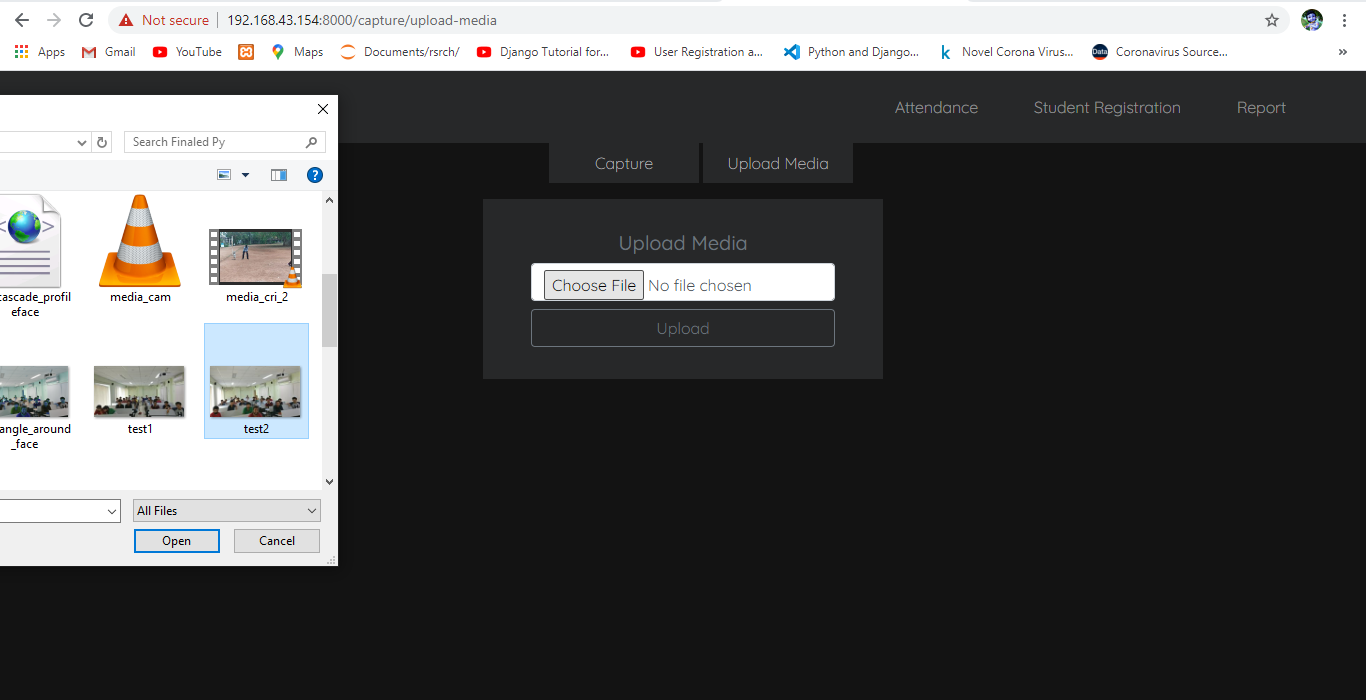


Fig. 4. Result of web application enabling to upload the media.



Fig. 5. Result of Face Detection using DSFD

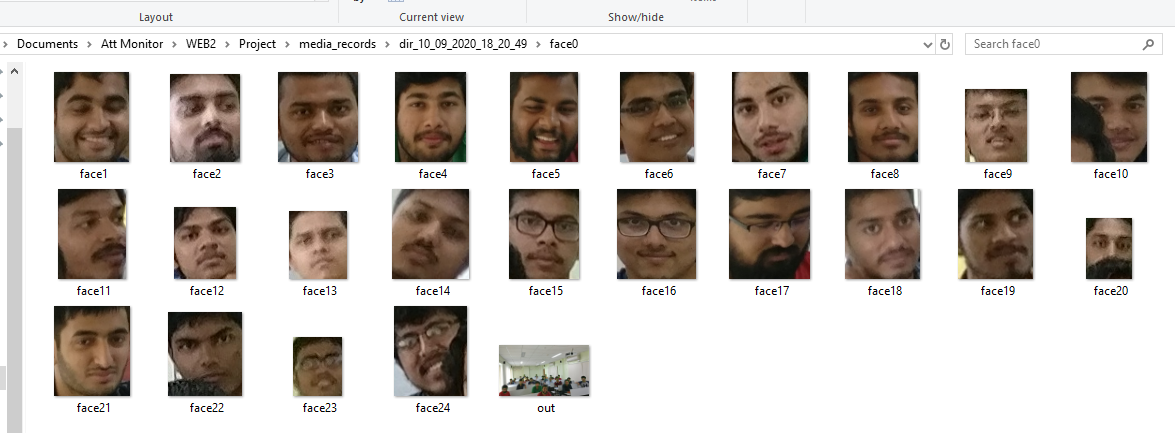


Fig. 6. Result of cropped detected faces

1. RESULTS OF VARIOUS FACE DETECTION MODELS

|  |  |  |  |
| --- | --- | --- | --- |
| ***Method*** | ***Total number of faces in an image*** | ***Detected Faces*** | ***Un detected Faces*** |
| Haarcascade | 24 | 21 | 3 |
| LBPH | 24 | 21 | 3 |
| MTCNN | 24 | 22 | 2 |
| **DSFD** | **24** | **24** | **0** |

Further these detected facial images are given to the classifier which is trained over the registered facial images of students. The features from the facial images are extracted using the FaceNet. These features are trained over the neural network which consists of Rectified linear unit (ReLU) function as the hidden layer and the softmax as the activation layer. Figure 5 shows the results of the faces recognized using the classifier. The images labelled with “face detected” are the images detected by the DSFD, images labelled with “Predicted” are the recognized images with the database.

The results of the face detection and face recognition are illustrated in the Table II. It shows the different cases where the images are tested consisting of different poses and variable number of students. In the case1, there are 20 students in the classroom. All the 20 student faces are detected and recognized. In the case2, there are 22 number of students in the classroom. All the 22 student’s faces are detected and recognized. Similarly, in the case 3 also all the student images are detected and recognized.

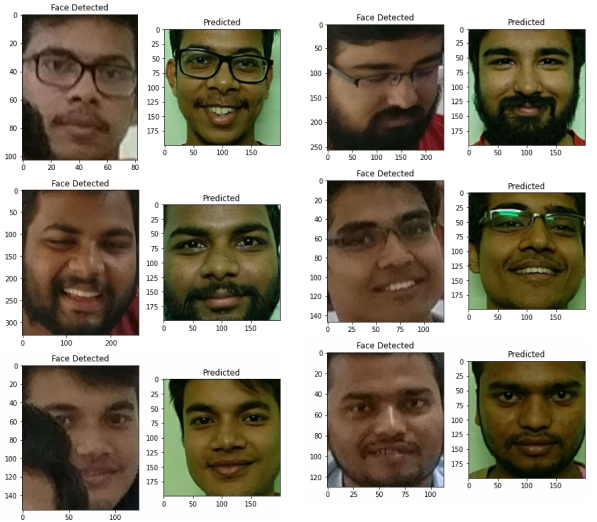


Fig. 6. Result of Face Recognition using FaceNet, Softmax

1. RESULTS OF FACE DETECTION AND FACE RECGONITION IN VARIOUS CASES

|  |  |  |  |
| --- | --- | --- | --- |
| **cases** | **Number of faces** | **Face Detection**  **DSFD** | **Face Recognition**  **FaceNet, Softmax** |
| Case 1 | 20 | 20 | 20 |
| Case 2 | 22 | 22 | 22 |
| Case 3 | 24 | 24 | 24 |

References:

[1]https://en.wikipedia.org/wiki/Wind\_power