# An Automatic Face Attendance Checking System using Deep Facial Recognition Technique

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***Abstract*—Nowadays, as computers are powerful enough for implementing complex algorithms, there are numerous applications that people utilize computers to run. In which, facial recognition is one of the most active fields of applications. In fact, computers can not only automatically identify who a person is, but also operate 24/7, which human beings cannot endure. This leads to the replacement of people by computers in some repetitive and real-time applications.**

**In this work, we apply the facial recognition into an attendance checking system that uses faces of registered people to check their attendance. This system has a GUI which allows easy user-to-system interaction. The core of the system is a deep facial recognition technique, which has four stages (e.g., removing motion-blur frames, detecting faces, removing non-frontal-view faces, and recognizing). Particularly, in the recognition phase, we consider this stage as an open-set facial recognition problem, so the system is able to detect people who have not registered in the database before. Also, we boost the performance of the system by utilizing hardware resources of users' computers. Although the system is designed to run with a low-resolution webcam, its performance is reasonably accurate on our private dataset.**

***Index Terms*—Face Attendance Checking, Facial Recognition, Deep Learning**

## I. Introduction

**This section is of Thien.**

Introduce about a framework of face recognition system, including face detection, landmark detection, face recognition.

### A. Face detection

### B. Landmark detection

### C. Face recognition

## II. Proposed system

In this paper, we apply deep facial recognition techniques into the problem of face attendance checking. A system is built in order to manage appearances of students in a class. As normally, the system is organized as a pipeline of typical stages, namely face detection, landmark detection, and face recognition. However, to ensure input frames for underlying algorithms are high quality, we append an early filter that are able to discard blur frames, which are caught by motions of people in front of a standard webcam. Besides, we take a more step by adapting the landmark detection to verify whether a face is in frontal view of the camera so that the result of face recognition is more accurate. Also, to leverage the ease in use, the design a friendly graphic user interface (GUI) so that people who want to use the system to manage (teachers) or check (students) attendance can interact with the application without any specific knowledge. To make the system more robust, we carefully analyze the distribution outlier of features representing for registered accounts. Therefore, the algorithm has ability to detect people who have not registered in the application before, which is equivalent to the open-set problem in face recognition. Figure **??** reveals our proposed system.

Our work is organized as follows. In the section III, stages of the proposed system are described clearly, including motion-blur detection, face detection, frontal-view detection, and face recognition. Then, section IV is for reporting some experimental results.

## III. Implementation

### A. Motion-blur detection

**This section is of Phu.**

The first stage of this system is detecting blurred image and rejecting them out of next stage. We know that the blurred image means each pixel in the source image gets spread out and mixed into surrounding neighbour pixels. For our attendance checking system, the motion blur happens when an object (namely face or webcam) moves during the exposure.

So as to detect whether an image is blurred, we use the 2D-FFT method. We will compute mean amplitude spectrum value of entire pixel in image and compare them to an optimal threshold which distinguishes blurred and non-blurred image as accurate as possible. The image is called non-blurred if and only if its average value greater than the threshold value, and vice versa. After that, non-blurred images are applied to face detection stage of system.

### B. Face detection

**This section is of Qui.**

### C. Frontal-view detection

**This section is of Qui.**

### D. Face recognition

**This section is of Thien.**

This work is our assignment in the course of "Artificial Intelligence in Control Engineering" Sep-Dec 2018, guided by Dr. Pham Viet Cuong (email: pvcuong@hcmut.edu.vn), Faculty of Electrical and Electronics Engineering, HoChiMinh city University of Technology.

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The software is open source and can be found in https://github.com/AntiAegis/Face-Attendance-System.

| DANH SÁCH SINH VIÊN | | | | |
|---|---|---|---|---|
| YOUR COURSE/SUBJECT/TITLE | | | | |
| | | | 1 = prensent | |
| | | | blank = absent | |
| ID | Last Name | First Name | Group | Total |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Fig. 1: New standard excel form

| DANH SÁCH SINH VIÊN | | | | |
|---|---|---|---|---|
| TRÍ TUỆ NHÂN TẠO TRONG ĐIỀU KHIỂN | | | | |
| | | | 1 = prensent | |
| | | | blank = absent | |
| ID | Last Name | First Name | Group | Total |
| 1511844 | Lương Hữu Phú | Lộc | 1 | |
| 1512221 | Phạm Ngọc Khôi | Nguyên | 1 | |
| 1512396 | Bùi Tấn | Phát | 1 | |
| 1512534 | Nguyễn Trọng | Phúc | 1 | |

Fig. 2: Excel form contain pre-inputed data

### *E. Graphic User Interface*

**This section is of Sy.**

### *F. Attendance management*

**This section is of Phuong.**

This is the final phase of Face Attendance Checking System. It was designated to mark the presence of one resulted from our algorithm in a file of excel format, namely xlsx extension. To be used by the system, the excel file must meet a stringent format made up of essential contents and be generated by the GUI.

Figure 1 depicts a new standard empty excel table generated by our GUI. After obtaining a new file, we should fill in the table with the desired data (Figure 2). The most special things in this table are column ID and Total. ID is considered a primary key because the algorithm will mark the presence of a specific person via his ID. To help the host in easy attendance management, we designed the column Total with a view to showing the number of absences in all.

Figure 3 depicts an excel file's content after a checking progress finished. The GUI will automatically insert the only one new day column between Group and Total ones and in the tail of previous checked day. Letter 1 will be marked as presence in a cell of this column accordant to an ID. After attendance checking process is completed, the Total column will display the number of absences of previous days and the current one. Smartly can it display as we specially assigned a size-dynamic sum function to each cell of this column.

| DANH SÁCH SINH VIÊN | | | | | |
|---|---|---|---|---|---|
| TRÍ TUỆ NHÂN TẠO TRONG ĐIỀU KHIỂN | | | | | |
| | | | 1 = present | | |
| | | | blank = absent | | |
| ID | Last Name | First Name | Group | 09/06/2018 | Total |
| 1511844 | Lương Hữu Phú | Lộc | 1 | | 1 |
| 1512221 | Phạm Ngọc Khôi | Nguyên | 1 | 1 | 0 |
| 1512396 | Bùi Tấn | Phát | 1 | | 1 |
| 1512534 | Nguyễn Trọng | Phúc | 1 | 1 | 0 |

Fig. 3: Form is under checking

## IV. Experimental result

**This section is of Thien.**

## V. Conclusion

In this work, we applied the deep facial recognition techniques to solve the problem of face attendance checking. The system has a pipeline with four stages (e.g., motion-blur detection, face detection, landmark detection, and face recognition). Besides, the system is also integrated a friendly GUI, which allows users both teachers and students interact with it in an easy way. On our private dataset, the application perform accurate despite of the low-resolution webcam of typical laptops. This demonstrates that our underlying algorithm is effective to deal with this poor-quality input problem.

In the future, we will target to widen our dataset so that the dataset will be asymptotic to real applications. In addition, more algorithms will be considered to improve the ability of the algorithm to discriminate feature distributions of output classes.

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