EVALUATE STUDENTS ENGAGEMENT AND UNDERSTANDING STATUSES IN CLASSROOM

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Presented in Partial Fulfillment of the Requirements
For the Degree of B.Sc. in Computer Science & Engineering
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Declaration

We declare that this thesis titled, **Evaluate Students Engagement and Understanding Statuses in Classroom** and the work presented in it are our own. I confirm that:

- This work was done wholly or mainly while in candidature for a BSc degree at United International University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at United International University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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Certification

I do hereby declare that the research works embodied in this thesis entitled **Evaluate Students Engagement and Understanding Statuses in Classroom** is the outcome of an original work carried out by **Md Monir Hossain, Fazley Rabbi Biswas, Mohammad Ruhul Amin, Rahat Nawaz Tushar and Md. Shadman Shakib** under my supervision and it was also co-supervised by **Mohammad Ali**.

I further certify that the dissertation meets the requirements and the standard for the degree of BSc in Computer Science and Engineering.

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Abstract

Effective, intelligible and interactive class lectures in the classroom of a school can help students to perceive educational materials. Sometimes it is difficult to manage the classroom and give concentration to all students during the class lecture. Some students may face difficulties with lectures even in the well-managed classroom because of their low understanding capabilities. Early detection of those particular students may be helpful for teachers to give extra effort to teach them the educational materials. In our research work, we use facial expression recognition techniques for analyzing the facial expressions of students during the class lecture in the classroom. Using machine learning classifiers, we cross-match prior data (training data) with collected data, classify students' expression and predict the engagement in the class lecture. To check the efficiency of our system, we take the quiz exam after the class lecture. If our system predicts a student as attentive and he also obtains good marks in the quiz, we can conclude our system is working properly.

Acknowledgements

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List of Acronyms

NAIS ..... (National Association of Independent Schools)

HSSSE ..... (High School Survey of Student Engagement)

MCQ ..... (Multiple Choice Questions)

K-NN ..... (K-Nearest Neighbour)

SVM ..... (Support Vector Machine)

CCTV ..... (Closed-Circuit Television)

HMM ..... (Hidden Markov Model)

KLC ..... (K-Lite Codec)

MTCNN ..... (Multi-Task Cascaded Convolutional Neural Network)

Chapter 1

Introduction

Not being able to retain concentration in class is a common problem among students everywhere across the globe. But the importance of being engaged in the classroom needs no explanation. Expression recognition can help predict the degree of attention of students in the classroom when a particular topic is being discussed. As an engaged student is more likely to do well in the class, making sure if the majority of the students are actually interested and eager to learn more is a good indicator of the effectiveness of the class lecture. If students get bored our system will detect it and the instructor can work on his lecture delivery methods so that students can stay motivated and interested.

In Bangladesh application of machine learning and modern technology can be very useful to ensure better quality education in the classroom and improve the overall result of students as well. Applying modern techniques learning process can become a lot more fun and interesting. When classroom lectures make sense, students are less likely to fail and more likely to pursue their hunger for knowledge. Image processing and classification techniques can be very useful in this regard. Real-time feedback from students' expressions can immensely help improve the classroom culture in Bangladesh. If students are immersed in the following class lecture, their prospects will certainly be brighter.

Boring and uninteresting lectures is one of the often quoted problems with the classroom culture of Bangladesh. When students find it difficult to grasp the concept being taught by the teacher, they understandably feel frustrated. They do not feel like coming to school the next day. They no longer stay eager to complete homework as they do not understand the topics properly. Schoolwork does not seem fun anymore; it becomes a burden. When a new topic is about to be discussed in the class, they do not feel excited because they did

not understand the previous lessons properly. Boredom takes over their mind, lessons seem harder to comprehend and they gradually become more likely to feign illness or skip school.

If we can analyze and classify the emotions of the students properly while being in a class lecture, engaging classroom ambiance will be ensured. Students will become passionate about learning. When topics discussed in the classroom that seems interesting, they will be curious to learn more. They will be able to make good results in exams. They are more likely to remember lessons easily and less likely to forget them. They will be eager to attend school on a regular basis. Drop out rate is expected to decline significantly. If they pursue higher studies, they are more likely to succeed as they have a strong foundation of basic concepts. They have a better chance to have a successful career.

Our project uses machine learning techniques. Using image processing techniques and machine learning classifiers, our aim is to analyze and classify students' facial expressions to determine whether a student was paying attention to the lessons well enough while attending the class. Machine learning gives computers the ability to make decisions from experience and improve itself without being explicitly coded while image processing is a procedure to extract information from an image by using machine learning algorithms and expression recognition is a way of categorizing images into different sections based on a.person's facial expression and let computers sense human emotion. Using webcams, we will capture students' expression and we will divide those facial expressions into two categories–attentive and inattentive. Both happy and neutral faces can be considered as the attentive face which we will determine using prior data(training data). Whether our system is working efficiently or not will be checked by taking quizzes. If students quiz marks correspond with our system's prediction–attentive face getting good marks whereas inattentive face obtaining poor marks–we can deduce that our system is working fine. We will try to work on making our system more efficient otherwise.

1.1 Motivation

In the classroom, the main objective is to educate/teach the students. To do so the teacher and student both have to co-operate in the classroom to maintain the environment. The teacher needs to be concerned about the learning capability of the students and effectiveness of the lecture. According to the NAIS [6] research 2019, the survey result of students' engagement in teacher's lectures 8% of the students are fully distracted during the class lecture. The survey also describes that 68% of students tells that the teaching method is not interesting. So, to avoid this kind of problem, the teachers should remain focused on the quality of the lecture and students capability of understanding the lecture properly during class time. From this, the idea of measuring student engagement in the classroom has risen. In this process, the teacher will have a knowledge on their lectures effectiveness at the end of the class. They will also be able to take necessary steps to improve their lecture which will be recommended too.

1.2 Objective

1.2.1 Face Recognition

To detect and recognize student, CCTV (Closed Circuit Television) camera will be used to recognize students' face in the class room.

1.2.2 Facial Expression Recognition

We will be using machine learning classifier to classify students' facial expression to analyse if they are attentive or not.

1.2.3 Assessment and Final Decisions

To check the efficiency of our system, we take the quiz exam after the class lecture. If our system predicts a student as attentive and he also obtains good marks in the quiz, we can conclude our system is working properly.

1.3 Organization of The Paper

This project document is basically divided into 8 chapters.

- **Chapter 1:** This chapter describes our full project overview which includes precisely the main idea of our project, the motivation behind this and the objectives of our project.
- **Chapter 2:** This chapter contains some of the related works we could find on the internet and also some literature reviews of some research papers related to our project.
- **Chapter 3:** This chapter describes all the procedures and the steps of our project to achieve its goal.
- **Chapter 4:** This chapter describes the standards we are following to develop our project.
- **Chapter 5:** This chapter represents the progress we have done so far to make our proposed system.
- **Chapter 6:** This chapter describes the different impacts and constraints of our project.
- **Chapter 7:** This chapter shows our weekly work distribution.
- **Chapter 8:** This chapter contains our individual contribution to our project so far and the future plan to complete our project in time successfully.

Chapter 2

Background and Related Work

2.1 Background

The main idea of our project is to increase students' engagement in the class room. In the class room teachers teach in traditional way. Therefore, there is no way to know the effectiveness of his class. That is why we are proposing to use facial expression recognition system in the class room to know how effective the class was and how much the students was engaged in the class room.

In this system CCTV camera will be used in the class room for capturing the students face. The CCTV camera will take pictures after every one minute and by this image data the expression of every student will be calculated. For the increasing of the calculated result there will be an online-assessment for every student. Then merged result will be considered as a final result. For the cross check of two results it will give us more accurate result to take any kind of decision about students engagement in the class room.

Facial recognition is mainly used for protect low enforcement, aid forensic investigations, identify people on social media platforms, track school attendance. Using face recognition and facial expression recognition in class room to increase students engagement is a new idea in Bangladesh. That will help education sector to improve their actions. We are using Face API and Tensorflow which is more accurate and faster. Our proposal is better from others because it would give us more accurate result for online-assessment and the result will be calculated in real time.

2.2 Related work

Thanchanok Sutjarittham et al. [8] proposing with their work that is representing the findings of a people counting sensor and a web tool to analyze and visualize the collected data which provides valuable insights into attendance patterns. There are multiple methods to count students in a classroom and each has its pros and cons. For this study, the beam counter sensor was used taking the cost, accuracy, and privacy of data into consideration. The quality data comprises timestamp, week of the semesters, doors, seats, Course ID, start time, end time, etc. R shiny was developed to visualize the data gathered. Its easy user interface helps the user to visualize the data to understand where improvement might take place in terms of utilization of classroom space.

K.R. Jayahari et al. [4] introduces a system that can indicate if the voice of the teacher is not heard from a particular point inside a classroom.

Two methods were used to handle the different setup of classrooms. The traditional classroom which does not have speaker had indicators to identify which part of the classroom is not hearing the voice. Whereas, in the case of smart classrooms with the speaker; the system automatically adjusted the matching speaker volume to get the desired level of volume. With careful study, the initial volume was set at an average level which gets adjusted to the volume level required dynamically.

The results show that it has immense benefits for teachers who can instantly identify where the voice is not heard so that they can raise their voice and face that way to cover that part of the classroom. Auto adjustments of volume level in the smart classroom using the sensors overhauls the process of manually increasing or lowering the sound which is prone to error. This automated sound adjustment system makes it easy, intuitive and creates an effective teaching-learning process.

Nenad Gligoric et al. [2] deals with an application system of IoT in the Smart Classrooms. The main aim of this paper is to give real-time feedback on lecture quality. Combining IoT with behavioral science makes an ordinary classroom into a smart classroom that continuously listens and analyzes conversations, behavior, movements, voices, behavior, voices, etc. to reach an end to the listeners' satisfaction and lecturers' presentation. The system collects data and sends it through the gateway. Storage and analysis, as well as for signal processing and the classification, the data center are utilized. The feedback is given in the real-time. HTTP, XML is used for data transport. Java is used to implement the algorithms for signal

analysis and classification. This paper is for observing and sensing technology to know the listener's behavior in this environment. In order to represent the idea in more precisely, the experimental design is given.

Akzharkyn Izbassarova et al. [3] proposed a system based on speech assessment on the oral presentation and the algorithm for a speech evaluation. It is based on optimal intonation. In the beginning the the Kazakh phonemes are extracted concur the features. After that based on Hidden Markov Model, the model for language recognition is constructed. To create HMM for Kazakh phonemes they used MATLAB. The intonation and tempo of the speech are being evaluated by the system. The prediction is that there is a straight relation among the deviation rate in fundamental frequency and the lustiness of the speech. We got first, second and third formats of Kazakh vowels from the data analysis results. By manually extracting each phoneme from KLC audio files these elements were gained.

Jian Han Lim et al. [5] have presented the application of IoT for measuring students' performance and behavior in their proposed system. They have presented that with the incorporation of IoT devices and computational algorithms such as computer vision techniques, machine learning and data analysis, it can ease the monitoring task and the analysis of students' performance in the class. In advance, it can perform automated real-time observation on the student's behavior through network and react immediately to critical situation if necessary. To begin with, a camera is first installed in a fixed and suitable angle in a closed environment (classroom) and use to continuously capture the classroom scene. The camera is connected to a processing unit to perform real-time monitoring, data feeding, and data analysis. The data gathered can be saved in the database for long term record and future analysis. A Face Recognition Module in their proposed framework, the processing unit is divided into three main important modules which are the face recognition, motion analysis, and behavior analysis modules. Face recognition algorithm is applied to detect and recognize the students face for identification purpose. With comparing to the conventional way of taking attendance, this system will continuously keep track of the students' attendance instead of just taking it once in the class. It helps to prevent the sneak out activity. This module is able to determine the concentration level of a particular student by assessing the rate of his face being recognized during the class. The theory behind is, when the student looking into other direction his or her face could not be detected. Next, human motion analysis is applied on the students with recognized face and their activity will be recorded into the database such as entering or leaving the classroom. At the end of the class, the gathered data will be used to evaluate their overall attendance. To achieve this, prior to the motion tracking, the students' upper body or full body must be detected. The

effectiveness of integrating upper body and full body detection in motion analysis is studied and tested in this work. In this work, they improve the performance of facial recognition module by combining the eigen faces and fisher faces. Finally, the data and information gathered from the previous modules will be used to evaluate students' behavior and performance. In their analysis module, they proposed several metrics for performance evaluation, such as the students' approaches. The proposed hybrid approach is proved to be more efficient and achieve real time processing which is one of the main concern in the IoT framework.

Improving the quality and integrity of teaching practices in the classroom for a Low-resource Environment is proposed by Salsabeel et al. [7]. This paper showed the design and implementation of a system that codes and reports classroom observations instantly without the need for a human observer. It uses the audio recording of the classroom session to automatically provide a teacher with a breakdown of their classroom activities based on Stallings-type classroom observation coding system. The proposed system relies on a cross-platform mobile app. A teacher can review their classroom activity based on recorded audio and visualize the results at the end of each class session. By extracting audio features from audio snapshots the App classifies activities in the classroom using Stallings Classroom Observation System. The app can also provide feedback based on the classification results. For example, if a teacher is spending most of the class time lecturing, the App will suggest that the teacher spend more time engaging the students in discussions and asking questions. the App is also able to make intelligent recommendations on which teaching activities are more effective in a specific classroom. Features were extracted from each audio file of each episode using the Librosa Python library available on GitHub. The features were selected based on a literature review of previous work on environmental sound recognition, audio file classification, audio scene classification and speech classification. MFCC was the most commonly used feature for building such classifiers. The balanced data-set was used to train and test seven commonly used machine learning classification algorithms: K-Nearest-Neighbor (KNN, K=10), J48, JRip, Multi Response Linear Regression, Multilayer Perception, Naïve Bayes, and Random Forest. The classifiers were trained and subsequently validated using 10-fold cross-validation.

Sheng et al. [9] introduced the idea of restoring attention Using Computer Game Mechanism in the classroom. During a class, the students are asked to use their smartphones to scan QR codes appearing on the projector screen from time to time. Each scan will reward students with a fraction of the class participation points and lead the students into a preset teaching scenario such as attendance checking, random questioning, and quiz. In this paper, they have used WeChat Mini Program Technology. They propose to slightly modify the

traditional solo-all-the-way teaching style and divide a long teaching block into several 8-15 minutes' short segments. After each segment of teaching, the lecturer would contest the students' attention and immediately reward them with participation points. Technology such as WeChat mini program allows the contest to be finished in less than 2 minutes using students' smartphones. The system also rewards those most attentive students by giving extra points to the students who are among the first several to finish a small contest. And for the process, they have designed and implemented a system using WeChat mini program which will provide small contests. They reported experiment results from two courses with over 100 students of class size. The experiment showed a substantial improvement in both the course attendance rate and the students' attention level.

According to the NAIS [6] (National Association of Independent Schools) research 2016, students engagement in teachers lecture in a scale of (Not at All, Very Little, Some, Very Much) the survey result is or 'Not at All' is 8%, 'Very Little' is 23%, 'Some' is 52% and 'Very Much' is 15%. So, here the 8% of students are fully distracted in class lectures.

Table 1: Student Engagement in Classroom Statistics 2016 [6]

Teacher Lectures	NAIS Participant Schools	HSSSE Public
Not at All	8%	23%
Very Little	23%	29%
Some	52%	39%
Very Much	15%	8%

Here, for HSSSE [1] (High School Survey of Student Engagement) public student engagement in a classroom for the scale of 'Not at All' is 23%, for 'Very Little' is 29%, 'Some' is 39%, and 'Very Much' is 8%. In HSSSE [1] the students who are totally not engaged with class are very high that is 23%. In the same survey, 68% of students describe that the teaching method is not interesting.

Chapter 3

Proposed System and Methodology

3.1 Overview

In this chapter, we will be describing the procedures of image-based face and facial expression recognition system. A picture was taken from a web camera, we would like to know if there is any person in the picture, who the person is and what his/her facial expression is. By classifying someone's facial expression, we want to predict if they are attentive or not.

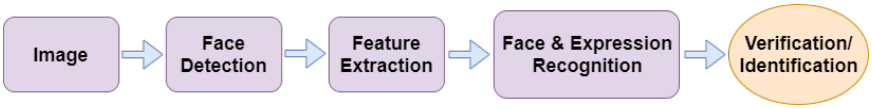

Figure 1: Three steps of the face/expression recognition procedure

3.2 Face Detection with face-api.js

Till now face-api.js solely implemented an SSD Mobilenet v1 base CNN model. This turns out to be a pretty accurate face detection model. But the downside is its slower than other architectures and you might not be able to accomplish real time face detection unless you have a powerful GPU.

In the real world scenario, you don't always need a super-accurate face detection model. We can actually make some tradeoffs for speed.

Here MTCNN comes into play, which is now available in face-api.js now. I'm going to list some differences between MTCNN vs SSD bellow.

3.3 Feature Extraction

In this step, the patched human faces are extracted from images. But some disadvantages are using these patches directly for face recognition; first, each patch generally holds so many pixels, which are so large that it becomes very difficult building a recognition system. Second, it may be taken from different camera angles with various kinds of facial expressions. To win these difficulties, feature extraction is performed to dimension reduction and noise-cleaning. Then the face patches are usually converted into a vector with a fixed dimension.

3.4 MTCNN-Simultaneous face detection and landmarks

MTCNN (Multi-task cascaded Convolutional Neural Networks) has 3 stages. It detects the bounding boxes of a face from an image and its 5 landmark points. In each stage, it improves its accuracy by passing its inputs through a CNN model.

In stage one images are scaled down multiple steps and image pyramid is made and each scaled image is passed through the CNN model.

In stage 2 and 3 we extract image patches for each bounding boxes and resize then (24X24 for stage 2 and 48X48 for stage 3) and passed through CNN. In stage 3 along with bounding boxes scores, 5 landmark points are also computed. After some MTCNN implementations, it turns out that pretty good and fast face detection models can be build compared to SSD mobilenet v1.

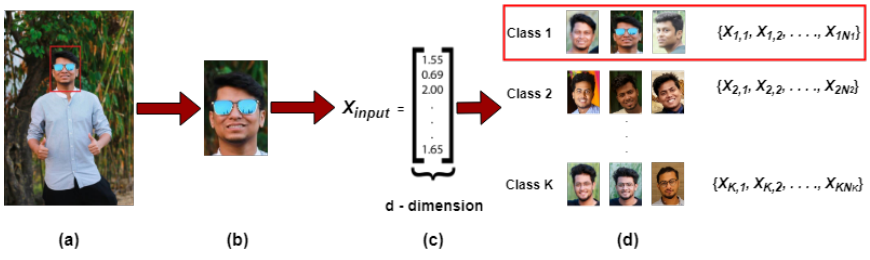

Figure 2: In depth of the three working process for face recognition

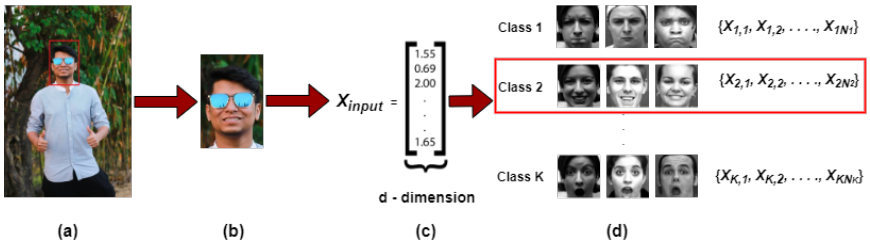

Figure 3: In depth of the three working process for facial expression recognition

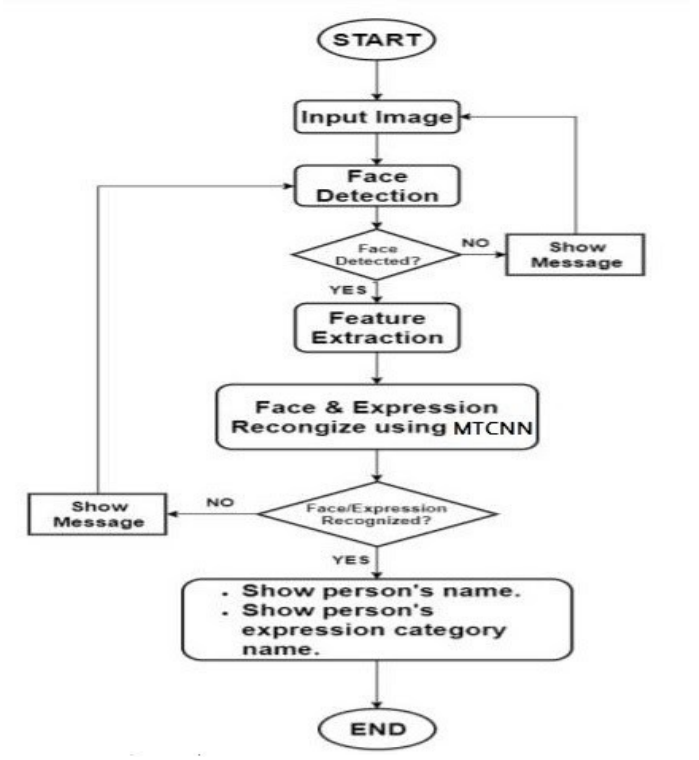

Figure 4: Flow chart of the face and facial expression recognition system

3.5 Webcam Face Tracking and Face Recognition

Now let's have a look at some implementations. We are gonna make a face detection system which will detect yourself as well as other people.

We will simply use a video element and an absolute positioned canvas on top of it with the same height and width as bellow:

Once the page loads we are gonna attach the MTCNN model as well as the face recognition model. We are also gonna attach the webcam video stream in the video element using navigator.getUserMedia:

Now we will be asked to grand the browser access for your webcam. We will be handling all the processing in onPlay callback and the onPlay hook will be triggered once the video starts playing.

3.6 Analysis and Decision Making

After classifying students' facial expressions, we want to predict if they are attentive or not. To achieve this prediction well enough we want to take some instant evaluation of the students after the class lectures. If our system predicts a student as attentive and he also obtains good marks in the quiz, we can conclude our system is predicting properly.

Chapter 4

Compliance with Standards

4.1 Introduction

In general, we have to conform to certain laws, policies and regulations. In this era of information, gaining a legally permitted model and the program is highly significant.

4.2 Types of Standards

We will be following different standards required for this project.

4.3 Technological

Table 2: Technological Standards

Programming Languages	JavaScript, PHP, HTML, CSS
Markup Languages	LaTeX
Software	Visual code & PhpStorm
Hardware	Web cam

4.4 License

Exclusive copyright nobody else can copy users will get an interface to use its service. In our application no code is available but we will think about making this open source.

- Javascript: Javascript is used in Microsoft Visual code.
- Visual code: Visual code is free.
- XAMPP: XAMPP is free.
- All our library functions we are using are free to use.

4.5 Safety

This application is safe to use. We have to ensure security for the datasets so user and administrative data can not be breached.

Chapter 5

Impacts and Constraints

In this chapter, we will be discussing the different impacts and constraints of our work.

5.1 Social Impact

Since we are working to help to improve the education system, we believe the impacts will be some positive effects on society.

5.2 Educational impact

As it is already mentioned, our main focus of this project work is to help to improve the education system, it is obvious to have positive impacts in this educational sector.

5.3 Ethical Impact

Our model can help teachers to identify and monitor the students who need extra attention. So it can bring some positive impact on teachers' ethical behavior.

5.4 Environmental Impact

Our work is mainly a research-based project which deals with some emotion classifiers to predict students' engagement in the classroom. So we believe there will be no negative impact on the environment of our project.

5.5 Health and Safety

Our system is safe to use as it does not create any harmful radiation or any other harmful effects that can cause some health issues. Our code is also free from well known exploits.

5.6 Economical

Our project work is to identify if anyone is attentive or not in the classroom so that he can get the extra care that he needs. So basically it is not replacing any job. Besides we are aiming to make the whole system as much cost-efficient as it can be.

5.7 Political

Our project does not harm any law and it does not require any government approval.

5.8 Manufacturability

Since our work is based on some machine learning classifiers that are well developed and free to use. We just need to use them properly and train our model well enough with effective data-sets.

5.9 Sustainability

Our model is sustainable since our model is mainly based on machine learning algorithms.

Chapter 6

Web Application

6.1 Development

The system has been developed using JavaScript, CSS, HTML. The JavaScript library used is "Face-api.js" which is a nifty little library to implement face recognition model in JavaScript. For UI HTML and CSS have been used. For storing the face data MySql server has been used. Form the server the face data matches in real time with the subjects from the webcam/CCcam. The service can detect the expression and face recognition for multiple subjects in real time.

6.2 User Manual

In the web application the home page in figure 5, there are three options to detect the expression of the subjects.

6.2.1 Live

The first one is a live option in figure 6 where the subjects which are in front of the camera will be measured in real time. In this option, the process will measure the subjects continuously. After the examination process, there will be a final result shown by clicking the button Show result.

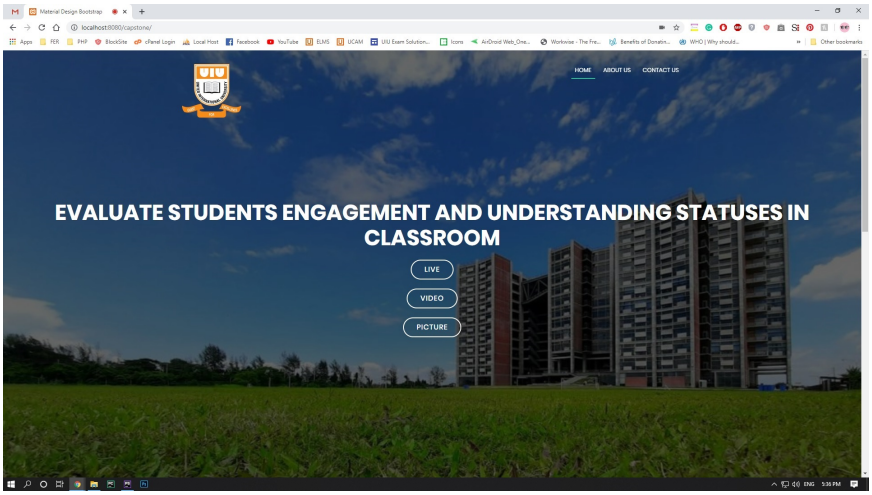

Figure 5: Front page of web application.

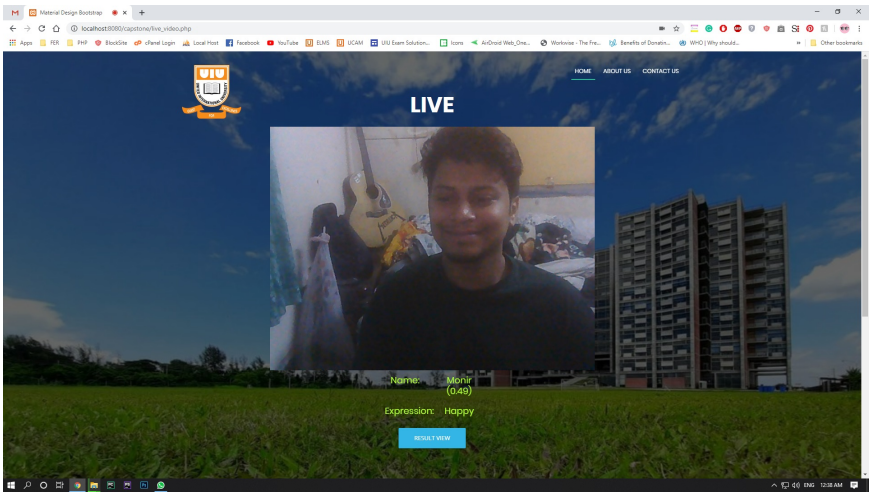

Figure 6: Live feature.

6.2.2 Video

The other option to measure the engagement in the classroom is by adding video. A pre-recorded video clip of the classroom can be upload to measure the engagement in class room.

6.2.3 Picture

The picture option simply tells the expression from image file.

6.2.4 Final Result

To see the final result a particular time slot should be selected from the list of starting time and ending time options. The result will show only in between that particular time slot the subjects Name, The subjects engagement rate, shown in figure 7.

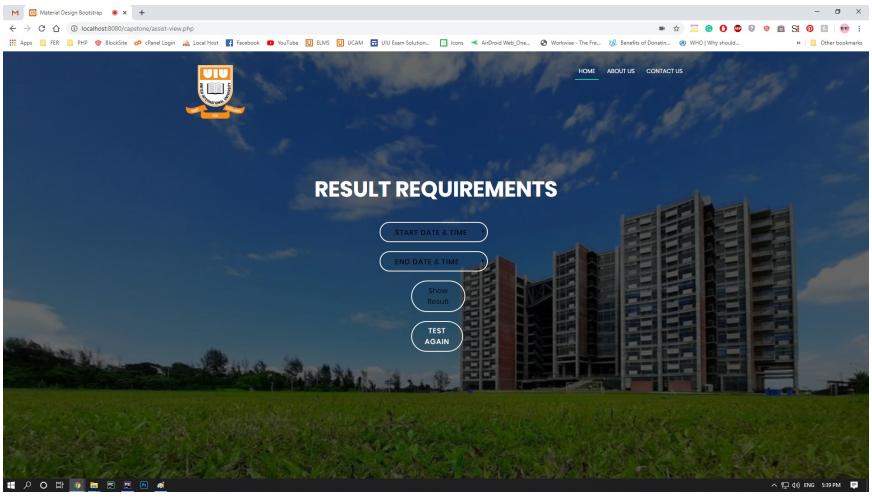

Figure 7: Result options.

6.2.4.1 Individual Activity Result

The Individual result will show a particular subjects activity in figure 8.

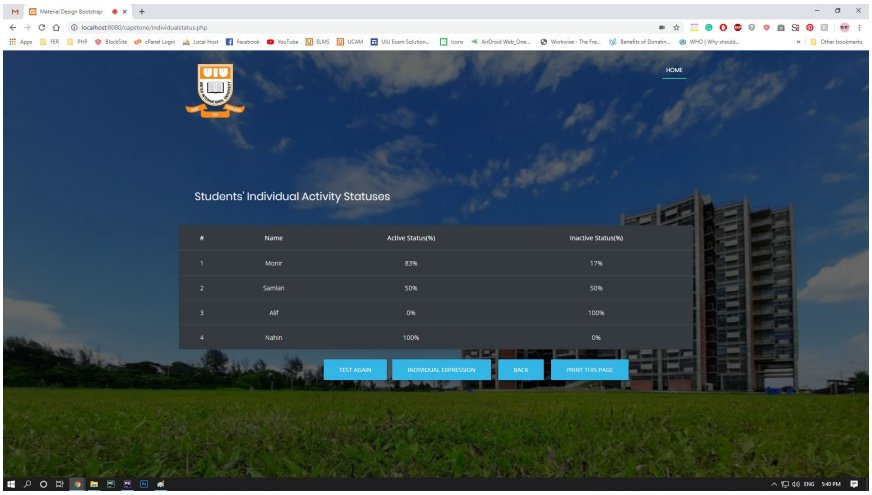

Figure 8: Individual activity result.

6.2.4.2 Total Activity Result

The Total result will show the engagement rate for the whole class, active/inactive shown in figure 9.

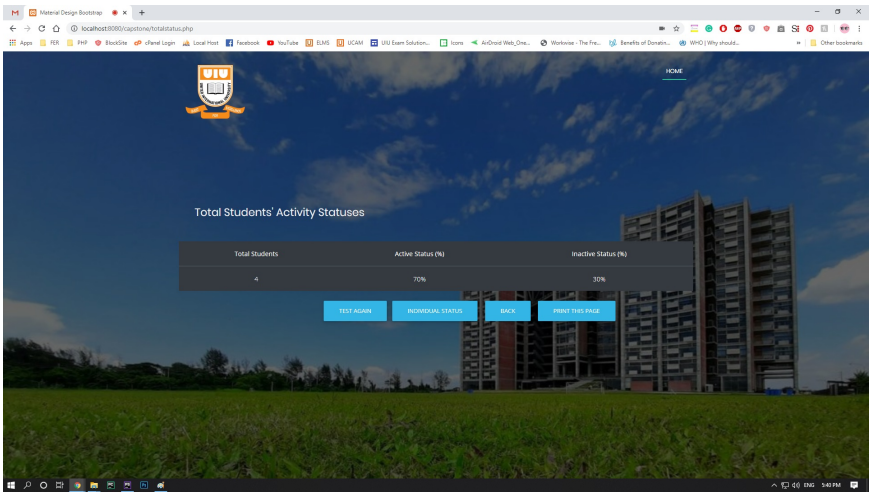

Figure 9: Total activity result.

6.2.4.3 Individual Expression Result

In result section, Individual expression will show Seven different expression rate of students/subjects with Name.Figure 10.

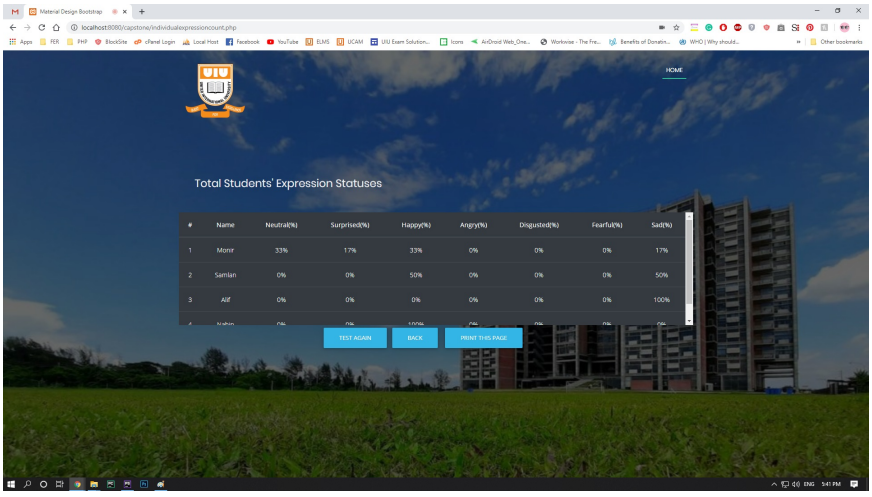

Figure 10: Individual expression status.

Chapter 7

Project Timeline

Week 1: Group formation, supervisor selection and topic area selection.

Week 2: Submission of project proposal.

Week 3: Eid-al-Fitr vacation.

Week 4: Collection of relevant research papers.

Week 5: Reviewing the research papers and fixing a specific topic.

Week 6: Learning python and understanding how face/expression recognition works.

Week 7: Trying to implement different face/expression recognition program collected from GitHub.

Week 8: Mid-term examination week.

Week 9: Successfully implemented a face recognition program and started to write the report.

Week 10: Successfully implemented a facial expression recognition program.

Week 11: Report writing.

Week 12: Report writing.

Week 13: Trimester break.

Week 14 - 20: Implementation.

Week 21 - 24: Debug.

Chapter 8

Conclusion

8.1 Contribution

Table 3: Individual Contributions

Name and ID	**Contribution**
Rahat Nawaz Tushar ID: 011 151 307	1. Collect and review thesis papers. 2. Report writing: Chapter 2 3. Optimizing multiple facial expression recognition.
Md Monir Hossain ID: 011 143 094	1. Collect and review thesis papers. 2. Report writing: Abstract Chapter 1, 3, 5, 6 3. Prepare final presentation slides. 4. Implementing face recognition program.
Mohammad Ruhul Amin ID: 011 151 306	1. Collect and review thesis papers. 2. Report writing: Chapter 3 3. Implementing facial expression recognition program.
Fazley Rabbi ID: 011 151 096	1. Collect and review thesis papers. 2. Report writing: Chapter 1, 4, 6, 7 3. Prepare presentation slides. 4. Latex work.
Md Shadman Shakib ID: 011 151 328	1. Collect and review thesis papers. 2. Report writing: Chapter 1 3. Prepare presentation slides. 4. Design the front end.

8.1.1 Future Work

Since we could successfully recognize a person as well as their facial expression with the help of some collected projects from Github, firstly we will now collect real-life datasets as much as we can by visiting actual classrooms to train our model to make it more accurate and more efficient. As we are working with Bangladesh Digital Education Research Limited, we have the opportunities to collect our required datasets visiting their schools that they are developing for so long. We will cross-match prior data (training data) with collected data, classify students' expression and predict their engagement in the class lecture. To check the efficiency of our system, we will take some instant evaluation quizzes in class and cross match our datasets. If our system predicts a student as attentive and he also obtains well enough marks in the quiz, we can conclude our system is working properly.

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