



Proposal / Application
for
Final Year Project
Computer & Information Systems Engineering Department

**“Intelligent Behaviour Management system using
machine learning”**

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1. Project Identification

A. Reference Number (for office use only)

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B. Project Title

Intelligent Behaviour Management System using Machine Learning

C. Project Internal Advisor

Name	Ms.Maria Waqas
Designation	Assistant Professor

D. Project Internal Co-Advisor

Name	
Designation	

E. Project External Advisor

Name		
Designation		
Organization		
Mobile #		

F. Student Team

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G. Sponsoring Organization (if any)

H. Keywords

Camera face detection; Face recognition system, Image processing, Computer-based assessment, Affective domain teaching objectives.

I. Project Idea

☐ New

2. Abstract

In today's world, Automated learning analytics is becoming an important topic in the educational community, which needs effective systems to monitor learning process and provides feedback to the teacher. The real time face detection and recognition is now a days a subject of interest in various daily applications like crowd identification, video conference, security measure, image analysis etc. The human face is a dynamic object and has a high degree of variability in their appearances, which make face detection a difficult problem in computer vision. Machine learning algorithms are used to train classifiers which estimate time-varying attention levels of individual students. Human observers' estimation of attention level is used as a reference.

The basic idea of our work is to utilize advanced capabilities of Kinect One sensor to unobtrusively collect behavioral data of multiple students during attending traditional lectures in the classroom or lab. We propose a methodology to compute features from the Kinect data corresponding to visually observable behaviors and to apply machine learning methods to build models to predict attentive state of the individual students. We analyze attention scores provided by human observers and match them with the observable behaviors, activities, gestures, etc. of the students. Those results allow us to define a meaning of observable attention levels in terms of student behavior.

Project Background and Literature Review

[1] Background

In the field of higher education, estimation of a long-term student engagement in the learning process is needed in order to evaluate courses and improve learning results . This evaluation is usually done through questionnaires, but with the proliferation of modern e-learning, it became possible to collect implicit usage data to estimate activity and engagement of students or children within learning activities. Attention is best described as the sustained focus of cognitive resources on information, while ignoring distractions. In the field of education, the terms of sustained attention or vigilance are used to describe the ability to maintain concentration over prolonged periods of time, such as during lectures in the classroom.

[2] Automated measurement of affective parameters

Non-intrusive visual observation and estimation of affective parameters is commonly using recorded video (RGB) signal, for example, to estimate student engagement from facial expressions , to estimate mood of children during one-to-one tutoring by using facial .A survey of automatic affect detection methods identified various types of signals (video, EKG, EMG...) used in affect analysis. Face analysis usually require high-quality image and are applicable to single-person observation, which limits their usability or reduces accuracy and available complexity of image analysis in the classroom setting. Eye tracking devices are very successful in measuring affective parameters such as concentration in the computerized learning environments, and Bixler et al. were using eye tracking data detect mind wandering during computerized reading . Apart from visual signals, other types of measurements such as brainwaves (EEG) were utilized to assess attention level of students

[3] Computer Vision

1. The goal of computer vision is to extract meaningful information from images/videos. Such as whether a certain object is present or not in a particular scene.
2. Computer vision is not limited to pixel-wise operations it can be complex, far more complex than image processing.
3. Those complex operations can be summarized into feature detectors which can provide rich information about the contents of the image/video.

[3a] Image processing

1. The goal of image processing is to enhance or compress image/video information.
2. Uses pixel-wise operations such as transforming one image into another. For example applying a rotation on pixels.
3. There is no extraction of meaningful information from those pixel-wise operations.

[3b] Machine learning

1. The goal of machine learning is to optimize differentiable parameters so that a certain loss/cost function is minimized.
2. Machine learning can be used in both image processing and computer vision but it has found more use in computer vision than in image processing.
3. In ML the loss function can have a physical meaning in which case the features learnt can be quite informative, but this is not necessarily the case for all situations.

4. Motivation and Need

This automatic attention estimation system has a clear potential usage as a tool for automated analytics of the learning process, providing a mechanism for large-scale analytics of student behavior in the classroom by using affordable but very capable hardware. This opens a possibility for teachers to evaluate their lectures and observe fine-grained effect on the students and possibly adapt them to increase participation and attention of students and thus improve results of the learning process, as well as their teaching methods.

5. Objectives

The main objective is to make a system that :

- To provide major source of “quality” in teaching will come from the teachers’ understanding of inter-personal relationships with their students.
- Our work focuses on that element, by exploring indicators for alerting the lecturers when the students have lost the attention.
- To provide a system that can manage activities of students like how much interest the student shows during the lecture, talking or create panic in the class room, using cell phone during the lectures.

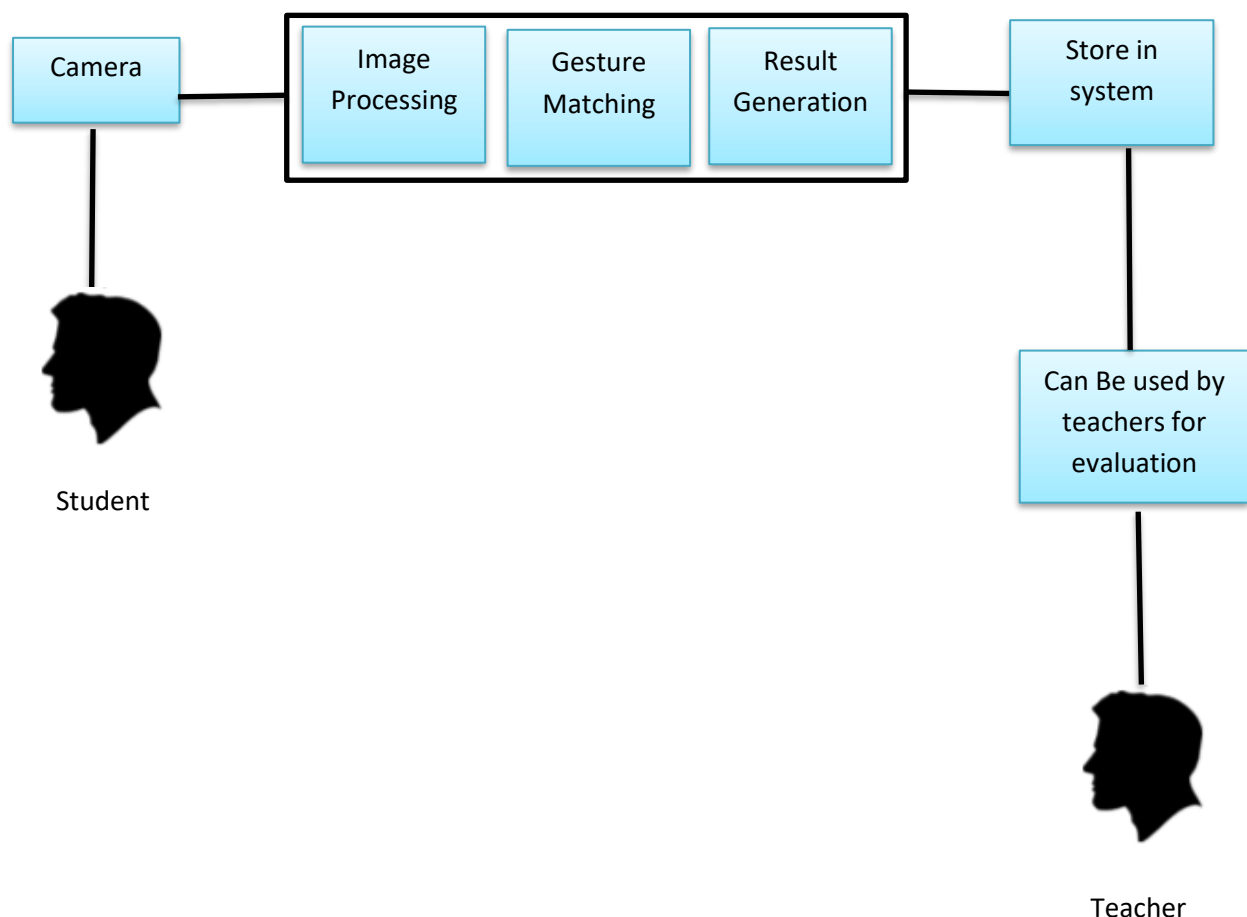
6. Methodology and Equipment/Tools

Kinect 360 sensor for human activity analysis, including body pose and activity recognition, and hand gesture analysis. Kinect One sensor provides advanced capabilities to detect face gaze and facial features. The interface between the development interface and the Kinect sensor is achieved through the usual USB communication the Kinect sensor gets recognised in operating systems other than Microsoft Windows, through another set of Free, Open source libraries called Libusb and libfreenect

Two state-of-the-art studies use machine learning methods to build models for automated estimation of student engagement from facial features.

- Monkaresi et al. use combination of geometrical facial features (detected by Kinect sensor), texture description features (local binary patterns), and physiological features (heart rate) to estimate two-level engagement of students Whitehill et al.
- Use computer vision methods to register faces and extract Box Filter features (Haar wavelets) and then train binary classifiers to estimate states of engagement.

Both works are studying the engagement of a single student during computerized learning which differs from our use case of attention during classroom teaching.



7. Key Milestones and Deliverables

No.	Elapsed time (in months) from start of the project	Milestone	Deliverables
1.	1 month November	Learning and research about circuit of hand gesture gadget and its application	Prototype and document of literature review.
2.	4 months December-March	Learning about Machine learning and Deep learning	Report regarding classifiers algorithm and their use in our project will be submitted
3.	6 months March-May	Learning and beginning work on application for hand gadget.	Basic infrastructure of application and code modules will be submitted
4.	7 months May-June	Complete the building of application for the hand gadget.	Progress Report will be submitted
5.	8 months June-July	Finalize the gadget for home automation and the application.	Verified functionalities along with report will be submitted
6.	8.5 months July	Project Testing	Complete project along with proper documentation will be submitted

8. Expected Outcome

A complete system that control and manage the activities of students like how much interest the student shows during the lecture, talking or create panic in the class room, using cell phone during the lectures.

Direct Customers / Beneficiaries of the Project

- To help the teachers in analysis.
- To do work effectively and timely manner.
- Can improve grading criteria.

Consent of the Internal Advisor

[illegible]

11. Project Approval Certificate








Recommendation of FYP Coordinator

Signature: _____

Approval by the Chairman

Signature: _____

12. Project Schedule / Milestone Chart

		Task Mode ▾	Task Name ▾	Duration ▾	Start ▾	Finish ▾	Predecessors
1			Learning and research about circuit of hand gesture gadget and its application	22 days	Thu 11/1/18	Fri 11/30/18	
2			Learning about Machine learning and Deep learning	62 days	Mon 12/3/18	Tue 2/26/19	1
3			Learning and beginning work on application for hand gadget.	48 days	Wed 2/27/19	Fri 5/3/19	2
4			Complete the building of application for the hand gadget.	22 days	Mon 5/6/19	Tue 6/4/19	3
5			Finalize the gadget for home automation and the application	20 days	Wed 6/5/19	Tue 7/2/19	4
6			Project Testing	10 days	Wed 7/3/19	Tue 7/16/19	5

