

**ANALYSING STUDENT'S ATTENTION IN
E-LEARNING ENVIRONMENT**

Submitted in partial fulfillment of the
requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering

By

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Pichikala Sri Krishna Kumari (40111258) and Shreedhruthi Boinpally (40111204) who carried out the Project work entitled "ANALYSING STUDENT'S ATTENTION IN E-LEARNING ENVIRONMENT" under my supervision from November 2023 to April 2024.


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DECLARATION

I, Pichikala Sri Krishna Kumari(40111258) hereby declare that the Project Report entitled "ANALYSING STUDENT'S ATTENTION IN E- LEARNING ENVIRONMENT" done by me under the guidance of Dr. M. Selvi. B.E.,M.TECH., Ph.D., is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering.

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ABSTRACT

There have been many studies in which researchers have attempted to classify student attentiveness. Many of these approaches depended on a qualitative analysis and lacked any quantitative analysis. Therefore, this work is focused on bridging the gap between qualitative and quantitative approaches to classify student attentiveness. Thus, this research applies machine learning algorithms (K-means and SVM) to automatically classify students as attentive or inattentive using data from a consumer RGB-D sensor. Results of this research can be used to improve teaching strategies for instructors at all levels and can aid instructors in implementing personalized learning systems, which is a National Academy of Engineering Grand Challenge. This research applies machine learning algorithms to an educational setting. Data from these algorithms can be used by instructors to provide valuable feedback on the effectiveness of their instructional strategies and pedagogies. Instructors can use this feedback to improve their instructional strategies, and students will benefit by achieving improved learning and subject mastery. Ultimately, this will result in the students' increased ability to do work in their respective areas. Broadly, this work can help advance efforts in many areas of education and instruction. It is expected that improving instructional strategies and implementing personalized learning will help create more competent, capable, and prepared persons available for the future workforce.

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CHAPTER 1

INTRODUCTION

N

Student's learning attention in an offline class is a quantitative index to measure students learning engagement in class, which includes attention depth and attention duration. The deeper and longer students attention is in the class, the better the learning results will be. The famous Russian educator formerly said that learning attentiveness is the only gateway to our soul, and everything in consciousness must pass through it to enter. There is a great similarity between attentive learning and immersive learning. A high learning attention state easily leads to an immersive learning state. Studies show that the learning outcomes of immersive learning can reach five times that of ordinary learning. Learning attention is related to a learner's learning motivation and learning interests. Strong learning objectives and intensive learning interests, such as happy learning or inquiry learning, can easily drive learners to enter a high- focus learning state. Well and carefully designed teaching methods can stimulate students learning interest in class and improve their learning attention. The characteristics of learning attention vary among students and depend on the special characteristics of each student . One student may easily enter a high learning attention state but cannot keep it for long. Another student may find it difficult to enter the state of high attention, but once entered, they can maintain this state for a long time. Some students struggle to stay engaged in their studies and are easily affected by external factors. We believe that studying the students whole learning attention in class can measure the Electronics 2022, 11, 2663. teaching effect of the teacher and make a quantitative index to measure the effect of class teaching. Students learning attention can also help teachers to improve their teaching methods. Studying the personal learning attention of each student can help customize personalized learning programs for each student. The research on online learning attention has attracted researchers and achieved valuable results. In practice, the degree of students class attention is difficult to measure. It is a challenging job to accurately detect the learning status of students in the class. Some scholars have conducted research on how to detect learning attention and achieved valuable results. Sun et al. Reviewed the existing progress in learning attention at home and abroad, divided the focus research into two aspects, attention recognition based on facial expression and attention recognition based on behavior, and further discussed the development trend of attention recognition. Focus research scenarios

mainly include the online education environment and offline class teaching environments. For the convenience of image and voice acquisition in online classes, researchers have studied attention recognition in online classes

and made good progress. Wang et al. Proposed a method of building a structural equation model based on the Triadic Theory of Learning, which studies the efficiency of online learning, divides the teaching quality into deep learning and shallow learning states, and tests the online teaching quality by taking 636 students majoring in economics and management in national universities as samples. This method puts forward that learning attention heavily affected students learning vigor and was heavily affected by teachers teaching contents and teaching method, further optimizing the configuration of the online teaching platform to improve the efficiency of online teaching. Chang et al. Proposed a method that consists of 3 sub-modules.

CHAPTER 2

LITERATURE SURVEY

1. Cebrián, G.; Palau, R.; Mogas, J. The Smart Classroom as a Means to the Development of ESD Methodologies. *Sustainability* 2020, 12, 3010. [CrossRef]

Educational institutions are envisioned as principal agents for addressing the current sustainability challenge that society is facing. Education for Sustainable Development (ESD) is transformational and concerns learning content and outcomes, pedagogy and the learning environment in itself. ESD entails rethinking the learning environment (physical and virtual) in line with sustainable development, which implies classrooms' transformation towards learner engagement, formative assessments and active methodologies. This paper responds to this need through exploring the relationship between Smart Classrooms and four widely used ESD methodologies (project or problem-based learning, case study, simulation and cooperative inquiry), identifying how the dimensions and categories of the characteristics of Smart Classrooms can contribute and lead to the implementation of ESD methodologies in real teaching practice in an effective way. The method used in this study consisted of a literature review of both theoretical frameworks separately, ESD and Smart Classrooms, and a subsequent expert analysis to identify the interrelation between both. The Smart Classroom shows a high level of adequacy for using problem and project-based learning, case study and cooperative inquiry methods because of its characteristics in terms of technology developments, environmental conditions and processes. Simulation is the ESD methodology with the lowest level of adequacy in a Smart Classroom, because it is primarily held online rather than through face-to-face teaching. Smart Education facilitates the putting in practice of ESD processes as it enables the creation of intelligent, sustainable, resource-efficient, personalized and adaptive learning environments. Further empirical research is needed to explore the influence that the Smart Classroom has in enabling ESD processes and practices, and to identify students' and teachers' needs at different education levels. Additionally, teacher training programmes focused on the correct use of Smart Classrooms and on the digital competence of teachers are critical to its successful implementation.

2. Xiao, N.; Thor, D.; Zheng, M. Student Preferences Impact Outcome of Flipped Classroom in Dental Education: Students Favoring Flipped Classroom Benefited More. *Educ. Sci.* 2021, 11, 150. [CrossRef]

Many reports in dental education showed that student learning improved with the flipped classroom method. However, there are few reports that describe how different subsets of students may benefit from the flipped classroom. In this study, we investigated how students' preference for the flipped classroom impacted their learning outcome. We used a flipped classroom module on the physiology of the autonomic nervous system taught to year one Doctor of Dental Surgery students to test the hypothesis that students who favored the flipped classroom performed better on assessment quizzes. The module was composed of pre-class activity, out-of-class assignment, in-class discussion, and two in-class quizzes. Quiz 1 was given after students self-studied the foundational content online through the pre-class activity, and Quiz 2 was at the end of the module. Students filled out a survey to report learning experiences and preferences. Fewer students scored below 75% on Quiz 2 than on Quiz 1. Students' self-evaluated understanding of content significantly improved after finishing the assignment and discussion compared to finishing the pre-class activity alone. Moreover, students who preferred to learn through the flipped classroom scored higher in Quiz 2. Students with higher overall grades in the course preferred the flipped classroom more than low performers. Our results indicated that students favoring the flipped classroom method spent more time on the assignment, understood the content better, and performed better on assessments than students who prefer traditional lectures

3. Huang, L.; Su, J.; Pao, T. A Context Aware Smart Classroom Architecture for Smart Campuses. *Appl. Sci.* 2019, 9, 1837. [CrossRef]

The Smart campus is a concept of an education institute using technologies, such as information systems, internet of things (IoT), and context-aware computing, to support learning, teaching, and administrative activities. Classrooms are important building blocks of a school campus. Therefore, a feasible architecture for building and running smart classrooms is essential for a smart campus. However, most studies related to the smart classroom are focused on studying or addressing particular technical or educational issues, such as networking, AI applications, lecture quality, and user responses to technology. In this study, an architecture for building and running context-aware smart classrooms is proposed.

The proposed architecture consists of three parts including a prototype of a context-aware

smart classroom, a model for technology integration, and supporting measures for the operation of smart classrooms in this architecture. The classroom prototype was designed based on our study results and a smart classroom project in Ming Chuan University (MCU). The integration model was a layered model uses Raspberry Pi in the bottom layer of the model to integrate underlying technologies and provide application interfaces to the higher layer applications for the ease of building context-aware smart classroom applications. As a result, application interfaces were implemented using Raspberry Pi based on the proposed technology integration model, and a context-aware energy-saving smart classroom application was implemented based on the proposed classroom prototype and the implemented web application interface. The result shows that, in terms of technology, the proposed architecture is feasible for building context-aware smart classrooms in smart campuses.

4. Francisti, J.; Balogh, Z.; Reichel, J.; Magdin, M.; Koprda, Š.; Molnár, G. Application Experiences Using IoT Devices in Education. *Appl. Sci.* 2020, 10, 7286

The Internet of Things (IoT) is becoming a regular part of our lives. The devices can be used in many sectors, such as education and in the learning process. The article describes the possibilities of using commonly available devices such as smart wristbands (watches) and eye tracking technology, i.e., using existing technical solutions and methods that rely on the application of sensors while maintaining non-invasiveness. By comparing the data from these devices, we observed how the students' attention affects their results. We looked for a correlation between eye tracking, heart rate, and student attention and how it all impacts their learning outcomes. We evaluate the obtained data in order to determine whether there is a degree of dependence between concentration and heart rate of students.

5. Sun, S.; Liu, R. A Review of Research on Attentiveness Recognition. *Sci. Technol. Inf.* 2021, 4, 6–8. [CrossRef]

Students' actual learning engagement in class, which we call learning attention, is a major indicator used to measure learning outcomes. Obtaining and analyzing students' attention accurately in offline classes is important empirical research that can improve teachers' teaching methods. This paper proposes a method to obtain and measure students' attention in class by applying a variety of deep-learning models and initiatively divides a whole class into a series of time durations, which are categorized into four states: lecturing, interaction, practice, and transcription. After video and audio information is taken with Internet of

Things (IoT) technology in class, Retinaface and the Vision Transformer (ViT) model is used to detect faces and extract students' head-pose parameters. Automatic speech recognition (ASR) models are used to divide a class into a series of four states. Combining the class-state sequence and each student's head-pose parameters, the learning attention of each student can be accurately calculated. Finally, individual and statistical learning attention analyses are conducted that can help teachers to improve their teaching methods. This method shows potential application value and can be deployed in schools and applied in different smart education programs.

6. Wang, P.; Wang, D. Research on the Application of Focus Recognition Technology in Teaching Monitoring. *Comput. Knowl. Technol.* 2020, 16, 38–42.

Students' actual learning engagement in class, which we call learning attention, is a major indicator used to measure learning outcomes. Obtaining and analyzing students' attention accurately in offline classes is important empirical research that can improve teachers' teaching methods. This paper proposes a method to obtain and measure students' attention in class by applying a variety of deep-learning models and initiatively divides a whole class into a series of time durations, which are categorized into four states: lecturing, interaction, practice, and transcription. After video and audio information is taken with Internet of Things (IoT) technology in class, Retinaface and the Vision Transformer (ViT) model is used to detect faces and extract students' head-pose parameters. Automatic speech recognition (ASR) models are used to divide a class into a series of four states. Combining the class-state sequence and each student's head-pose parameters, the learning attention of each student can be accurately calculated. Finally, individual and statistical learning attention analyses are conducted that can help teachers to improve their teaching methods. This method shows potential application value and can be deployed in schools and applied in different smart education programs.

7. Chang, Z. Analysis and Reflection on Concentration of Online Teaching in Vocational Colleges. *J. Wuhan Eng. Inst.* 2020, 32, 91–94.

COVID-19 has affected traditional instructional activities. Home-based isolation and restrictive movement measures have forced most learning activities to move from an offline to an online environment. Multiple studies have also demonstrated that teaching with virtual tools during the COVID-19 pandemic is always ineffective. This study examines the different characteristics and challenges that virtual tools brought to online education in the

pre-pandemic and pandemic era, with the aim of providing experience of how virtual tools supported purely online learning during a health crisis. By searching keywords in public databases and review publications, this study tries to summarize the major topics related to the research theme. These topics are the characteristics of learning supported by technologies in pre-pandemic and pandemic era, the challenges that education systems have faced during the COVID-19 pandemic. This study also compares the functions, advantages and limitations of typical virtual tools, which has rarely been done in previous studies. This study tries to present the features of virtual tools that support online learning and the challenges regarding real-life risk scenarios, and tries to provide educational institutions with a distinct perspective for efficient teaching and learning in future potential health crises.

8. Deng, Q.; Wu, Z. Students' Attention Assessment in eLearning based on Machine Learning. *IOP Conf. Ser. Earth Environ. Sci.* 2018, 199, 032042. [CrossRef].

Multimedia-based Electronic learning (eLearning) is an effective method of knowledge transfer. It provides the opportunity that students can use the videos or other materials at any time after they are delivered. Multimedia applications provide convenience, but there also exist challenges. One of the challenges is to measure and assess students' attention when they are studying online. This paper presents a framework based on machine learning methods for the measurement of students' attention. The framework employs a Gabor wavelet to extract the eye state features and train the model using support vector machines (SVM) to complete automatic classification on students' eye states. Experiments over thousands of facial photos show that the proposed system reaches a good performance, which has a significant value in real applications.

2.1 INFERENCES FROM LITREATURE SURVEY

In this Coronavirus pandemic time, understudies with Chemical imbalance Range Issue (ASD) are attempting to adjust to classes in the web-based climate utilizing Google Meet or Zoom. Neglecting to keep supported consideration in the class is a typical issue for understudies with ASD. In up close and personal classes, educators can follow an understudy's way of behaving and movement to surmise the understudy's mindfulness level and act in like manner. Be that as it may, it becomes hard for an educator to screen the mindfulness level of different understudies at the same time on web-based stages like Zoom. Identifying the mindfulness level of an understudy and telling the educator in a robotized way can assume an essential part in further developing the learning result. In this paper, we propose the principal profound learning based mindfulness level expectation method for understudies with ASD. Our model distinguishes the way of behaving (e.g., uncommon development, look and so on.) furthermore, exercises from constant recordings and utilizations them as elements to characterize the mindfulness level as low, mid and high. Existing cutting edge methods to distinguish the mindfulness level of normally evolved understudies utilizing look or look can't be inconsequentially reached out for understudies with ASD as they don't display customary and steady way of behaving. We gather video information having a place with various classes covering different sorts of exercises over a significant stretch, train our classifier, and run broad investigations to approve the expectation execution. Our answer beats existing baselines overwhelmingly.

2.2 OPEN PROBLEMS IN EXISTING SYSTEM

- > In an existing system a The learner's behaviors such as login, exit and jump between web pages in the system are trajectory behaviors.
- >Trajectory behaviors are the most extensive type of behavior and the most basic type of learning behaviors. When a learner retrieves a certain type of resource, this behavior belongs to both the resource learning behavior and the trajectory behavior.
- >The difference between the trajectory behavior and the resource learning behavior is that the resource learning behavior contains the body of the search, and the track behavior is only to retrieve the action, not including the main content of the retrieval.

CHAPTE R 3

REQUIREMENT ANALYSIS

3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ◆ **ECONOMICAL FEASIBILITY**
- ◆ **TECHNICAL FEASIBILITY**
- ◆ **SOCIAL FEASIBILITY**

3.1.1 ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

3.1.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement for implementing this system.

3.1.3 ECONOMICAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system

3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

SOFTWARE REQUIREMENTS:

Operating System - Windows
XP Coding language - Python

SOFTWARE ENVIRONMENT

Python:

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- **Python is Interpreted** – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** – You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** – Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** – Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python Features

Python's features include –

- **Easy-to-learn** – Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** – Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** – Python's source code is fairly easy-to-maintain.
- **A broad standard library** – Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** – Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** – Python can run on a wide variety of hardware platforms and has the same interface on all platforms.
- **Extendable** – You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- **Databases** – Python provides interfaces to all major commercial databases.
- **GUI Programming** – Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** – Python provides a better structure and support for large programs than shell scripting.

Apart from the above-mentioned features, Python has a big list of good features, few are listed below –

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.
- It supports automatic garbage collection.

- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Python is available on a wide variety of platforms including Linux and Mac OS X. Let's understand how to set up our Python environment.

Getting Python

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official website of Python <https://www.python.org>.

Windows Installation

Here are the steps to install Python on Windows machine.

- Open a Web browser and go to <https://www.python.org/downloads/>.
- Follow the link for the Windows installer python-XYZ.msifile where XYZ is the version you need to install.
- To use this installer python-XYZ.msi, the Windows system must support Microsoft Installer 2.0. Save the installer file to your local machine and then run it to find out if your machine supports MSI.
- Run the downloaded file. This brings up the Python install wizard, which is really easy to use. Just accept the default settings, wait until the install is finished, and you are done.

What is Python?

Python is a popular programming language. It was created in 1991 by Guido van Rossum. It is used for:

- web development (server-side),
- software development,
- mathematics,
- system scripting.
- .

What can Python do?

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.

- Python can be used for rapid prototyping, or for production-ready software development.

Why Python?

- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc).
- Python has a simple syntax similar to the English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.
- Python can be treated in a procedural way, an object-orientated way or a functional way.

Good to know

- The most recent major version of Python is Python 3, which we shall be using in this tutorial. However, Python 2, although not being updated with anything other than security updates, is still quite popular.
- In this tutorial Python will be written in a text editor. It is possible to write Python in an Integrated Development Environment, such as Thonny, Pycharm, Netbeans or Eclipse which are particularly useful when managing larger collections of Python files.

Python Syntax compared to other programming languages

- Python was designed to for readability, and has some similarities to the English language with influence from mathematics.
- Python uses new lines to complete a command, as opposed to other programming languages which often use semicolons or parentheses.
- Python relies on indentation, using whitespace, to define scope; such as the scope of loops, functions and classes. Other programming languages often use curly-brackets for this purpose.

CHAPTER 4

Description of proposed system

This article describes a system that uses a commercial camera to monitor, count, and record student gestures, postures, facial expressions, and verbalizations in order to produce data for determining student attentiveness. Machine learning algorithms are then used to cluster, label, and classify the data for the purpose of classifying subsequent students as attentive or inattentive. This system is an imperative step towards developing the proposed personalized learning system described in this article. The investigated as an indicator of student attentiveness. Eye and head pose tracking have also been used to determine student attentiveness. Facial expressions have been used to infer student attentiveness for computer network courses.

4.1 SELECTED METHODOLOGY OR PROCESS MODEL

1. Image
acquisition
2. Preprocessing
3. Feature
extraction
4. Segmentation

4.2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM

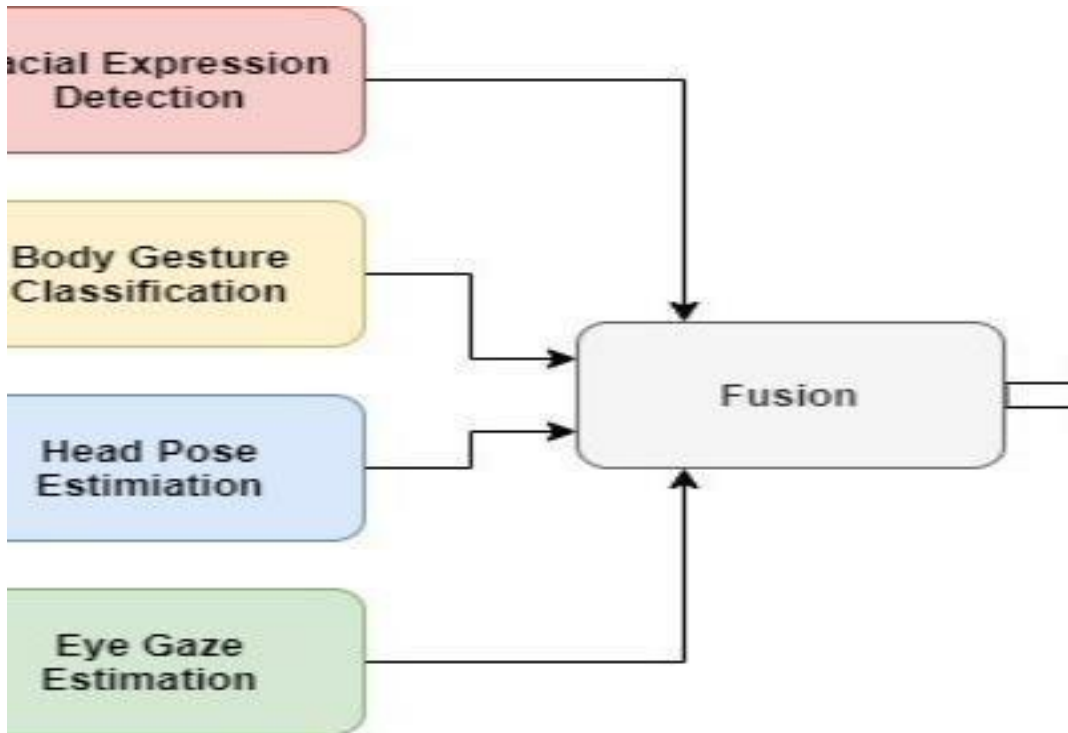


Fig 4.2: System Architecture

4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

We proposed a framework to measure the student's visual attention automatically. This framework starts working by extracting frames from the video stream of the student's webcam. Each frame is automatically analysed by searching the faces including facial points and eye states. Eyes' states are detected automatically to decide whether they are opened or closed. This automatic detection is based on machine learning algorithms and predictors [16]. Fig. 1 shows the schematic diagram of the proposed framework, which includes the following steps.

1. Face Detection. Firstly, we should determine whether there is a face or not in an image or video sequence. The score is calculated for each frame according to formula

2. Facial Point Detection. For further analysis, we generate the 68 facial points by current machine learning model [16]. The 68 facial points cover the main parts of the face including eyes, mouth, nose and eyebrows, which are famous on the face detection.

3. Eye Detection. After the facial points are obtained, we detect the eye area-related points and extract the eye images. The facial points are generated by the current machine learning model as shown in the middle in Fig. 1. We can utilize this model in the first three steps. However, the eye state classification is another difficult problem in this system. To solve this problem, we proposed a machine learning model consisting of feature extraction and classification algorithms for the eye state classification, which would be introduced in the next section. Figure 1. Student's visual attention assessment framework based on machine learning models.

Eye State Classification For eye state classification, we propose to use machine learning approach to automatically give the eye score. Machine learning algorithms are mainly divided into two parts, feature detection and classifier algorithms. This article compares existing several feature extraction algorithms and classifier algorithms. Feature extraction algorithms include principal components analysis (PCA) and Gabor features. The classification algorithms include k-nearest neighbours algorithm (KNN), naive Bayes classifiers (NBC) and support vector machines (SVM). The algorithms are described in detail below.

4.4 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

1. Image acquisition
2. Preprocessing
3. Feature extraction
4. Segmentation

Image acquisition

Image acquisition can be defined as the act of procuring an image from sources. This can be done by hardware system such as cameras and datasets and also some encoders sensors also take place in this process.

Preprocessing

The main aim of an image pre-processing is an improvement of data such as image that

reduces the unwanted distortions or enhances some features, simply we can say that remove the unwanted disturbance from the image.

Feature extraction

It is a part of the reduction process in dimensionally in which an initial set of the raw data is divided and reduced to more manageable groups.

Segmentation

It is a process of conversion of pixel into labeled image from the image. By this process you can process the important segments not an entire image.

Classification

The task of identifying what exactly in the image. That process is going to happen by the model is trained to recognize various classes. For example, you may train a model to recognize the three different animals in the image.

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