Students Live Behaviour Monitoring in Online Classes Using Artificial Intelligence

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***Abstract*— Many universities turned to virtual education as a solution to the health emergency that prevented them from utilising their centres for instruction. impacting students' learning processes, which has made many of them more used to this new method of learning and increased the usage of virtual platforms. A lot of educational institutions now depend heavily on digital platforms like Zoom, Microsoft Team, Google Meet, Discord, and Skype. Reporting on the effects of student learning via the usage of the previously described videoconferencing tools is the aim of the study. Teachers and students were surveyed, and the results showed that 66% of them felt no impact on their educational progress. The majority of them grew acquainted with the platforms; yet, fewer than 24% of them indicated that their academic performance had improved. Some teachers continue to have psychological challenges as a result of this new teaching approach. In conclusion, both educators and learners concur that these resources are very beneficial for online learning. This project's main goal is to develop an independent agent that can provide instructors and students with information. Important academic outcomes like critical thinking and grades are closely correlated with the degree of student participation in a subject.**

***Keywords*— Face recognition, , Deep learning, Attention Assessment, Student Behavior.**

I. INTRODUCTION

The detection, observation, and comprehension of human physical behaviours are the focus of the significant field of computer vision research known as human behaviour analysis. One may argue that the teaching and learning cycle is the most important process in an academic setting. Along with instructional activities, attendance and student behaviour are constantly observed during courses. Data has indicated that student interest has a crucial role in engagement and output. In order to make assumptions about a student's true participation in learning events, teachers will be able to monitor student activity and identify pertinent signs. However, people's behaviour is unexpected in most circumstances, making monitoring difficult, particularly in large settings. Research indicates that emotions have a significant impact on learning and performance. These feelings could be either happy or sad. Four recognized academic emotions are important for students' learning: (1) Success Emotions are related to the following: (1) Tasks of accomplishment and the performance and failure of such practices; (2) Epistemic emotions, which are feelings brought on by neurological challenges, such as the joy of solving a problem or the excitement of starting a new task; (3) Topic emotions, which are related to the topics discussed in the lessons; and (4) Social emotions, which are related to teachers and other school personnel and include feelings like affection, concern, compassion, respect, wrath, jealousy, or social anxiety. These feelings are especially important when it comes to community learning and teacher-student interactions. The emotional process of focusing on one aspect of the world while ignoring others is called attention. Around the world, a lot of teachers often tell their students to "pay attention!" The first step towards learning is to pay attention.

An automated assessment system is used in a classroom setting, for instance. Facial expressions may be used to gauge a student's conscientiousness in the classroom. Facial expressions are modifications to the features of the face resulting from internal mental states, thoughts, or social interactions. Computer programmes that aim to automatically comprehend and recognise facial expressions and changes in visual detail are referred to as facial expression recognition programmes. Single-person and classroom-based research interactions can be divided into two types for automated classroom evaluation. Facial movements can be used to provide feedback on present neurological functioning and to assess action unit (AU) features in a single-person research. In a research conducted in a classroom, the focus shifts from particular subjects to participant characteristics and experiences. It's critical for instructors to keep an eye on student behaviour so they can quickly spot and address inappropriate behaviour. By monitoring students' behaviour, educators may help them meet behavioural goals, think about their own behaviour and how it affects others, and finally give them the confidence to recognise and develop habits that are critical to their academic success. In order to ascertain each student's behaviour, this article employed single-person analysis to identify each student's face. To gather data, an experimental setup was put in place. By using facial recognition during class, the researchers want to introduce a novel method of forecasting students' behaviour, whether they are paying attention or not. This shows how to monitor student behaviour in real time. The obtained data was used to anticipate student behaviour in the classroom using the YOLO (you only look once) v3 algorithm, which was developed using a deep learning technique. This will be the format for the remaining portions of the paper. The related research is outlined in Section 2. The experimental methods that were discussed in Section 3. In Sections 4 and 5, the experiment's results and implications are examined.

II. LITERATURE SURVEY

Feature-based methods: Traditional approaches used handcrafted features like HOG and HOF, followed by classifiers like SVM or HMM. Deep learning approaches: CNNs excel in spatial feature extraction, while RNNs capture temporal dependencies [1]. The paper on "Automated Classroom Monitoring With Connected Visioning System" contributes to the growing body of literature exploring the integration of technology in educational settings. By leveraging connected visioning systems, the proposed approach offers insights into classroom dynamics that can inform instructional practices and enhance learning outcomes. However, further research is needed to address challenges and ethical considerations associated with automated classroom monitoring systems [2] The paper on "Translating Head Motion into Attention - Towards Processing of Student's Body Language" highlights the importance of non-verbal communication in education and proposes a data-driven approach to analyzing students' head motion as an indicator of attention. By integrating body language analysis into educational data mining frameworks, the proposed approach offers potential benefits for understanding and supporting students' learning experiences. However, further research is needed to validate the effectiveness and scalability of this approach in diverse educational settings and populations [3]. The paper on "Attentive Toward a Machine Learning Approach to Assessing Students' Visible Engagement in Classroom Instruction" underscores the importance of objective measures of student engagement in education and proposes a data-driven approach to automate the assessment of students' visible behaviors using machine learning and computer vision techniques. While promising, further research is needed to validate the effectiveness, reliability, and scalability of this approach in diverse educational settings and populations [4]. Pekrun's book "Emotions and Learning" provides a comprehensive examination of the role of emotions in the learning process, drawing on theoretical frameworks and empirical research from multiple disciplines. By elucidating the mechanisms underlying emotional influences on learning and exploring practical implications for educational practice, Pekrun's work contributes to the growing body of literature on emotion and cognition in education [5].

The paper on "Machine Vision Recognition System for Iceberg Lettuce Health Condition on Raspberry Pi 4B: A MobileNet SSD v2 Inference Approach" by Alon and Dioses demonstrates the feasibility of deploying machine vision systems for real-time quality assessment of agricultural produce. By leveraging the MobileNet SSD v2 architecture on a Raspberry Pi platform, the proposed approach offers a cost-effective and accessible solution for farmers and agricultural practitioners. However, further research is needed to validate the effectiveness and scalability of the system across different crop varieties and growing conditions [6]. The paper on "Predicting Students' Employability Using Support Vector Machine: A SMOTE-Optimized Machine Learning System" by Casuat, Festijo, and Alon underscores the importance of leveraging machine learning techniques for predicting students' career outcomes in education. By incorporating SVM with SMOTE optimization, the proposed approach offers a promising solution for addressing class imbalance issues and improving the accuracy of employability prediction models. However, further research is needed to validate the generalizability and scalability of the system in real-world educational settings [7]. The paper by Alon, Festijo, and Juanico showcases deep learning's effectiveness in automatically detecting and segmenting trees from remote sensing data. Their approach, which utilizes genus-specific training data and integrates LiDAR with orthophoto datasets, holds potential for precise and swift forest inventory evaluations. However, more research is necessary to confirm its reliability and adaptability across various forest types and regions [8]. The paper by Malbog et al. introduces a new method for fire identification using hybrid feature extraction techniques. By combining approaches for combustible and fluid fire segmentation, the proposed method shows potential for enhancing the precision and dependability of fire detection systems. However, additional research and testing are required to evaluate its effectiveness across various fire scenarios and environmental contexts [9]. Malbog's paper demonstrates how MASK R-CNN can effectively detect pedestrian crosswalks and perform instance segmentation, aiding pedestrian safety and urban mobility. While promising, additional research and validation are needed to ensure its effectiveness in real-world applications and integration into operational systems [10]."Face Recognition Methods & Applications" by Parmar and Mehta provides an overview of face recognition techniques and their diverse applications. The paper underscores the importance of ongoing research and development in this field to address challenges and unlock the full potential of face recognition technology across various domains [11]. The paper by Arya, Pratap, and Bhatia offers an extensive overview of face recognition technology, covering its evolution, current techniques, applications, challenges, and societal implications. It emphasizes the progress made in the field and suggests future research directions to tackle emerging challenges and opportunities, providing valuable insights into the field's dynamic landscape and societal impact [12]. Singh and Prasad's paper offers a thorough examination of face recognition techniques, challenges, evaluation methods, and future research paths. It emphasizes the significance of tackling technical hurdles, ethical concerns, and societal impacts in face recognition system development. Overall, the paper provides valuable insights into the current state of face recognition and lays the groundwork for future advancements in the field [13]. Bah and Ming's paper introduces a novel face recognition algorithm designed for attendance management systems, highlighting its potential to improve administrative efficiency. However, additional research and validation are needed to overcome challenges and facilitate widespread adoption in diverse organizational contexts [14]. Yuvaraj et al.'s paper introduces a novel method for automating attendance tracking through image processing, utilizing advancements in computer vision and pattern recognition to enhance efficiency and accuracy. Further research and validation are required to overcome challenges and enable practical deployment across different organizational settings [15]. Ibrahim et al.'s paper proposes a promising method for enhancing examination integrity through real-time anomaly detection. By utilizing machine learning techniques, the approach offers a potential solution to overcome challenges associated with traditional invigilation methods. Further research and validation are necessary to ensure the practical deployment and effectiveness of these systems in educational institutions [16]. Haider et al.'s survey offers a comprehensive overview of methodologies, algorithms, evaluation metrics, and challenges in face detection and recognition. It highlights the importance of understanding existing approaches' strengths and limitations while identifying opportunities for future research and innovation. Overall, the paper is a valuable resource for those interested in advancing face detection and recognition technology [17]. Zafeiriou et al.'s survey provides a comprehensive overview of methodologies, algorithms, evaluation metrics, and challenges in face detection in unconstrained environments. It offers insights into the evolution of techniques, current state-of-the-art approaches, and future research directions. Overall, the paper is an essential resource for those interested in advancing face detection technology in real-world scenarios [18]. Guo and Zhang's survey offers a comprehensive overview of methodologies, evaluation metrics, applications, challenges, and future directions in deep learning-based face recognition. It is a valuable resource for researchers, practitioners, and enthusiasts interested in leveraging the latest advancements in this technology [19]. Li et al.'s paper introduces a novel approach to automate PCB electronic component detection using advanced computer vision techniques. It provides insights into the development, implementation, and evaluation of the improved YOLO V3 algorithm for this specific application. Overall, the research contributes to advancing automated inspection systems in the electronics manufacturing industry, potentially enhancing productivity, quality assurance, and cost savings [20].

III. SYSTEM REQUIREMENTS

1) HARDWARE REQUIREMENTS:

- System: Intel(R)Core(TM)i3-7020U CPU@ 2.30GHz
- Hard Disk : 1 TB.
- Input Devices : Keyboard, Mouse
- Ram : 4 GB.

2) *SOFTWARE REQUIREMENTS:*

- Operating system : Windows XP/7/10.
- Coding Language : Python
- Tool : Anaconda
- Interface : Jupiter notebook

IV. SYSTEM DESIGH

The system requirements, operating environment, system and subsystem architecture, file and database design, input and output formats, layouts for human-machine interfaces, detailed design, processing logic, and external interfaces are all included in the system design document.

MODULES

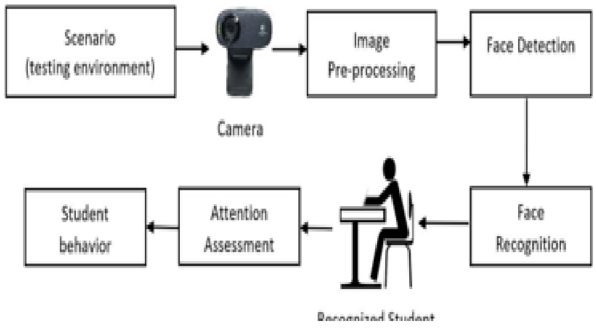
Client: Students use this programme to access the camera and view their own videos on the screen. Each frame's specifics are transmitted to different modules for processing and analysis using a trained model. The analysis results are displayed on a graph.

Server Module: This module is used to monitor student information and evaluate real performance. The face processing module receives each frame and compares it with a trained model. Data processing between the client and face processing modules is done via the server module.

Face Processing Module: This module each frame is taken as input and shape predictor model is used to predict various aspects of features like (eye aspect ratio, mouth aspect ratio, drowsy, yawn, head pose. After calculating these values are sent to server module.

SYSTEM ARCHITECTURE:

The conceptual model that describes a system's behaviour, structure, and other aspects is called a systems architecture, or simply systems architecture. A system's formal definition and representation is found in an architecture description. arranged to facilitate thinking about the rules and actions of the system.



V. SYSTEM IMPLENTATION

In the realm of system development, the logical design stage serves as a foundational step where the abstract depiction of data flows, inputs, and outputs is meticulously crafted. This is typically achieved through various modeling techniques, with Entity Relationship Diagrams (ER Diagrams) being a common tool utilized to map out the relationships between different entities within the system. Conversely, the physical design phase delves into the practical implementation of these abstract concepts, focusing on the actual input and output operations that occur within the system's environment. During the physical design phase, meticulous attention is given to the tangible steps involved in data entry, validation, processing, and the subsequent display of results. This entails a thorough consideration of input, output, storage, processing, and system control requirements to ensure the seamless functioning of the system in real-world scenarios. User interface design, data design, and process design are key components of this phase, each playing a vital role in shaping how users interact with the system and how data is stored, represented, and manipulated.

Moreover, documentation is an integral aspect of the physical design phase, serving as a comprehensive guide for subsequent stages of development. This documentation encapsulates the intricacies of user interface design, data design, and process design, providing valuable insights into the underlying architecture of the system. It serves as a roadmap for developers, guiding them through the implementation process and ensuring consistency and coherence across all aspects of the system. It is important to note that the term "physical design" does not pertain to the physical layout of the information system in a tangible sense. Instead, it refers to the practical implementation of input, output, storage, processing, and control mechanisms within the system's architecture. This distinction underscores the nuanced approach required in translating abstract concepts into tangible, functional components that power the system's operations.

VI. RESULT

Fig: Graphical representation of Drowsiness

Fig: Graphical Representation of Yawns

Fig: Graphical Representation for Drowsiness, Yawn, Head Pose

VII. CONCLUSION

A deep learning method using the YOLOv3 algorithm was used to evaluate the student's observable actions in the classroom teaching system. Figures 12 and 13 display the live identification of student actions based on specified scenes. Immediately following the live stream review, the assessment was developed. There are several models available. These models were evaluated with mAP in order to determine which model is suitable for object detection. The precision of the artefacts being examined is often assessed using the mAP (mean average accuracy). The following class was the emphasis of this measure: high = attentive and low = not attentive. The accuracy of the model, according to experimental testing, is 88.606%. Based on observable student activities during classroom teaching, tests show that this approach gives a fair rate of identification and favourable outcomes for measuring student engagement. The suggested approach is often versatile and responsive to different situations, since more students would be interested in greater room sizes, utilizing a higher form of camera with certain enhancements such as IP camera for continuously capturing images of the students, detect the faces in images and compare the detected faces with the database. It may be used such as greater input picture measurements, anchor box dimensions ideal for different situations and further training details.

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