POTENTIAL APPLICATIONS FOR AUTOMATED, BLOCKCHAIN-BASED, STUDENT ATTENDANCE REGISTERS USING CONTEMPORARY SECURITY CAMERAS AT EDUCATIONAL INSTITUTE

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Abstract: This research presents an innovative solution for automating the creation of a student attendance register using AI-based security cameras. The system aims to reduce administrative burdens and paperwork for teachers by automatically tracking student attendance. This solution, which has not yet been implemented at any university, utilizes blockchain technology to secure data storage by encrypting data and storing it on multiple nodes.The AI-powered camera system can monitor student attendance at lectures by capturing facial features, including a timestamp, classroom number, lecturer's name, and subject designation. Students attending lectures would receive digital subject approval through this system.Additionally, the system could be used for fire protection purposes. In the event of an evacuation, the cameras would indicate the exact location of each student, aiding rescuers and firefighters in locating individuals within the premises.

Keywords : Blockchain; Student attendance , security camera

1 Introduction

Security cameras are currently undergoing rapid development. These frameworks use various scientific arrangements with enormous goal, in high detail. The implicit man-made brainpower has showed up, reducing the undertaking of salvage staff. To additional increment proficiency, the execution of new advances is likewise suggested, which were not used to nowadays in such a complicated, composite way. An outstanding solution is the connection of blockchain technology to the cameras' NVR (Network Video Recorder) system for data storage. The accompanying developments have been brought to completion: As of late, there was a significant development in the utilization of data innovation [1]. As the current cloud-based data storage solutions are centralized and require users to trust providers, blockchain-like data storage will see a significant expansion over the next three to five years [2]. The clients' data are distributed across the blockchain's nodes in the case of decentralized cloud-based data storage [3] instead of being stored on a single server. • Furthermore, in a few mid-level instructive establishments, the way of behaving or individual students is checked by cameras equipped for face acknowledgment. These cameras perceive the accompanying examples of conduct: composing, perusing, detailing and giving close consideration [4]. • Nowadays, the Colleges might make their blockchains, expecting to close shrewd agreements with their understudies. The framework is equipped for checking understudies' semi-yearly grades box the in-school framework, accordingly shaping an automatized bursary installment framework. On the off chance that an understudy finishes the circumstances specified in the agreement, he/she gets the bursary, consequently, with next to no requirement for outside mediation or management [5]. • The freshest exploration has brought up that blockchain-based information capacity could be utilized as a feature of brilliant urban communities. A blockchain would be used to store the video recordings from the security cameras. The cameras checking public spaces could save their information as to become obvious proof in courts. This technique could happen as expected

through a blockchain of unalterable principal record. The primary record would demonstrate that the video accounts have not been compromised, separately, that these completely portray the genuine happenings in cases given [6]. • Research is pushing toward giving College Testaments, in a paper-based structure, yet in addition as an electronic report, gave through a blockchain. A blockchain provides a high level of security for data. As there were several instances in which applicants presented employers with fake certificates, the number of misuses could be reduced through the implementation of such a method [7]. • With most of blockchains, the records are posteriorly, not erasable, in this way, Colleges might comprise their own records for their understudies. These records would contain data about the classes visited and any installments for the educational expenses. On the off chance that mistaken information were saved in a given record, another record should be made. The corrected record would become relevant, but both the old and new records would remain visible under this method's implementation. By the applying of this methodology, the alterations would turn out to be effectively recognizable and retraceable [8]. The automatized, electronic, blockchain-based, understudies' participation register created by the framework, associated with the surveillance cameras, is viewed as a remarkable arrangement in the instructive organizations. The college which would be first to carry out this element would vouch for a cutting edge, creative arrangement. It could be expressed that the off-chain based blockchain was at that point created by and by, as well as the UDSC - Colleges Information Stockpiling Chain. The blockchain innovation has been connected with a surveillance camera highlighting scientific capacities and facial acknowledgment by and by. The acquired outcomes are examined in the paper. This work is organized as follows: After the presentation of current surveillance camera frameworks, the current article talks about the blockchain-based information capacity, the UDSC, the in-school off-chain programming engineering, as well as the conceivable outcomes of the usage of automatized, electronic, blockchain-based participation registers in the school system.

2. Methodology

A framework making out of an automatized participation register of understudies, comprises of various parts, for example, Surveillance cameras ,A NVR-unit ,A blockchain The student record system at schools

Administering attendance before and during lectures is a necessary but burdensome task. It involves tracking student and lecture attendance, which can be automated using security cameras. During the practical implementation of this system, security cameras were equipped with several functions:

- Facial detection
- Facial recognition
- Headcount
- Black and white lists
- Deep learning

These functions are essential for automatic student recognition at universities. Additionally, it is necessary to install an NVR (Network Video Recorder) unit to manage the cameras and store all recording data on its hard disk. The NVR should have the following capabilities:

- Operating system: Allows for the NVR's configuration, including relevant details. A Linux operating system is recommended for stability.
- Artificial intelligence: Enables the full utilization of the cameras' capabilities.
- Functions such as trigger events (e.g., PTZ), video push, snapshot, or automatic email notifications.

2.1. Blockchain-based Data Storage

For secure data storage and potentially long-term data retention, it is advisable to use blockchains. Decentralizing data offers greater security and protection against corruption compared to traditional storage methods. Files are divided into parts and distributed among nodes, which can be located anywhere globally, and even the nodes themselves cannot access the entire file's content simultaneously.

As part of the system for creating an automated student attendance register, a unique university-based blockchain called UDSC (Universities Data Storage Chain) was developed. This blockchain stores video recordings of students

and their photos (Photo IDs) used for personal recognition.

Advantages of this solution include:
- It is nearly impossible to make posterior changes to the existing blockchain without the agreement of the majority of network users. An individual would need to control at least 51% of the network, which is highly improbable in reality.
- Unlike some cloud-based providers that may modify or delete personal data, or even exclude a user, such cases cannot occur with a blockchain due to the distributed nature of data storage among nodes.

2.2 The NVR-Unit's Integration with Security Cameras and Blockchain

To ensure the flawless operation of the in-school blockchain in practice, careful attention must be paid to its various elements through adequate configuration. The following steps are crucial:

1. Connection of Security Cameras to NVR: The security cameras need to be connected to the NVR unit, as this unit is essential for the cameras' operation.

2. Key Pitfalls Experienced During Testing:
- Allocated Channels: Consider the number of channels allocated from the NVR. Institutions should consider a 24-port capable NVR unit to accommodate the number of cameras required.
- Compression Codecs: Attention should be given to the types of compression codecs. H.264 may achieve suitable data compression, while H.265 is the most effective for saving storage space.
- Bandwidth and Internet Speed: Consider the bandwidth and future speed of the Internet. Ensure that the NVR unit supports the institution's Internet speed to utilize the full bandwidth available.
- HDD Capacity: The maximal HDD capacity determines the capacity of the hard drive connected to each port. For long-term applications, a capacity of 4TB is optimal for 24 cameras.

3. Designation of Blockchain as Secondary Storage: On the interface of the NVR, designate the blockchain as a secondary saving place for recorded data by inserting its accurate IP address.

4. Data Saved Within the Blockchain Database:
- Photo IDs of students
- Video footage from students (recommended to keep these for a short period if no incidents occurred, as they take up significant space in the database).

Every student's semester schedule; each lecturer's semester schedule; and the timetable for each classroom, including subject and time

2.3. Education Institute System

The blockchain and the automated electronic attendance registration system may be integrated with the school system. Hungary's higher education institutions use the system, which is software. It's a unified scholastic system (ETR) that both students and faculty in higher education can easily use online. There are two modules in the system: one for teachers and one for students. Students can choose a subject, register for an exam, view descriptions of the subjects they have chosen, and pay exam fees using an escrow account with the aid of the students' module. The teacher's module enables the following: • Sending students emails with information .The assignment of grades to each student for the topics they have taken; the scheduling of test rooms; and the actions related to the term papers

3. The Universities Data Storage Chain (UDSC) Constitution

A blockchain was developed as part of the practical reality of secure data storage. This UDSCchain contains the recordings that the NVR has stored. It is advised that when developing this kind of blockchain, the following factors be taken into consideration: The database's accessibility address. This includes being reachable by the sender and the recipient.The camera system's address. choose the appropriate server address. It is advised to devote two servers to the blockchain in order to boost security and maintain system readiness continuously.

4. Prospects for Using an Electronic Blockchain-based Automated Student Attendance Register in the Educational System

Intelligent security cameras now have many capabilities that were unheard of just a few years ago. These future the accompanying

skills: • Recognition of treachery • Meandering aimlessly • Discovery of congestion • Recognizable proof of tags The referenced video scientific arrangements, notwithstanding, can be used just less proficiently in the training, as opposed to the chance of the structure of an electronic participation register. The in-school administrational loads have continued to develop of late, and the undertakings to be finished have not been altogether lessened all things considered. Moreover, the digitalized information ought to be uniquely joined in, because of its responsiveness, or rather, to stay away from its defilement. Consenting to the GDPR regulation is definitely not a simple undertaking either, putting a significant weight on the IT specialists, and the school the board. The putting away of the recorded film by a blockchain would be a safe arrangement foretelling progress. The USDC framework's construction and its activity is occurring in the accompanying way: 1) As an initial step, understudies' names (first and last names in right request) should be transferred into the camera's data set. Then, the order is prescribed to isolate the understudies' names by concentrate on gatherings, branches, for the benefit of better straightforwardness. This is required in light of the fact that it might happen that the camera's man-made brainpower can't perceive the understudy, subsequently it can't designate a name to the face given. In such circumstances, the labor ought to step in, and an individual from the security staff ought to distinguish the understudy being referred to. Searching out an understudy's name from a sensible information base is a lot simpler and more productive arrangement. 2) As a subsequent step, profile pictures in high goal (to some extent in HD) are designated to the names. In view of these two significant information (by having the name and the Personal ID of an understudy), the framework is fit for the understudy's ID. This isn't just important in light of the participation register, yet in addition for sifting through the intruders all the more effectively, consequently raising the degree of safety applied. This arrangement works in view of a highly contrasting rundown, which capacity is as of now remembered for current cameras. 3)Following these means, the number and assignment of the homerooms should be transferred into the camera's information base. It is suggested that each classroom within the system be registered. By assignments, the specificities of the referenced study halls are implied, similar to software engineering, science or science homerooms. 4) The schedule addresses the subsequent stage. In the long haul, this is the most tedious errand in this framework, as the schedule is changed in every semester, and recording it two times per year is essential. To increment productivity, bringing in from the programming is suggested. 5) After the transferring of the total information base, the distinguishing proof of the people follows, inside this, the face recognition, which is a fundamental piece of this innovation. Face detection is a very difficult process because, in the case of an educational establishment, the camera needs to recognize multiple faces at once. 6) After the camera has recognized a face, it should be distinguished, by coordinating it with an information base passage, which gets doled out with a name by the framework. 7) The system would compile an attendance register when it had sufficient data. Its most pivotal condition is the effective recognizable proof, and the acquiring and shared association of prearranged information. 8) As the last step, information is sent in predefined periods. This could happen on a daily, weekly, monthly, or semiannual basis. It's critical to find out who is getting these notifications. It is prescribed to assign a teacher, an understudy, and the framework separately. All things considered, the teacher and the understudy both get the report about the participation. This way, the issue can be resolved quickly and even the eventual misunderstandings that result from an incorrect identification can be resolved.

5. The Identification Efficiency of the Cameras

One of the most pressing issues in these technology fields at the moment is facial recognition. As per previous encounters, the correlation of camera pictures with data set sections is certainly not a basic undertaking. On the off chance that the framework handles a significant data set, these meddling impacts could profoundly corrupt the achievement pace of acknowledgment [10]. The cameras' trying practically speaking was acted in the accompanying way: • The whole testing time frame endured a month and a half • There were fourteen days doled out for every one of the 3 camera types It is critical to take note of, that

these cameras were all highlighting worked in man-made consciousness. Due to the fact that the testing was carried out at the university, complications that were discovered during the trials have had a negative impact on the identification's success. The accompanying elements were experienced: • Look: - The ID might be thwarted even by a grin, as it changes the lineaments of a face. • Different covers: - before the homeroom passageways, the understudies might cover each other's countenances, even by some coincidence. • Picture quality: - Deficient lighting conditions, inappropriate overshadowing (paying little heed to which, the daylight is as yet deterring the focal point), - Decision of the proper goal, picture recurrence, and variety profundity. Presence or nonattendance of facial characteristics: - Hair, facial hair, mustache, glasses, - A huge number of varieties, shapes, and sizes [11]. There were 57 understudies taking part in the current exploration, all concentrating regarding the matter Software engineering 1. This entailed three groups in practice. A significant perspective was, that in the event of every one of the 3 cameras, the members were something very similar. Along these lines, the chance was given for deciding the cameras' ability and accuracy of distinguishing proof. The six-week time frame has endured from mid-January to the furthest limit of February 2020. It was an important viewpoint that the cameras be executed one after another. Throughout the colder time of year season testing, the attire propensities and hair styling of the understudies was comparative in the time span analyzed. In the event that a portion of the cameras were sent in winter and some tried in the late spring, the accuracy of the ID would have shown more noteworthy disparities, which would have impacted the exactness of the estimation. As a result, the provision of nearly equal conditions was the primary objective.

During week 2, the cameras operated more efficiently compared to the previous week, thanks to their built-in artificial intelligence. Continuous learning improved the efficiency of student identification significantly by the end of the testing period. The results showed:

- A 1.3 MP resolution camera identified students with 75% efficiency in the first week, increasing to 89% in the second week.
- A 2 MP resolution camera operated at 80% efficiency in the first week and improved to 91% in the second week.
- A 10 MP resolution camera achieved 89% efficiency in the first week and increased to 96% in the second week.

Higher pixel density likely contributed to improved efficiency, but the relationship is complex. The increased number of pixels also requires stronger processors, which may affect the performance of the built-in artificial intelligence software. However, this information was not provided by the manufacturer.

The connection between the NVR and the blockchain was successfully established, ensuring the secure storage of data. However, data storage on the blockchain took longer than expected, making traditional cloud-based systems faster. This suggests that blockchains become more efficient when running on a high number of machines. Further research is needed to explore this issue in more depth.

6. Conclusions

In summary, there are numerous components that make up the system that serves as a security camera-based attendance register. It can be proposed to create a university-based, proprietary blockchain that would make data storage on its nodes easier. The NVR's connection to the UDSC would make it feasible to store data securely. In addition, data transmission to the university's system via the Internet would be feasible. As a result, during a particular semester, a student's visits to classes are recorded each time. Using a security camera with a Deep Learning feature is more efficient because facial recognition, facial detection, and head counting are all used in the identification process. Notably, since the camera system tracks the whereabouts of every student on campus, it might also be successfully applied to fire prevention with reference to saving human lives. Thus, missing students can be located. Finally, a camera system with facial recognition capabilities and the ability to create an attendance record and study habits have been taken into consideration when examining

student awareness. The majority of students said they wouldn't be insulted by facial recognition technology, and 59% of them think it's vital to have a solution that can create an attendance registry.

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