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Automatic Attendance System Using Facial Recognition Using the ADA Boost Algorithm

[1]Shweta Saraswat, [2]Dr. Monica Lamba

[1]Research Scholar, Computer Science & Engineering Department, Suresh Gyan Vihar University, Jaipur, India
[2]Asst. Prof., Computer Science & Engineering Department, Arya Institute of Engineering and Technology, India

***Abstract* - Every industry is seeing constant technological advancement. We are of the opinion that educational institutions such as schools and colleges may make use of some of the new technologies in their day-to-day operations to make the academic workload more manageable. Facial recognition is one of the technologies that may help alleviate the challenges presented by the time-consuming nature of the process of collecting attendance, which also happens to be one of the most vital tasks. The purpose of this paper is to conduct research on face recognition by using an ensemble method in order to tally the attendance based on the identified faces present in a picture taken by any camera. An image of the students in the classroom will be taken here, and then it will be run through a facial recognition algorithm that is similar to Haar's. Once the students' faces have been identified, the image will be run through an ensembler, which will then record their presence in the attendance log. Open CV will extract the countenance from the photographs that are provided and will keep some of the variations that are present within the image data. While there are now quite a few methods available for the identification of faces, the primary emphasis of this study is placed on the facial recognition process utilising the AdaBoost algorithm. The accuracy of the monitoring system that has been presented is 98% when it is operating at peak efficiency.**

Keywords: Smart Attendance, ADA Boost Algorithm, Facial recognition, Statistical Model.

I. Introduction

The noting of attendance in order to identify the presence of students is a criterion that must be met on a daily basis by academic organisations in order to track their development outside of class. The traditional method of learning, which involves paper and pen and the teacher calling students' names in class, wastes time that may be better spent studying. The change to digital has given us the ability to find a solution to this problem via technical means. Attendance tracking is now being addressed by a variety of fully automated and partially automated approaches, including the following:

- The use of attendance systems that are based on mobile devices such as smart phones is becoming more common in the retail industry.
- Authentication tools like as badges, access cards, identity cards, and punch cards are distributed to students so that valid enrollment can be tracked.
- Fingerprint and retina scans are examples of the types of biometric attendance monitoring that may be found in businesses, schools, and educational institutions.
- Enterprise resource planning (ERP)-based attendance systems in medium and big businesses.

In order to effectively monitor the individuals who are putting in effort, you will need an information system that records individual attendance. It is easier to keep track of them, what they are doing, when they arrived, when they departed, and so on thanks to this. Checks for them are written out by the employer with their assistance.

Whenever there is a problem with attendance, instructors will notify the parents using information tools that are specifically designed for that purpose. Nowadays, we may choose from a variety of methods to monitor attendance with the assistance of a wide range of surveillance equipment, and our method is one of those methods. An method to statistics that makes use of ensemble learning algorithms is analysed and discussed in this paper. The technique that has been suggested is useful for monitoring the arrival and departure of students in a university classroom.

II. Related Work

The use of biometric verification is very important to the authentication process. For the purpose of similarity analysis, either single or multimodal biometric features indicating the biological characteristics of a human individual, such as their iris, face, palm, or retina, are employed. Uses of it may be found in a wide range of sectors, including the corporate sector, the industrial industry, retail marketing, and many more.

Hossen et al. [1] suggested an approach, with the support of Open CV's Viola-Jones set of criteria that discards erroneously identified faces formed on coding eyes. This

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method was developed using Open CV. +ve and -ve pictures are used as input, and the Adaboost rules that transform vulnerable classifiers into robust classifiers are applied. The Classifier Cascade method is both quicker and more precise, achieving a level of 98.97% accuracy.

Mary Prasanna et. al, [2] developed a direct graphical user interface (GUI) that was completely based on biometric identification, and they advanced the use of open face. HOG is used to change the size of the front half of the faces that have been identified. DNN is used in the process of extracting face characteristics from a picture that was produced via the use of landmark algorithm. The result of this is an image that has sixty-eight landmarks since each pixel is compared with the pixels that are next to it. For the purpose of human identification, SVM is used.

Faces were identified by the use of a supervised method by Alankar Patil et al. [3]. During the registration process for the class, photographs of the students were collected and categorised. Picture feeds of students who are registered for a class are made accessible at the beginning of the process. During the second step, cameras are used to do face recognition, and an electronic format is used to keep the information up to date. It is helpful in determining if a student is present or absent from the class. Using this method, it is possible to monitor a person's behaviour in order to improve safety measures in high-risk areas such as airports, nuclear power plants, workplaces, information technology companies, and financial institutions. The automation of processes has led to a reduction in mistakes.

A plan consisting of three stages was presented by Wu-Chih et al., [4]. To begin, portions of the pores and skin are preserved. In the succeeding step, a container is used in order to dispose of various parts of the environment. The performance of the face recognition system was evaluated with the help of the FERET picture library, from which the faces in a variety of postures and sizes were taken and employed.

Khumbhar et al., [5] utilised characteristics similar to those of Haar to stumble on faces. The method that has been suggested can extract faces from HD videos and capture them from a variety of various perspectives. The Raspberry Pi BCM283 CPU processor is used in conjunction with a number of framework libraries, including Simple CV and OpenCV. The prototype could be put to use to obscure certain things in a picture while it was being captured in real time.

The notion of an integral picture was first presented by Viola et al.,[6] with the intention of facilitating rapid assessment. Feature selection is then followed by classification using AdaBoost and the rich Cascaded training classifiers made using AdaBoost are used to increase face identification accuracy and speed. Cascaded training classifiers are generated by obtaining basic features in a sequential order.

A framework for the recognition of faces based on brain structure was proposed by Rowley et al. [7]. When determining whether or not a face is there, the neural structure that is related with the retina looks at certain areas of the image known as "little windows." In order to prepare, they make use of a bootstrap computation, which results in the introduction of false findings into the instruction set as the process of preparation progresses. The laborious task of physically selecting non-face preparation models to traverse the whole space of non-face photos is eliminated with the use of basic heuristics, which helps to simplify the process. The implementation of the framework is significantly improved in terms of recognition and false positive rates.

A CNN-based facial recognition system was suggested by Zhao Pei et al., [8] for the purpose of class monitoring. Experiments with an orthogonal design were used to carry out the data augmentation procedures linked with the data. The ortogonal table is used to select the best option. CNN is able to build the feature automatically while simultaneously reducing bias, which ultimately results in improved accuracy. The accuracy went up to 96.1% despite just an 86.3% increase in the number of samples.

Senigla et al. [9] developed and deployed a deep learning model for attendance tracking that had optimised execution and more epochs of training than previous models. The register's contents are saved online in a cloud database, which both protects the data from being tampered with and makes it possible to access it without compromising its integrity. The technique is not obtrusive, which helps to reduce the amount of fraudulent attendance caused by proxies. Developing technologies like as machine learning, image processing, and the internet of things have made it possible for consumers to choose this kind of intelligent system.

In order to develop a better face recognition approach, Tabatabaie et al. [10] combined the face localization strategy developed by Viola and Jones with a shading-based technique. The results of their research indicate that their technique effectively reduced the number of false positives and, as a result, increased the precision of the face recognition system, especially when applied to photographs with complicated backgrounds.

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III. Proposed Methodology

Monitoring attendance with the use of technological tools is a practise that is widespread in businesses in the modern day. The biometric attendance system that is based on fingerprint scanning is the information system that is utilised the most on all continents. In order to communicate with internet- based systems, the IOT-based system employs a circuit that is based on a microcontroller, in addition to a fingerprint sensor, a minimum power supply, and a wi-fi modem. While the way of tracking attendance based on IoT is more secure, it is unduly reliant on the technology. An automated system that monitors kids and uses security cameras or web cams is suggested in order to cut down on the amount of human intervention that is necessary in this age of ubiquitous computing. Since the vast majority of the student population has not been immunised, it would be of the utmost advantage to them.

In the suggested method, the picture is recorded using an IP camera /web-cam mounted in the classroom that covers the faces of all the pupils. During the pre-processing step, the picture that was collected is sent via Open CV's Haar-like features algorithm. This allows the positions of all faces to be pinpointed and cropped. The photos after cropping are utilised for face analysis identification by examination of the previously collected dataset. In the event that the participants' faces are recognised, the attendance record for that specific topic will be updated to reflect their presence. In the event that it is unable to identify any of the faces, we will have to manually update the website with the attendance information.

Figures 1 and 2 provide a visual representation of the proposed automated attendance management system's high-level architecture, respectively.

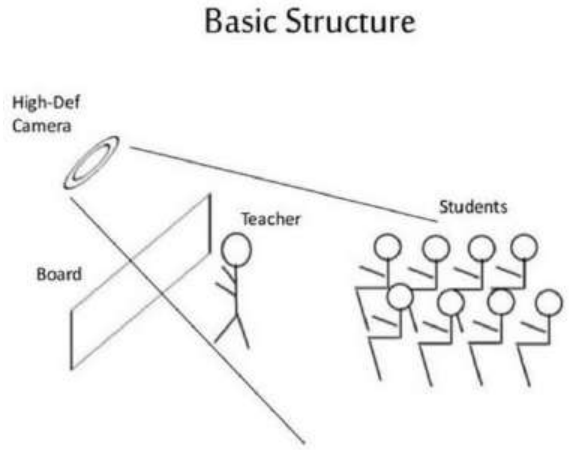

Figure 1: Demonstrates the fundamental building blocks of the suggested technique

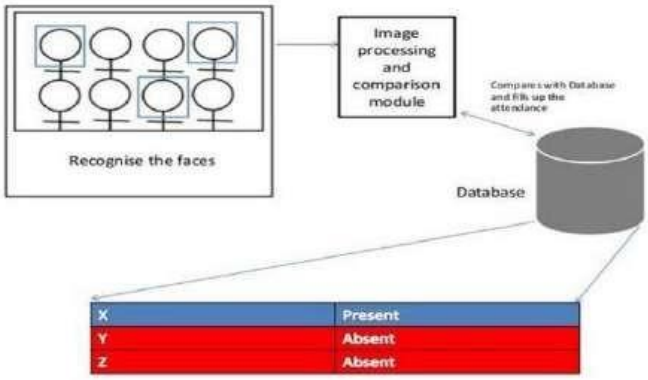

Figure 2: Demonstrates how the attendance is recorded

Figure 3 and Figure 4 respectively exhibit a pictorial representation and a suggested design for the automated attendance management system. These figures are located in the middle of the page. The system receives images as input that is collected via the use of IP cameras. The face is analysed using a HAar-Like cascade classifier, and the results are then passed on to an ensembler for further classification. The students in the room may be precisely identified with the assistance of ADABoost's face classification system, which is based on statistical models.

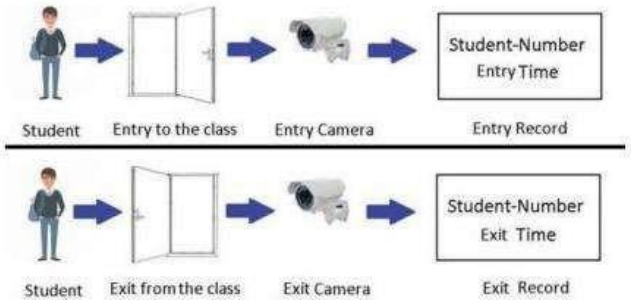

Figure 3: Graphical illustration of the paradigm that we have suggested

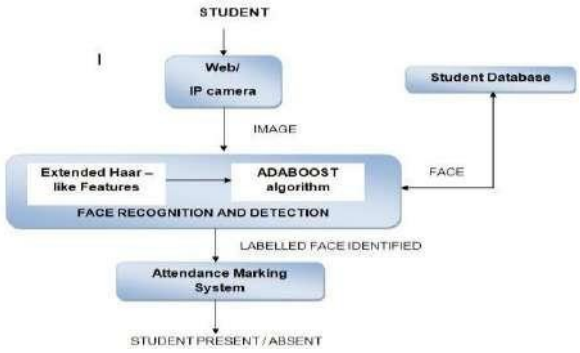

Figure 4: The overall structure of the model that we have suggested

Face detection: The suggested method starts with face identification utilising Haar-like characteristics that allow it to discover facial objects of interest. This enables it to identify faces of interest. As can be seen in Figure 5, the kernel performs operations on the edges, lines, and rectangles that

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make up the features to establish the bounding box that surrounds the detected face.

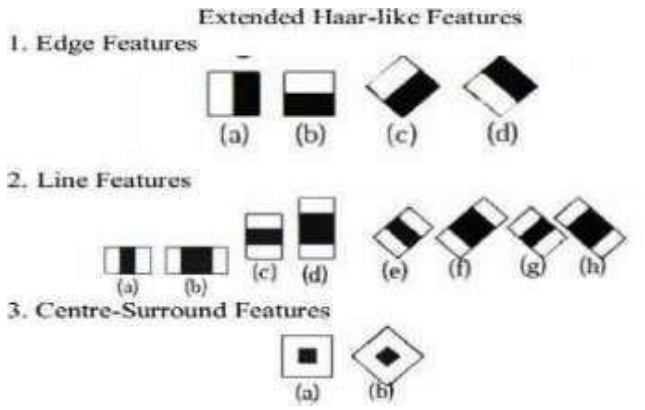

Figure 5: Extended Haar-like Characteristics

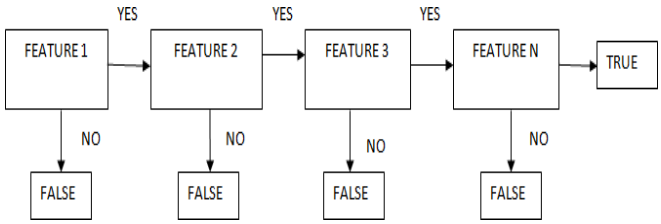

Figure 6: Illustrates a feature-based cascade classifier

When a classifier has been developed, it is often applied to a particular region of focus within a statistical picture. The classifier returns the value "1" if the area has a high probability of revealing the face, and it returns the value "0" otherwise. In order to find the necessary facial item with inside the whole image, one might acquire the inquiry window across the shot and examine at each location using the classifier, as seen in Figure 6.

Adaboost

The stages that make up the Ada Boost algorithm, which represents an ensemble technique, are going to be covered here with this article.

IV. Implementation and Results

The suggested automated system for face recognition is composed mostly of four different parts. Figure 8 provides a visual representation of the functionality and functioning of each module.

- Get images of the Students
- Conduct facial recognition and detection
- Build and Maintain Databases
- Do Post-Processing

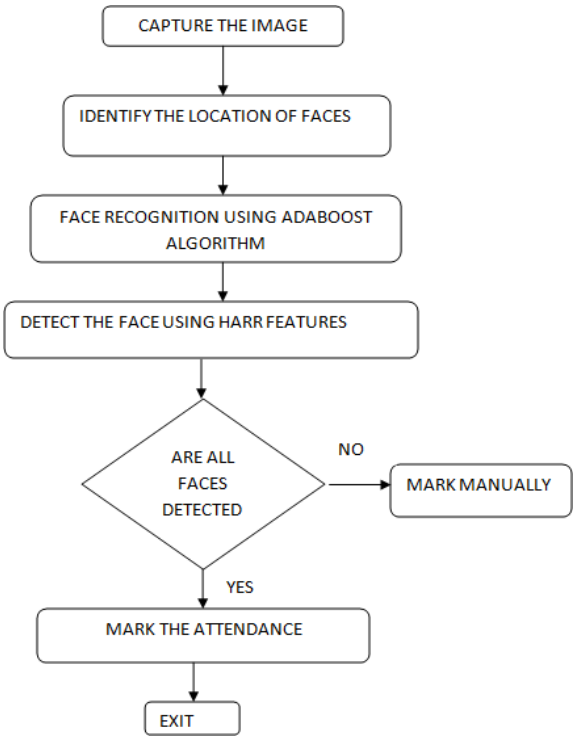

Figure 8: Flow diagram of the system that has been presented

A) Image capture: At first, cameras are installed at the front of the classroom to take pictures of the students' faces as they enter and leave. These pictures are then preprocessed in preparation for facial recognition.

B) Forecasting and recognising faces: is one of the most significant parts of the form prediction system. This may be accomplished by face recognition and detection. In order to recognise the facial characteristics of the face, it is necessary to identify and find the landmark aspects of the face, such as the eyes, the nose, and the jaw line. The Haar feature based classifier, which was developed by Paul Viola and Michael Jones, is the face identification approach that has shown to be the most successful when used in our study. The classifier is educated using both positive and negative examples throughout the training process. The extraction of facial characteristics and the use of facial landmark detection are both components of the face detection process. In order to train the facial characteristics for labelling, the AdaBoost face recognition algorithm, which is the most popular of its kind, is utilised. OpenCV's primary function is to identify distinctive features of the face. For face detection and identification, we made use of both Haar cascades and the AdaBoost classifier that was included with OpenCV.

C) The creation of the database: after identifying the facial characteristics of each face in the training dataset, we either crop them or If the face is not aligned correctly, the photograph should be deleted. After that, it is placed in a separate folder and given the same names as the training

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pictures that it was trained on. After that, we will think about using this folder for facial recognition. In the event that it is necessary, the stored pictures are improved subsequently using preprocessor methods. One thousand unique pictures of students are kept in their own folders, and the folders are organised in such a manner that each student's name can be seen with all of the aspects of the student's face.

D) Post Processing: Lastly, the recognised and detected faces of the students are kept in the database, and attendance will be supplied for the students via the automated facial recognition system that was designed for the purpose of attendance marking.

V. Results Obtained

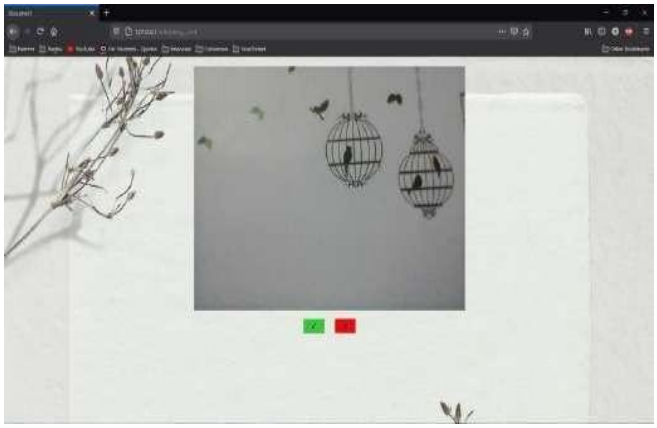

Figure 9: Capture image using web camera

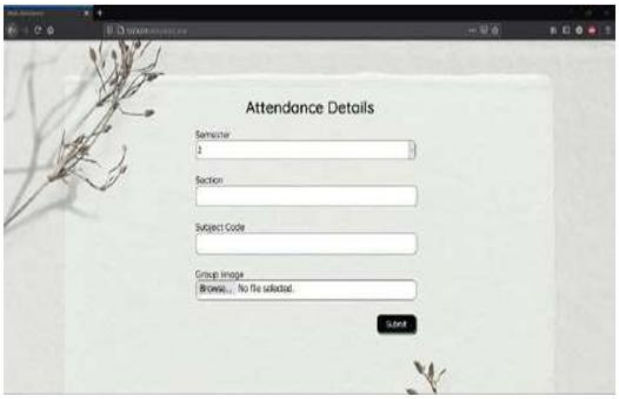

Figure 10: Mark attendance using faculty login

To mark attendance, the captured and saved image is uploaded by filling out the form, as shown in Figures 9 and 10. This sends the image to the back-end, where OpenCV is used to find and recognize faces.

Figure 11: Face detection and recognition

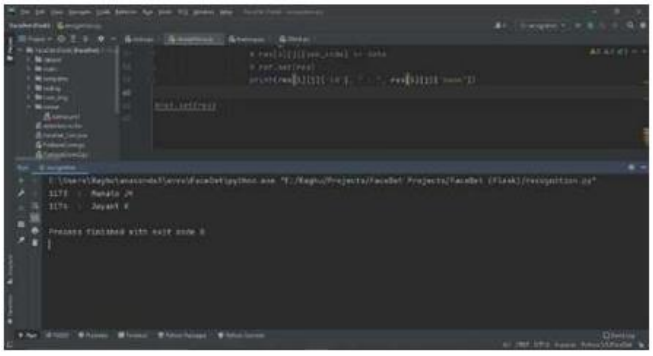

Figure 12: Accuracy of the Result obtained

Figure 11 shows that a face has been found, and Figure 12 shows that the terminal shows the name of the face that has been found. The OpenCV library is used to do this. A mounted IP camera or plug-in camera takes a picture of the class, which is temporarily stored in the system and then uploaded to the cloud.

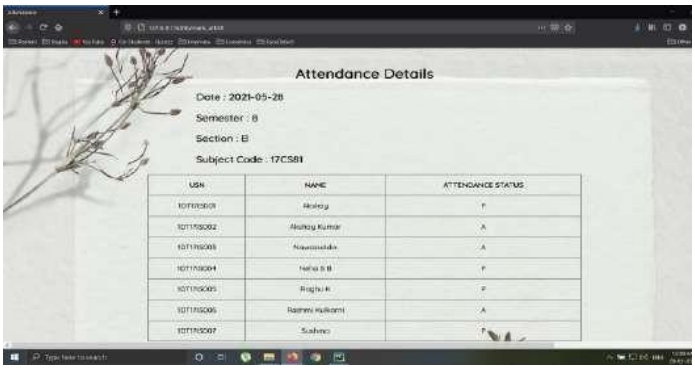

Figure 13: Details of the class's attendance as a whole

Figure 13 shows the attendance after the faces that have been recognized have been compared with the data in the database and the faces that have not been recognized have their attendance marked as "present".

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VI. Conclusion

In this paper, we show how face recognition can be used to make a smart attendance system. With an automated system, teachers don't have to mark attendance by hand, which takes a lot of time. Students don't have to send in proxies like they usually do. Face recognition works 98% of the time. The other 2% varies because of problems with alignment, lighting, and low-resolution training images. By using the AdaBoost algorithm, you can make a strong classifier and find the weak ones to throw away. The cascading process used in classification helps to make the face detection system more accurate and work at the best speed.

In the future, the dataset can be improved by adding more images of students with different resolutions to help with the training phase so that the face recognition scheme can be made better. We can fix the alignment problem by putting the camera at the right angle, which lets us see all the faces clearly and helps us get good images for training. To cut down on false positives, improved image registration techniques can be used.

REFERENCES

[1] Hossen, A. M. A., Ogla, R. A. A., & Ali, M. M. (2017). Face detection by using OpenCV's Viola-Jones algorithm based on coding eyes. Iraqi Journal of Science, 58(2A), 735-745.

[2] Prasanna, D. M., & Reddy, C. G. (2017). Development of real time face recognition system using OpenCV. Development, 4(12), 791.

[3] Patil, A., Priya, K. P., More, P., Joshi, A., & Kamble, A. R. (2020).Attendance Monitoring using Face Recognition and Machine Learning. International Journal of Future Generation Communication and Networking, 13,94-102.

[4] Hu, W. C., Yang, C. Y., Huang, D. Y., & Huang, C. H. (2011). Feature-based Face Detection Against Skin-color Like Backgrounds with Varying Illumination. J. Inf. Hiding Multim. Signal Process., 2(2), 123-132.

[5] Kumbhar, P. Y., Attaullah, M., Dhere, S., & Hipparagi, S. (2017). Real time face detection and tracking using OpenCV. International journal for research in emerging science and technology, 4(4).

[6] Viola, P., & Jones, M. J. (2004). Robust real-time face detection. Internationaljournal of computer vision, 57(2), 137-154.

[7] Rowley, H. A., Baluja, S., & Kanade, T. (1998). Neural network-based face detection. IEEE Transactions on pattern analysis and machine intelligence, 20(1),23-38.

[8] Pei, Z., Xu, H., Zhang, Y., Guo, M., & Yang, Y. H. (2019). Face recognition viadeep learning using data augmentation based on orthogonal experiments. Electronics, 8(10), 1088.

[9] ChayaDevi, S. K., & Agnihotram, V. (2020). Smart attendance system using Convolution Neural Network and Image Processing. European Journal of Engineering and Technology Research, 5(5), 611-616.

[10] Tabatabaie, Z. S., Rahmat, R. W., Udzir, N. I. B., & Kheirkhah, E. (2009). Ahybrid face detection system using combination of appearance-based and feature-based methods. International Journal of Computer Science and Network Security, 9(5), 181-185.

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