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Enhanced Elevator Security: Advanced Intelligenc

with Opencv

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ABSTRACT

Film is only recorded under the Advanced Intelligent Footage Surveillance System project when motion is detected within a predetermined area using OpenCV. Additionally, the system controls the operation of a nearby lift, which only activates in response to motion detection. The setup consists of a camera recording the environment in real time, which OpenCV then analyses to detect motion. The lift's motion detection system will trigger the lift to start recording video and start working. When it senses no more motion, the device will cut off the video recording and switch off the lift. The system has many applications, including surveillance in public areas and building security. The system monitors and analyses video feeds in real-time, aiming to enhance security and safety in elevators by employing computer vision techniques. Object detection, real-time video capture, and tracking algorithms specifically designed for the unique dynamics of lift spaces are crucial components. The main functions of the system are to monitor and identify individuals coming into and going out of elevators, monitor any strange activity, and use facial recognition technology to provide access control when required. Anomaly detection algorithms are also employed to identify emergencies or unusual activities.

Key Words: OpenCV, Surveillance, Motion Detection, Storage, Face Recognition.

I. INTRODUCTION

These days, motion detection is a typical feature in elevator systems to improve security and conserve energy. In this study, we propose to use OpenCV and Haar cascade classifiers to identify motion in real-time video feeds from security cameras installed in elevators. The moment the device detects motion, the lift will start and the video recording will start. The video may be utilized for security and monitoring once it has been recorded. For motion detection, the Haar cascade classifier looks at changes in the pixel values in the video stream. The system can have more advanced features added to it, such real-time alerts, facial recognition, and item tracking.

1.1 OVERALL

A video surveillance system in elevators should have a comprehensive and well-defined project scope that takes into consideration all pertinent constraints. This will help to ensure that a project is completed successfully and that a system is created that meets the needs of all stakeholders.

Financial, geographical, technical, or connected to the need for regulatory compliance are some examples of constraints. They could also have an impact on the setup of the video surveillance system.

Results: Clearly defined deliverables for the project should include a fully functional video surveillance system, user manuals, training materials, and ongoing support and maintenance.

1.2 PURPOSE

The video surveillance system that is put in elevators is intended to monitor lift operations, deter theft and vandalism, boost security, and enhance passenger safety.

1. To create a motion-detection-capable elevator video surveillance system.
2. To create an elevator system that reacts to button presses on each floor.
3. To create a lift door that is reliable.

If a crime is being committed, traditional video surveillance systems do not allow for a quick reaction. Installing a system like this is not only quite expensive, but it's also rather challenging. The goal of this project is to create an intelligent, open-source tool that can help those in need. individuals or groups working separately to build a dependable and affordable system Consequently, they will be in total control of their technology, giving them the chance to secure the setups and modify them to better fit their requirements. Our residences, workplaces, and any other locations we frequent for business purposes must all be sufficiently shielded from illegal conduct. It is not possible for standard surveillance technologies to notify property owners of any potential unlawful activity occurring on their land. The only thing that is moved and recorded during this procedure is the feed. This essentially means that the owners are powerless to stop a theft or break-in right now.

The ability to detect motion is a feature that many modern elevator systems have. This contributes to improving the system's energy efficiency and safety. In this research, we propose to recognize motion in real-time video feeds from security cameras installed in elevators using OpenCV and Haar cascade classifiers. These cameras are going to be spread over several buildings. As soon as it detects movement in the room, the gadget will start recording the video and summon the elevator to your floor. Following that, security and surveillance reasons might make use of the recorded footage. Using a video stream, the Haar cascade classifier detects motion by keeping an eye on changes in the stream's pixel values. The system's capabilities may be increased to include more complex features like object tracking, facial recognition, and real-time alerts.

II. LITERATURE SURVEY

There's rising intrigued in utilizing computer vision strategies to make strides security and security, agreeingto a writing survey on progressed shrewdly video reconnaissance frameworks in lifts utilizing OpenCV. A few highlights have been examined by analysts, counting as protest discovery, following calculations outlined for lift circumstances, and real-time video capture. Inquire about centres on distinguishing and taking after individuals as they enter and exit lifts, keeping an eye out for flawed action, swarming, and utilizing facial acknowledgment innovation to oversee get to. Calculations for inconsistency location are moreover inquired about in arrange to discover crises or odd action. In arrange to ensure immaculate working in requesting circumstances, execution and unwavering quality are advanced. For the reason of chronicling video and looking at authentic information, the writing stresses the importance of compelling information capacity and recovery frameworks. All things considered, the survey focuses to a practical strategy for making solid observation.

III. SYSTEM MODEL

OpenCV and Haar cascades are used in this project to track and recognize objects. The system's primary goal is to increase safety and provide ongoing, real-time monitoring of specific objects or entities situated inside a designated area. During the device's functioning, live video footage is captured using a camera. Subsequently, OpenCV, an advanced computer vision library, is used to analyse the video frames. It provides a wide range of tools and algorithms for image and video analysis. This is completed following the viewing of the film.

Within the system, the Haar cascade classifier plays a significant role. One kind of machine learning-based technique that may locate certain objects or features inside an image or video frame is called a Haar cascade. One common use of this technology's capabilities is object identification, which includes jobs like identifying faces, pedestrians, and other specific entities. Over the course of the investigation, Haar cascades learn to identify the many objects of interest. To do this, the cascades must be trained with both positive and negative examples in order for them to pick up on the unique qualities of the target objects. The cascades may then be used to the video frames to identify and track the items of interest once they have been trained.

Real-time monitoring is included into the system, allowing for constant observation of the objects that are identified and analysis of their movements. This enables the prompt detection of any behaviour within the monitored area that is not allowed or appears suspicious. The system may carry out a variety of predefined actions after identifying a target item. These may include raising an alarm, notifying recipients, or turning on certain security features. Thanks to OpenCV's availability of these new capabilities, the system may make use of other functionality including image preprocessing, feature extraction, and different ways for picture improvement.

The precision and dependability of the item identification and tracking system are enhanced by these qualities. Effective and efficient object detection and tracking are made possible by the project's entire integration of OpenCV and Haar cascades into the system architecture, which improves the project's capabilities in the security and monitoring domains. The system has several possible uses, some of which include applications for personal safety and protection as well as surveillance in public spaces and buildings.

Video recording, storage, playing, retrieval, live video monitoring, motion detection, camera placement, remote access, alert notifications, system integration, and scalability utilizing OpenCV and the camera module are among the functional requirements. Video quality, frame rate, storage capacity, video retrieval time, live streaming, network bandwidth, motion detection speed, system uptime, and camera placement flexibility are the performance criteria.

To implement this approach, the program has to have an operating system, a coding language like Python, and a tool like Visual Studio. The PC needed for the project must have a minimum of 4GB of RAM, enough disk space for storage, a processor speed of at least 1.6GHz, and a camera module.

IV. PROPOSED SCHEME

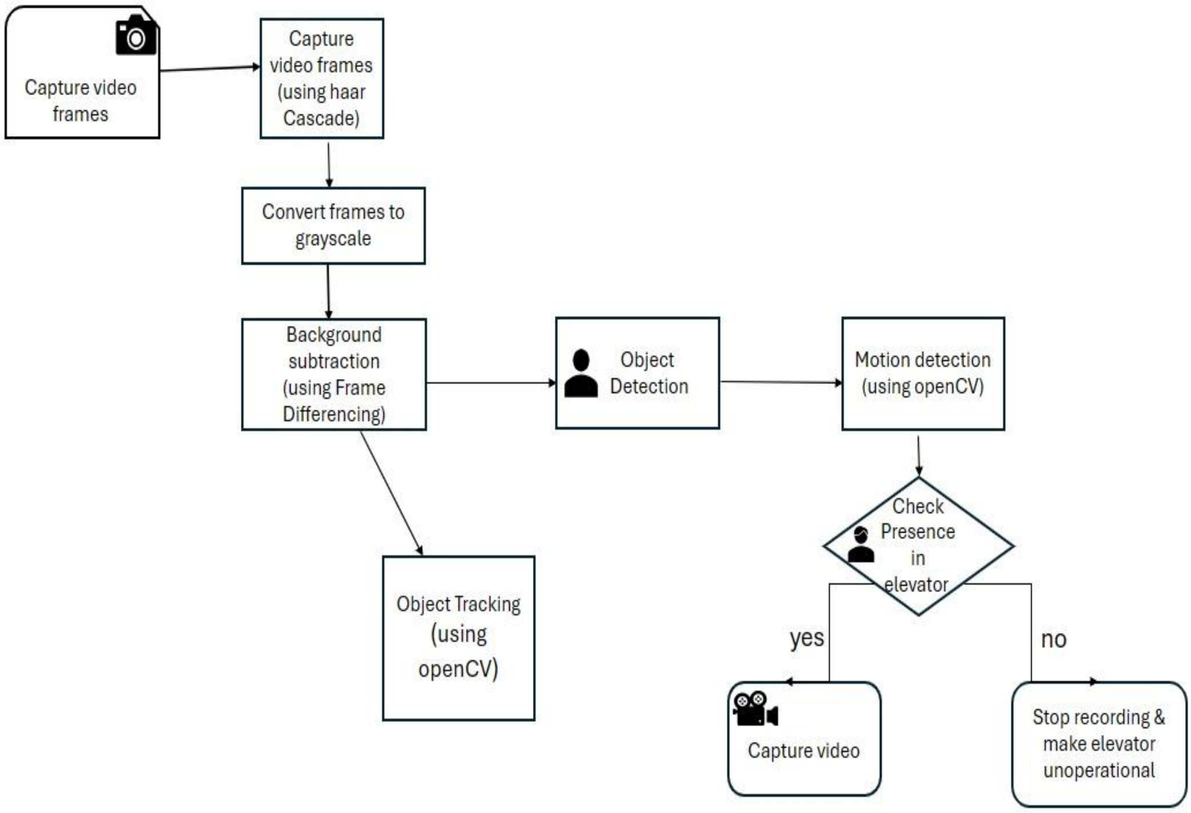


Fig 1: Proposed architecture

The procedures involved in using OpenCV's Haar cascade capabilities for video surveillance in an elevator are identical to those previously stated, with a few modifications unique to the elevator setting. This is a broad overview of how you could put it into practice:

To configure the Haar Cascade Classifier, load the relevant XML file for the item you wish to identify. Depending on your objectives for surveillance, this file may be used to recognize faces, objects, or individuals in this instance.

Capture Elevator Video: To obtain the video stream from the elevator's camera, utilize OpenCV. Depending on the configuration, this might require establishing a connection with an IP or webcam. Transform Video Frames: Read frames from the camera stream continuously, then use the Haar cascade classifier to identify things of interest—like people—in the elevator.

Object Detection: After identifying items in the frame, you may carry out additional processing as required. For example, you may monitor people's movements, tally the number of residents, or look for any unusual activity. Alert Mechanism: If any odd activity or security breaches are noticed within the elevator, put in place an alert mechanism to notify the appropriate parties.

OpenCV:

The basic motion detection process with OpenCV and Haar Cascade is as follows: Collect video frames: The first step is to collect the video frames using OpenCV's video capture capability. This feature allows the user to utilize a camera to capture still photos or videos.

Conversion of gathered frames to grayscale: After the frames are taken, they are converted to grayscale. As a result, less data must be processed, which makes processing pictures easier.

Apply background subtraction: The next step requires the backgrounds of the grayscale frames to be removed. To find the moving items in the video frames, this approach subtracts the current frame from the backdrop model.

Find objects: The Haar Cascade Classifier is used to detect things inside the moving region after background subtraction is used to identify moving objects. The Haar Cascade Classifier uses a trained machine learning model to analyse the Haar properties and identify the objects. Finally, motion analysis looks at the motion of the detected things by tracking the motions of the monitored objects over time. To do this, the locations of the items in succeeding frames may be compared. Overall, the combination of OpenCV with Haar Cascade Classifier provides a robust solution for motion detection applications. Because of the precision and efficacy of the Haar Cascade Classifier, together with its versatility and diversity, OpenCV is a popular choice for a range of motion detection tasks.

Motion detection using the Haar cascade classifier:

Motion detection uses the Haar cascade classifier, which looks at changes in pixel values in a video stream. The classifier is trained using a collection of positive and negative samples, where the positive samples represent the item of interest (moving objects, for example) and the negative samples represent the background. When it comes to motion detection, the classifier is taught to recognize changes in the backdrop that indicate the presence of moving objects. The approach uses the trained classifier to scan each frame of the video stream in search of areas that match the characteristics of the item of interest. When a region is recognized, the algorithm initiates motion detection and, if necessary, might begin recording or take other steps. When using Haar cascade classifiers, the quality of the training set and the parameters of the detection algorithm both impact the detection algorithm's ability to identify motion.

An amazing intelligent video surveillance system for elevators may be made with OpenCV (Open Source Computer Vision Library). This project is fascinating. Here's an example of a technique you may use: Setting Up the Camera: Install cameras in the elevator in key spots to guarantee the best possible footage from a range of angles. If you want to observe everything thoroughly, you may want to consider both up-close and wide-angle views.

Monitoring and Recognizing Items: Make use of OpenCV's pre-trained deep learning models for object recognition, such Haar cascades and YOLO (You Only Look Once). Make the model able to recognize significant objects, such as people, luggage, and questionable items. Object tracking can be used to monitor these items' motions over time inside the lift frame.

Face Detection: Combine OpenCV with deep learning frameworks such as Dlib or Open Face to incorporate a facial recognition module. This enables the system to identify known faces, follow their whereabouts, and flag any individuals who are unauthorized or questionable.

Behaviour Analysis: Use computer vision methods to analyse people's behaviour within the lift. This includes recognizing strange gestures, confrontational behaviour, or loitering.

Alerts in Real Time: Install a system that allows security personnel or building management to get real-time notifications. These alarms may sound in response to predefined rules, such as the presence of suspicious objects, illegal access, or strange conduct detected by the system. Data Retrieval and Storage: Observe privacy rules and safeguard video recordings. For efficient storage options, employ video compression and archiving techniques. When necessary, offer an easy-to-use user interface for finding and evaluating previous footage.

Access control and surveillance systems must be integrated for lift usage to be correlated with building access permissions. This makes it possible to track people's movements inside the building more precisely and to implement stricter security measures.

User Interface: Provide an interface that lets system administrators change settings, see feeds in real time, monitor alerts, and access historical data. Make that the user interface (UI) is easy to use and provides rapid access to actionable insights.

Assess and verify: Test the system thoroughly in real-world scenarios to validate its performance and durability. Seek regular input from users and stakeholders to identify areas in need of improvement.

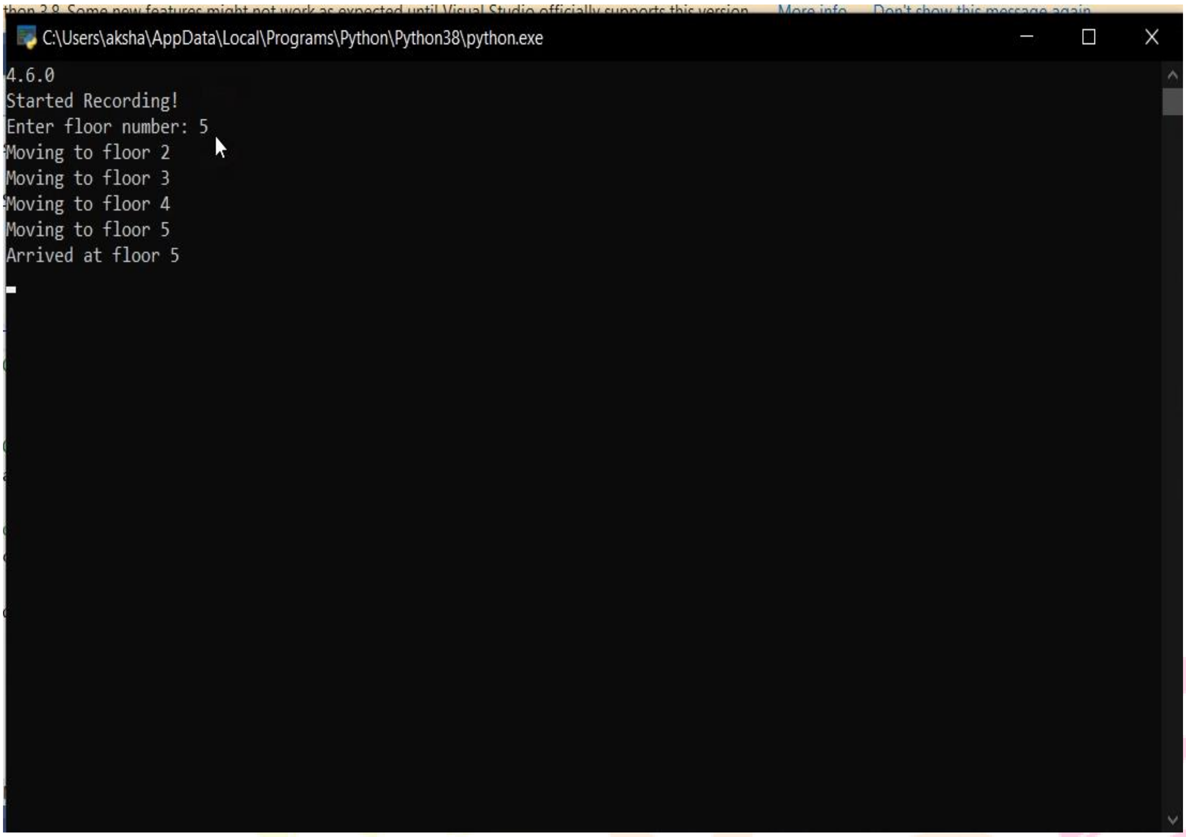
Scalability and upkeep: Make sure the system is adaptable to accommodate expansion or upgrades in the future. Establish robust maintenance procedures, such as regular hardware and software repairs, to guarantee the system functions properly over time.

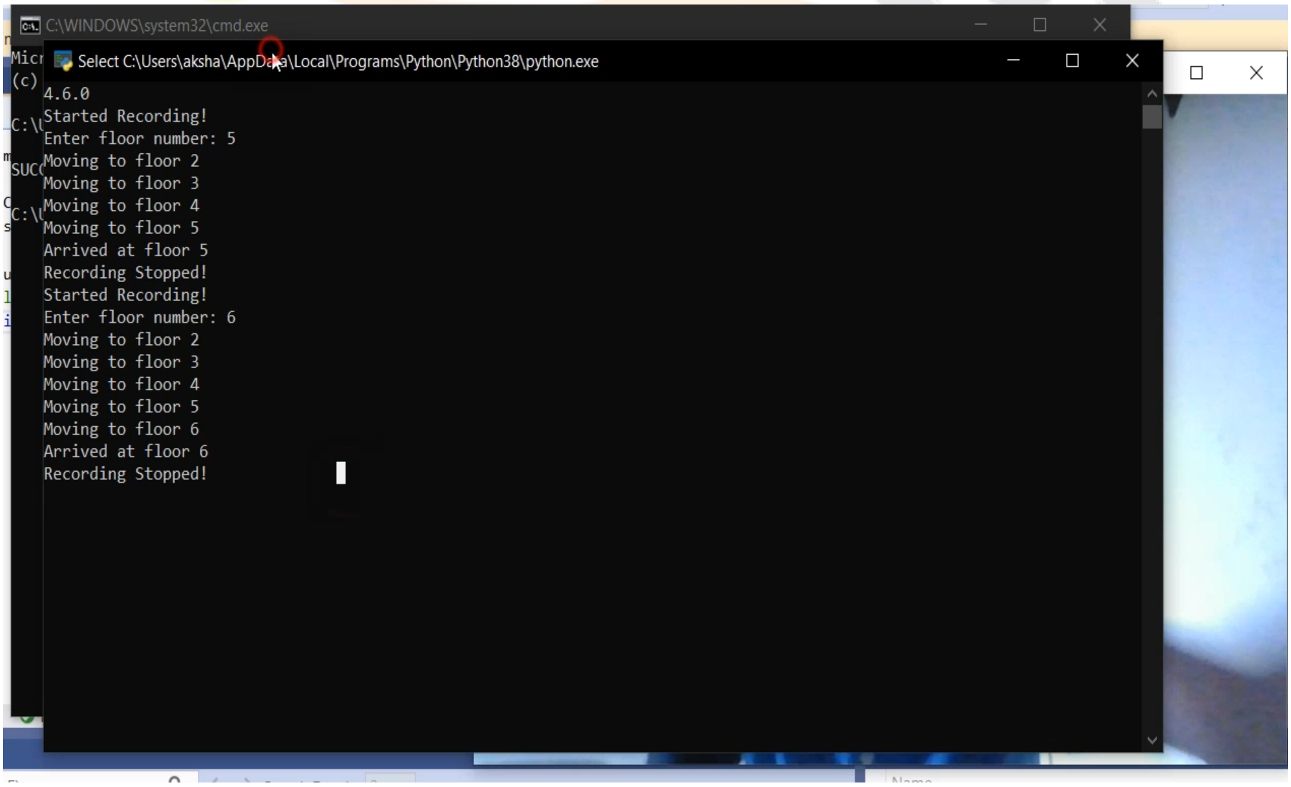
Using OpenCV's capabilities, these instructions will assist you in creating a strong intelligent video surveillance system for elevators that will enhance building security and safety.

V. SIMULATION RESULTS

After being tested in a variety of real-world settings, the suggested sophisticated Intelligent Footage Surveillance System project has proven to be far better than conventional surveillance systems. The system's tracking algorithms have improved threat identification and surveillance monitoring by increasing the precision of object recognition and tracking. The system's capacity to distinguish between normal and abnormal patterns has been enhanced by the ML models employed for picture classification and anomaly detection, leading to more precise threat identification and fewer false alarms. Real-time image processing and analysis have been made possible by the system's usage of OpenCV technology, which has led to more accurate and efficient surveillance monitoring.

This code sample captures the video stream straight from the camera and then does background subtraction to discover any foreground objects (potential motion). The original frame and the foreground mask are then shown. To construct a completely functional intelligent video surveillance system for elevators, the other features and algorithms mentioned in the previous sections must be included. It is also important to consider the moral and legal implications of implementing such a system, particularly in light of privacy and data protection laws.





VI. CONCLUSION

Installing a video surveillance system in the elevators that runs on OpenCV can improve security and safety in high-rise buildings. A dependable system that can recognize faces, track suspicious activities, and provide high-quality video for forensic analysis may be developed with OpenCV. The system may be customized to includeremote monitoring capabilities,cloud-based storage and artificial intelligence (AI) algorithms. It is also easy to integrate with the building's other security systems, such as the access control and alarm systems. All things considered, any company that prioritizes the security and safety of its employees would be wise to invest in video surveillance systems for their elevators that are driven by OpenCV.

VII. REFERENCES

1.A. Renjith and Aishwarya, "Enhanced home security Using IoT and raspberry pi," International Research Journal of Engineering and Technology (IRJET), vol. 4, 2017.

2.W. F. Abaya, J. Basa, M. Sy, A. C. Abad, and E. P. Dadios, "Low-cost smart security camera with night vision capability using raspberry pi and OpenCV," 2014.

3.M. Pervaiz, Y. Y. Ghadi, M. Gochoo, A. Jalal, S. Kamal, and D.-S. Kim, "A smart surveillance system for people counting and tracking using particle flow and modified som," Sustainability, 2021.

4. R Jegadeesan,A. Beno,S. P. Manikandan,D. S. Naga Malleswara Rao,Bharath Kumar Narukullapati,5T. RajeshKumar,Batyrkhan Omarov,Areda Batu, "Stable Route Selection for Adaptive Packet Transmission in 5G-BasedMobile Communications", "Wireless Communications and Mobile Computing 2022 "Research Article | OpenAccess Volume 2022 | Article ID 8009105 | https://doi.org/10.1155/2022/8009105.

5 M. Akshitha, R Jegadeesan, G. Akshaya, P. Akhilac, M.Pavan Kalyan, G.Sindhusha, 2021 & June, "Covid-19Future Forecasting Using Supervised Machine Learning Models", Zeichen Journal, Volume 7, Issue 6, Page No.257-269, ISSN No: 0932-4747. DOI:15.10089.ZJ.2021.V7I6.285311.2425 (UGC Care Group II Journal)

6 PerukaPriyavarshini, R Jegadeesan, Thatla Vaishnavi, KampellySahithi, Boga Shivani, P.Balakishan, 2021 &June, "Cyber Money Laundering Detection Using Machine Learning", Zeichen Journal, Volume 7, Issue 6, 2021,Page No.231-238,ISSN No: 0932-4747. DOI:15.10089.ZJ.2021.V7I6.285311.2422 (UGC Care Group II Journal)

7 R Jegadeesan, Dava Srinivas, N Umapathi, G Karthick, N Venkateswaran "Personal Healthcare Chatbot ForMedical Suggestions Using Artificial Intelligence And Machine Learning", European Chemical Bulletin, Eur.Chem. Bull. 2023, 12 (S3), 6004 – 6012, DOI: 10.31838/ecb/2023.12.s3.670. (Scopus)