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"WatchDog": An advanced surveillance system

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Surveillance systems have become an integral part of the business world today due to the intensive care given to ensure the security of properties with a considerable monetary value. As a result, Closed-Circuit Television (CCTV) cameras are widely used in organizations. However, these systems have added an additional complexity to the user's day-to-day work due to considerations like footage review and storage. The most common solution to this problem is incorporation of intelligence and automation to these systems. Typically, image processing and machine learning concepts are employed to implement such surveillance systems. However, the currently available advanced surveillance systems are not affordable for small and medium enterprises. The most widely used freely available advanced surveillance systems only detect motion. On the other hand, the systems that can identify the presence of people and even recognize them cost a considerable amount that does not fit into the budget of most, small scale businesses. Further, the most of the available free surveillance systems have not been designed in a way to achieve both storage efficiency and giving feedback on footages. In fact, most of them do record the footage 24x7. To address all those issues, in this paper, we present "WatchDog", an advanced surveillance system that is implemented as a 100% free and open source product with features like detection of human presence, storage efficiency mode where the footage is stored only when there is a human in the frame, feedback and reporting facilities and recognizing people in the footage. The system detects people, and only those frames are recorded in high quality while rest of the video is saved in low quality to achieve storage efficiency.

Using facial feature recognition, the system can predict factors such as gender and age of people in the footage. At the end of each day, the system produces a report with detailed information. This report would be a great relief from the user's point of view since it drastically reduces the time to review the footages when required. Viola Jones algorithm, *Haar* features, Integral image, *Adaboost* and Cascading concepts are used for Human detections and facial feature recognition in this system. Our aim of this research is to answer the 3 major problems in surveillance systems such as affordability, storage efficiency and intelligence all at once.

Keywords: CCTV, Face recognition, Facial feature, Machine learning, Surveillance