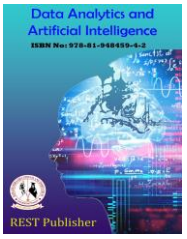
Data Analytics and Artificial Intelligence

Vol: 3(3), 2023

REST Publisher; ISBN: 978-81-948459-4-2

Website: http://restpublisher.com/book-series/daai/



An Integrated Smoking Detection Method Based on Convolutional Neural Network

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Abstract: *Smoking is a risk factor for hypertension, lung disease, cardiovascular disease, cancer and diabetes and is a leading cause of chronic disease and death worldwide. Passive smoking can be very harmful. With more than 7,000 toxic chemicals, secondhand smoke is known to cause cancer in non-smokers. Cigarette smoking causes 87% of lung cancer deaths and is also responsible for many other cancers and health problems. In addition, infant deaths in pregnant women are attributed to smoking. So smoking in the restricted area is prohibited, sometimes the public will not follow the rules and regulations, which will become a big problem for non-smokers. This project is designed in such a way that the face detection is done by the YoloV8 algorithm, which is linked to the database where the face is recognized. This face detection is done using a camera that is placed in limited locations. YOLO V8 is an object detection algorithm that identifies specific objects in images. This project mainly aims to not smoke indoors, if a person smokes indoors, a voice warning is given to them not to smoke, even if the person continues to smoke, it takes a picture and sends a notification via SMTP. The report was sent to the management department, where they will monitor the smoker and non-smoker and finally find the specific person. Through this project we can avoid the "smoking ban" and keep our society healthy.*

Keywords: *Yolo V8 algorithm, Database, Camera, "No Smoking" and Video processes.*

1. INTRODUCTION

Smoke usually has non-contact and wide detection properties. Therefore, smoke detection can detect the fire location and fire situation more quickly and effectively in fire prevention and monitoring. At present, fire smoke detection is the main method, which often has the problem of layout, small detection range and high cost of consumables. With the development of image processing technology in YOLOV8, image-based object detection technology has been gradually applied in smoke fire detection. Other smoke detection methods are then proposed. Chen et al. proposed a detection algorithm based on static characteristics of smoke and dynamic characteristics. The detection effect of this method is good in a specific environment but becomes unsatisfactory when the environment changes. proposed a forest fire smoke detection method by combining remote sensing technology with neural network technology Although this method improves detection accuracy. Suggested using a sliding window to analyze the suspected smog area and then detect the smoke by varying the amount of exercise. It is similar to the method we used to improve detection accuracy, but it has a problem with detection speed. In this project, the detection speed is effectively improved by YOLO V8.

2. OBJECTIVE

- We presented an improved object detection method based on deep convolutional neural networks (YOLOV8) for fire smoke detection.
- This project developed an image processing-based smoke detection method that provides a decision function to improve the reliability of smoke detection.
- To improve the accuracy of smoke detection, a new approach based on YOLOV8 is proposed, which can be trained end-to-end from raw pixel values to classifier outputs and automatically extract features that avoid

complex image pre-processing.

3. LITERATURE SURVEY

A fire detection system is generally intended to detect an early fire with fewer false alarms. However, as feature-based methods, current commonly used point sensors result in high false positives for signal processing techniques in sophisticated fire environments. Compared with point sensors, image-based fire detection could effectively reduce the disturbance of the external environment. At the start of a fire, smoke provides timelier potential information compared to flames. Automatic detection methods are largely based on machine learning algorithms, with one channel using manually extracted features to train classifiers, such as a support vector machine [1]. The deep neural network (DNN), which uses the deep learning method, is categorized as a non-linear model and can learn the multi-level abstract representations of raw data. Traditional machine learning algorithms require prior feature extraction, while DNNs handle this within the model. The convolutional neural network (YOLOV8) is a category of feedforward DNNs used for the classification and clustering of images on the basis of similarity and detection of objects within a scene. The YOLOV8 is the reason for the tremendous growth in deep learning because it is powering significant advances in computer vision, which has many intriguing applications such as medical diagnosis, surveillance, self-driving cars, security, etc. In recent years, YOLOV8s have become an area of great interest among researchers [2]. Artificial intelligence is useful for processing and analyzing this data and has taken the technological world to new heights. The field of computer vision has emerged due to the huge amount of data generated in the IoT. [3]. Artificial intelligence is useful for processing and analyzing this data and has taken the technological world to new heights. The field of computer vision has emerged due to the huge amount of data generated in the IoT. Deep learning for detection and recognition has become the backbone of computer vision technology. [4]. It has a depth of 164 layers and is a hybrid model that has significantly improved its performance in terms of recognition tasks compared to its predecessors. [5]. These two studies used YOLOV8, which supports fast localization capability but lacks high accuracy for the problem under consideration. A large number of accurate detections in one class and a comparatively larger number of false positives in another class may provide higher average accuracy and precision but may not necessarily solve the desired problem [6].

4. EXISTING SYSTEM

- Although this method can achieve smoking identification through smoke classification, the threshold value in the algorithm is empirically set and its value will change with the background, leading to a high false detection rate and poor applicability.
- Detection bad result yolo v8 version very low accuracy.
- There is no artificial intelligent camera in the existing manual annotation system. Existing CCTV cameras record but do not alert.

5. PROPOSED SYSTEM

- In this project, we propose a method for detecting smoke in a confined space. It works well in the image captured by surveillance cameras.
- YOLO V8 is designed to recognize smoke fire patterns attached to images to generate automatic smoke detection if a person continues to smoke, capture the image and send a notification via SMTP.
- The moving regions are segmented from the captured image sequences and are therefore used as candidates to check for smoke.
- The proposed method can provide a reliable and cost-effective solution for smoke detection and can be more attractive than conventional smoke detection methods.

6. ARCHITECTURE DESIGN

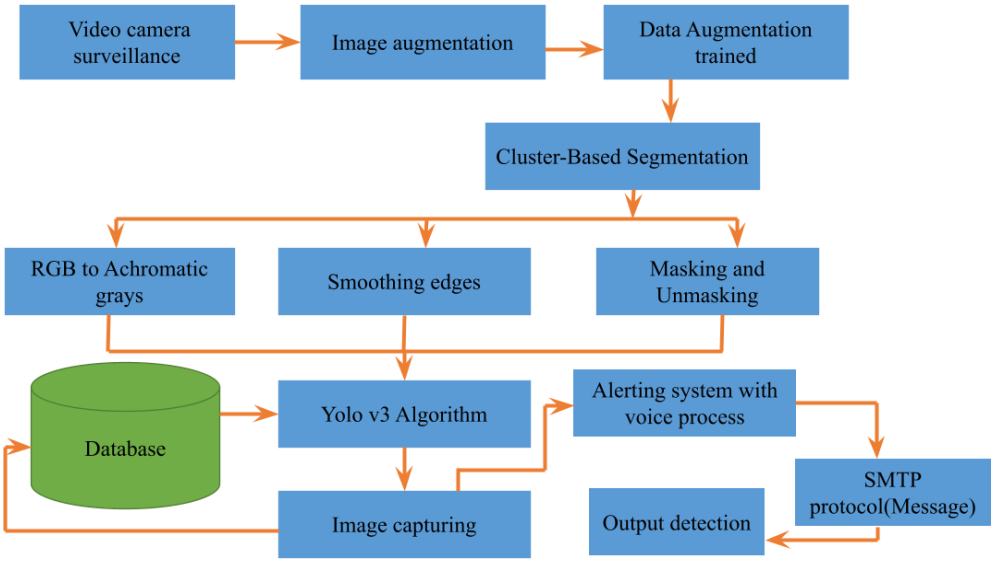

FIGURE 1. Architecture design

7. SYSTEM MODULES

Object detection using yolo: Through a computer vision task that involves object identification and object localization in images or videos. It is an important part of many things such as surveillance, self-driving cars or robotics. Object detection algorithms like YOLOV8 can be used to identify objects. ***Two-shot object classification using yolov 8:*** Two-shot object detection uses two passes of the input image to predict the presence and location of objects. The first pass is used to generate a set of suggestions or potential object locations, and the second pass is used to refine these suggestions and make final predictions. This approach is more accurate than one-shot object detection but is also more computationally expensive. ***Video processing module:*** A camera installed in public places captures all smokers. The plurality of interfaces includes interfaces for wired connection to the cameras and for receiving image data from the cameras. It will segment cigarette smokers from the camera. Database module: A database is a systematic collection of data. They support electronic data storage and manipulation. Databases facilitate data management. **Let's discuss a *database example*:** An online phone book uses a database to store people's data, phone numbers, and other contact information. ***Alert system:*** An alert system is installed with this software that will send an alert to the relevant authorities when smoking is also detected by the network.

8. SYSTEM FUNCTION

Cluster-based segmentation: Image segmentation is a method in which a digital image is divided into different subgroups called image segments, which helps to reduce the complexity of the image and simplify further image processing or analysis. Segmentation in simple words is assigning labels to pixels. All picture elements or pixels belonging to the same category are assigned a common label. For example: Consider a problem where an image must be provided as input for object detection. Instead of processing the entire image, the detector can be embedded with the region selected by the segmentation algorithm. This prevents the detector from processing the entire image, reducing inference time. Image segmentation is a method in which a digital image is divided into different subgroups called image segments, which helps to reduce the complexity of the image and simplify further image processing or analysis. Segmentation in simple words is assigning labels to pixels. All picture elements or pixels belonging to the same category are assigned a common label. For example: Consider a problem where an image must be provided as input for object detection. Instead of processing the entire image, the detector can be embedded with the region selected by the

segmentation algorithm. This prevents the detector from processing the entire image, reducing inference time.

FIGURE 2. segmentation process for cigarette object

RGB to Achromatic grays:

The most common color model in RGB, which stands for Red-Green-Blue. As the name suggests, this model presents colors using individual values for red, green, and blue. Specifically, color is defined using three integer values from 0 to 255 for red, green, and blue, where a value of zero means dark and a value of 255 means light. Given the values, the final color is defined when we mix these three base colors weighted by their values. Grayscale is the simplest model because it defines colors using only one component, which is lightness. The degree of lightness is described using a value ranging from 0 (black) to 255 (white). However, they are common in image processing because using a grayscale image requires less available space and is faster, especially when dealing with complex calculations.

Properties:

- This is an additive color model. Colors are added to black.
- 3 main channels: red, green and blue.
- Used in DIP, open CV and online logos.

FIGURE 3. RGB to Achromatic grays

Smooth Edge Detection: Canny edge detection is a technique for extracting useful structural information from various vision objects and dramatically reducing the amount of data processed. Canny found that the requirements for applying edge detection on different vision systems are relatively similar. Therefore, edge detection solutions to address these requirements can be implemented in a wide variety of situations. General criteria for edge detection include. Edge detection with a low error rate, which means that the detection should accurately capture as many edges as possible shown in the image The edge point detected by the operator should be located exactly in the center of the edge.A given edge in an image should be labeled only once and, if possible, image noise should not create false edges.To meet these requirements, Canny used calculus of variations—a technique that finds a function that optimizes a given functionality. Among the edge detection methods developed so far, the Canny edge detection algorithm is one of the most rigorously defined methods that provides good and reliable detection. It has become one of the most popular edge detection algorithms due to its optimality for meeting the three edge detection criteria and the simplicity of the implementation process.

Database Management: A database is a systematic collection of data. They support electronic data storage and manipulation. Databases facilitate data management. Let's discuss a database example: An online phone book uses a database to store people's data, phone numbers, and other contact information. Your energy service provider uses a

database to manage billing, client issues, fault data processing, etc. Let's also consider Facebook. It needs to store, manipulate and present data about members, their friends, member activities, news, advertisements and much more. We can provide countless examples for the use of databases. A database has your actual data and the rules for that data, while a DBMS is the program that surrounds and manages your actual data and enforces the rules you've specified on your data. For example, rules can be a data type such as integer or string, or a relationship between them.

***Smtp Protocol*:** SMTP is a Simple Mail Transfer Protocol that defines both a Mail Transfer Agent (MTA)client for sending mail and a Mail Transfer Agent (MTA) server for receiving mail. SMTP simply defines how data or commands are transferred from a client to a server that is used twice between a sender and the sender's mail server and between two mail servers. To transfer mail, SMTP uses three phases, i.e. connection establishment, mail transfer and connection termination, and commands that are used to send data from the client to the server and responses that are used to send data from the server to the client. The SMTP protocol is used to set communication guidelines between servers. The servers identify themselves and announce the type of communication. Servers also handle errors such as incorrect email addresses. For example, if the recipient's address is incorrect, the recipient's server will respond with an error message. If the recipient's email address's domain name is different from the sender's domain name, MSA sends the mail to a mail transfer agent (MTA). To forward the email the MTA finds the destination domain's.

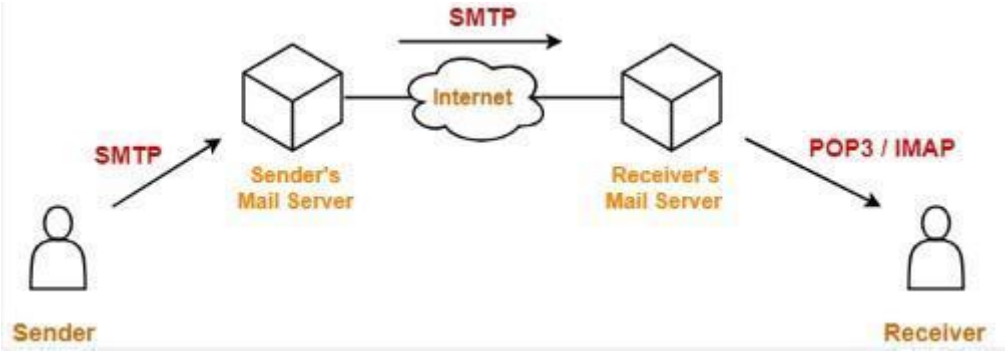

FIGURE 4. SMTP protocol

YOLO V8: YOLO Object Train Detector (YOLO) v8 is a multidimensional object detection network that uses a feature extraction network and multiple detection heads to perform multi-level predictions. Although it is no longer the most accurate object detection algorithm, it is a very good choice when you need real-time detection without losing too much accuracy. The third version of YOLO has been released and this post aims to explain the changes introduced in YOLO v8.If not, I encourage you to read the following articles by Joseph Redmon and all to understand how YOLO works.

9. RESULTS

Heavy smokers have a typical smell of smoke on their clothes, breath, hands and can be easily recognized by this smell. The smoking smell affects our body, causing the kidney and heart to fail so it avoids the smoking. So, if you're in doubt about the history, it can be helpful to use your olfactory powers, especially with teenagers. In this project to implement by avoiding smoking in restricted places.

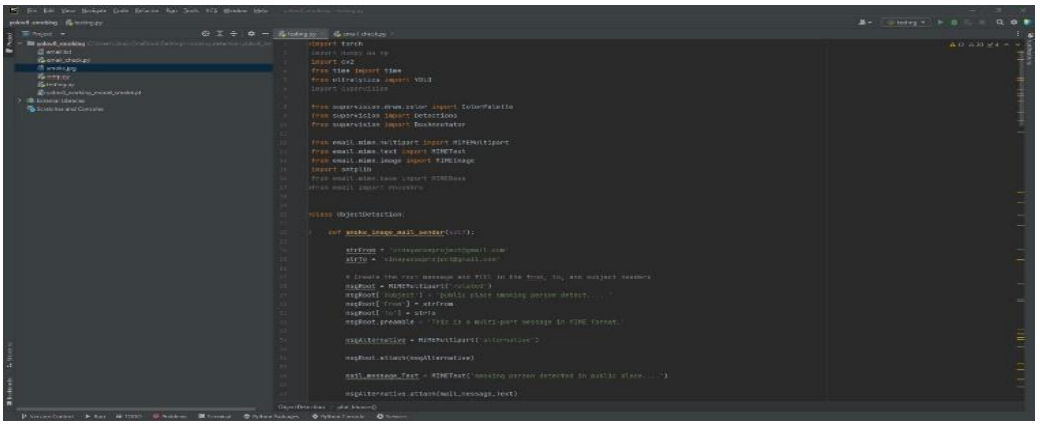

FIGURE 5. PyCharm editing window

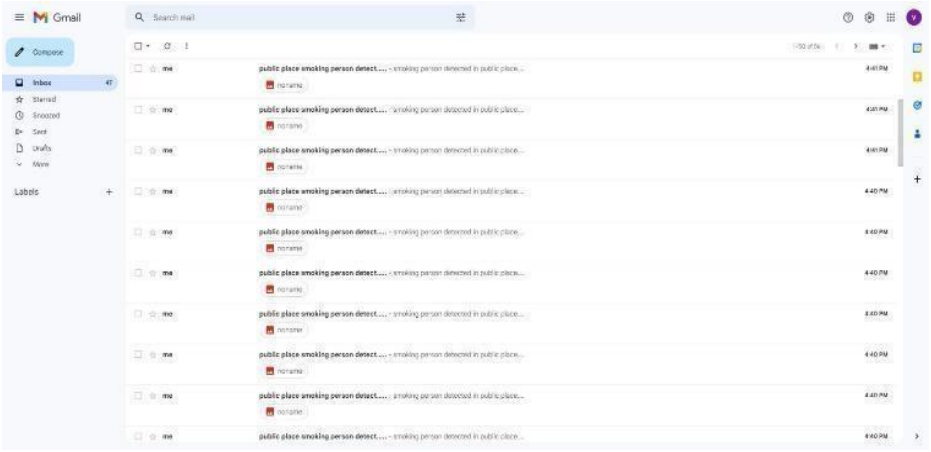

FIGURE 6. Gmail alert module

FIGURE 7. smoking detection

10. CONCLUSION

In this research work, to better regulate the smoking ban in outdoor non-smoking areas, we presented a new idea for an AI-based surveillance system for smart cities. We intended to address the issue of non-smoking area surveillance by introducing a framework for an AI-based smoker detection system in non-smoking areas. The newly modified smoker detection image dataset consists of two classes, Smoking and Not Smoking. The performance of the proposed approach to predicting smokers and non-smokers was evaluated and compared with other YOLOV8 methods using various performance metrics. Although we have trained the proposed method on an image dataset, we believe that the real-time performance of the system will not be affected.

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