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GEO TRACKING OF WASTE, TRIGGERING ALERTS AND MAPPING AREAS WITH HIGH WASTE INDEX

[1] Mr. M Sravan Kumar Babu,[2] M. Naga Srevika,[3] P. Sai Sanjana,[4] M. Lavanya
[1]Assistant Professor,[234]Students
Department Of CSE
Malla Reddy Engineering College for Women

ABSTRACT

Littering has a severe damaging effect on the ecology and the economy of the country. Because there is no reliable system for monitoring and identifying waste, littered trash is not retrieved. The traditional approach to waste management is on the appointed parties, such municipal corporation trucks, to regularly collect trash. The project's objectives are to provide a comprehensive waste management solution and aid in the development of a more sustainable and clean environment. The user of the recommended system may submit a video of garbage together with geographic data that was captured using a mobile camera. A deep learning system may be used to detect Yolo waste in videos if it is present. This method may also provide an audible alarm. Making use of the data Based on the user's feedback, the administrator gets in touch with the nearest garbage collector to pick up the trash. The program aims to provide a comprehensive waste management solution and support the development of a more sustainable and clean environment. The recommended system is compact, affordable, easy to operate, and needs minimal human contact.
Keywords: waste detection, Yolo

1 INTRODUCTION

Trash is manually disposed of by cleaners in most cities, villages, towns, and other public areas [1]. Trash is usually scattered over the road and may be hard to find, which makes hand cleaning problematic. Sometimes garbage is left outdoors for many days, posing a risk to human health and the environment, since cleaners are unaware of where it is. The problem of waste buildup in many parts of the globe is exacerbated by the exponential increase in the human population [2]. Misclassification of garbage is another issue with waste management. Most trash may be recycled if it is sorted properly, creating a safe environment for everyone. By using state-of-the-art technology, the problems related to garbage disposal may be minimized. One useful real-time pre- and post-waste management system that may be built using mobile apps is [3, 4]. In this study, we address waste management concerns using deep learning techniques. Our method locates garbage heaps efficiently, classifies the waste according to its recyclable and biodegradable components, and facilitates segregated disposal. We also discuss the problem of volumetric waste analysis. Litter pile volumetric estimation has several applications, such as calculating the amount of waste generated per square area in a city or region, illustrating the patterns of waste generation in specific areas, such as the cityside or bayside, and establishing the validity of an object that has been labeled as waste. or a lifeless object. Based on measurements of six types of trash (plastic, metal, glass, paper, cardboard, and food waste), smart mobile device users can identify waste piles and notify cleaners with the aid of a set of Yolo Framework in Convolutional Neural Network (cNN)-based object detectors and classifiers [5].Along with the growth of our country's population comes an increase in the quantity of garbage generated by houses, hospitals, shops, and marketplaces. It's important to find answers since poor waste management may lead to a host of health and environmental problems. In order to solve this problem, our project aims to set up a platform that will enable people to submit recordings of trash that has been left on public property, together with location data, on municipal streets and other locations. We are automatically identifying and extracting trash images from these films by using the state-of-the-art object identification technology called YOLO (You Only Look Once).

YOLO splits the input picture into a grid and estimates bounding boxes and class probabilities for each grid cell. The method is perfect for real-time applications such as garbage recognition because of its speed and efficiency. Our system will notify the waste management team by audio alarm when the trash has been detected, together with the location data (which is shown as a video in which the user has provided their latitude and longitude values). Waste management personnel will be able to find and remove the rubbish as a result. We also include a training component in our study, where we teach our YOLO model to accurately identify different types of rubbish, such as cardboard, plastic, metal, and glass. Furthermore, we use data augmentation techniques to generate extra training data and improve the resilience of our model. Using the YOLO algorithm and the power of technology, we want to create a system that will help solve the problem of improper waste management and make our communities healthier, cleaner, and more sustainable.

2. LITERATURE SURVEY AND RELATED WORK

Due to rapid urbanization and population expansion, there is a considerable rise in trash output. Academics are attempting to discover a

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technical solution to address this problem. Machine learning algorithms have been employed more and more in recent years to promote sustainable environmental development and improve waste management. These algorithms work well for providing insight into intricate nonlinear systems. A study published in [10] summarizes the application of machine learning algorithms across the full waste lifecycle, from creation to collection, transportation, and disposal.

Recently, picture segmentation and identification have been the focus of deep learning—a subset of machine learning—based on artificial neural networks [11–15]. Deep learning is capable of analyzing images, videos, and unstructured data in ways that often call for less ongoing human involvement. how AI is unable to. Due to the effectiveness of these techniques, waste management researchers have embraced the same approach for identifying and classifying rubbish. Carolis et al. [16] found and identified garbage in video streams using a CNN model. Similar detection approach was also updated by Tharani et al. [17] to better handle and identify small items in garbage. It is now possible to utilize this technology to remove trash from water channels. The two-step deep learning method for waste management developed by Majchrowska et al. [18] integrated the ideas of rubbish photo localization and classification into a single framework. Chen et al. [19] adapted deep learning to produce a model that can recognize medical waste in a video stream. By isolating medical waste from other trash, this method may help with waste recycling by enabling its identification and treatment. Trash categorization is a critical step in waste management. Ruiz et al.'s work [20] evaluated the performance of many CNN-based models for supervised garbage classification using a well-known benchmark trash dataset. The research provides a basis for selecting appropriate waste categorization models. Vo et al. [21] suggested a garbage categorization method based on deep transfer learning. Rather of building a new categorization model from start, the strategy altered a neural network that had been pre-trained using millions of pictures of common things to boost classification accuracy. Mittal et al. [5] developed an efficient CNN-based trash categorization algorithm that can be used on a mobile device to streamline online waste management. The research shown that even with low resources, it is feasible to develop a smartphone app for trash management.One of the most important steps in the waste management process is quantifying the quantity of recognized trash. Nilopherjan et al. [22] proposed the Poisson surface reconstruction method and sift features for the volumetric measurement of waste. However, the accuracy of the sift feature-based technique is limited for realistic waste management applications. Suresh et al. [23] established a strong method for trash volume estimate using a deep neural network and ball pivot point surface reconstruction.

Models and algorithms designed for a particular phase of the waste management process are used in the aforementioned study. However, all of the identification, classification, and volume estimate procedures must be integrated into a single management system architecture in order to allow an automated waste system. In this paper, we provide a novel approach that combines all waste management practices into a single framework. We improve the models and build an application for mobile devices. The following sections provide details on our novel framework's data preparation, methodology, application, and results.Solid waste problems include those related to its origins, composition, disposal, recycling, and valuation. 2018 via panelAbdul-Shafy HusseinS.M. Mona MansouSolid waste disposal is a major and widespread problem in many industrialized and developing countries, both in urban and rural settings. Municipal solid waste (MSW) collection and disposal is one of the key problems affecting urban settings in most countries today. Administration of MSW Solutions that are economically viable, technically practicable, socially and legally acceptable, and ecologically benign are needed.

"A review on source-separated municipal solid waste automated sorting for recycling" 2016 Contributed by Atul Thakur, Subrata Hait, and Sathish Paulraj Gundupalli 3. Before recycling becomes a crucial part of managing municipal solid waste (MSW), it is important to separate recyclable items from source-separated MSW. In an effort to improve recycling's overall efficacy, scientists have been experimenting with automated sorting techniques. The latest advancements in source-separated MSW automated sorting and recycling technologies—including physical processes, actuators, and sensors—are examined in this article. It also covers issues with autonomy and control. "Impact of particle size and shape on plastics mixture jigging separation," 2015 Fernando Pita 1, Ana Castilho 2. Plastics are used in a broad variety of applications because of their great flexibility and beneficial properties including affordability, durability, and lightness. As a consequence, the production of plastic trash is continuously increasing, making it one of the main types of municipal solid waste. Most plastic materials may be recycled, however doing so requires sorting the different types of plastic. The purpose of this research was to evaluate the jig's ability to separate bi-component plastic mixtures. The six granular plastics utilized in this experiment were polystyrene (PS), polymethyl methacrylate (PMMA), polyethylene terephthalate (PET-S, PET-D), and polyvinyl chloride (PVC-M, PVC-D). Plastic mixes were jigged in a Denver mineral jig in the lab. The results showed that the caliber of the jigging The combination, variations in densities, and the size and form of the particles all affect how separated the particles are."Intelligent processing of solid waste using optical sensor-based sorting technology," 2010 Jiu Huang, Zhengfu Bian, and Thomas Pretz Every Writer Solid waste is consistently collected in a range of forms. They are disassembled, classified, and processed at solid waste treatment facilities. Sorting is the stage in these procedures that establishes whether something may be recycled or used again. Conventional sorting methods, such as magnetic sorting and eddy current sorting, are only able to fully process a limited number of certain waste combination components, such as the separation of ferrous and non-ferrous metals. Given that separators and waste particles have complementary force fields. The solid particles' hues, shapes, and other attributes However, texture traits would not be considered sorting criterion since there would not be a strong enough force field between these qualities and separators. This study developed and implemented an indirect sorting method based on optical sensors and a mechanical separation mechanism.

In the year 2020, "Advanced waste-splitting by sensor-based sorting on the example of the MTPlant oberlaa," Janusz Bobulski and Mariusz Kubanek The management of waste is a problem for the whole planet. The plastic waste may be automatically selected for disposal on sorting lines in enterprises using computer vision methods. Because manually sorting garbage is a time-consuming and costly job, scientists create and investigate automated sorting systems to boost the overall efficacy of the recycling process.

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"the enhancement of the grade of the mixed recycled aggregates from using technology to filter out near-infrared construction and demolition waste," Oliver Lambert, InigoVegas, Peter Nielsen, Kris Broos, and Amia Lisbon in 2015 additionally Recycled aggregates with the greatest purity are required for high-end building applications like concrete in order to provide the best possible technical and environmental performance. Gypsum, organic material, and autoclaved aerated concrete (AAC) are the main contributing factors to the deterioration of recycled aggregates suitable for use in premium applications. This study investigates how Near Infrared (NIR) sorting technology might improve the quality of mixed recycled aggregates. Mixed recycled aggregate samples from many EU countries, including Germany, Sweden, Spain, and Italy, were used for the testing.

The investigation into "Interpretability of fuzzy systems applied to nonlinear modelling and control" 2017 Krzysztof Cpalka Due to these drawbacks, fuzzy systems arise in a number of situations, including the difficulty to ensure their interpretability in many real-world scenarios. If interpretability is not the primary concern, we may consider using methods from the "black box" category, like as artificial neural networks with a teacher. However, if interpretability is the primary concern, then certain techniques and algorithms need to be developed.

3 PROPOSED WORK

As more people migrate into our nation, more trash is produced by homes, hospitals, shops, and marketplaces. Errors in waste management may affect the environment and cause illness in humans. With this initiative, anyone may share films of rubbish in cities and on the streets.

Our system will use a program called YOLO to look for and collect trash from these videos. When it finds trash, it will communicate its location to the waste management staff. It will also provide the exact location (using latitude and longitude data) where the video was uploaded by its maker. In this approach, the individual who submitted the video would help the trash management personnel by giving them important information regarding the location of the rubbish.

is located.We want to employ technology to help manage waste and improve everyone's quality of life in cleaner, healthier communities.

Better disposal of waste: The technology is designed to facilitate faster and more efficient garbage collection and disposal by recognizing waste and promptly notifying the waste management staff. As a consequence, cities may become cleaner, enhancing the standard of living for residents.immediate information The real-time information on the locations of garbage provided by the technology allow waste management staff to plan their collection routes and prioritize their tasks appropriately.

reduction of health hazards By quickly detecting and eliminating trash, the technique may help reduce the likelihood of health problems associated with rubbish, such as the spread of sickness or polluting water sources.

Increasing participation from the public Allowing uploading allows users to

The method may help increase public participation in and knowledge of waste management programs.

Development that is long-term This strategy may support the development of a more sustainable, healthy, and clean environment. A key element of sustainable development is efficient waste management.

It reduces the likelihood that hardware failures may result in data loss.health awareness the importance of being healthy.

benefits of being instantaneous and real-time, as well as suitable for mass data processing. The sensitivity, spatial resolution, and accuracy of the forecast result have all improved.

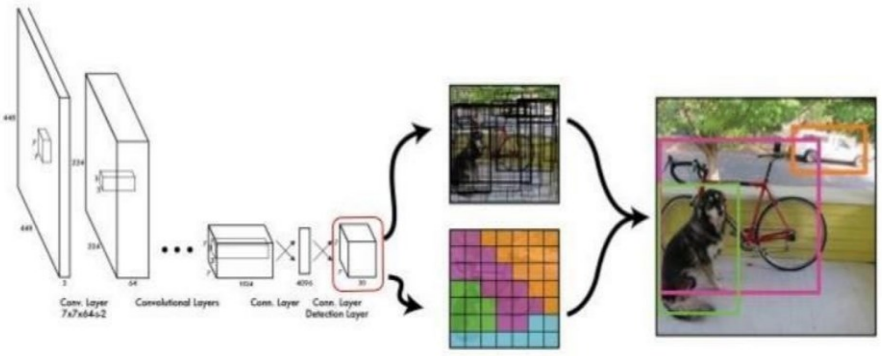

Fig: Architecture

4 METHODOLOGIES

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OPENCV

OpenCV is a well-known open-source toolkit for computer vision and machine learning. It provides a range of tools and techniques for object identification and recognition, processing of pictures and videos, and machine learning. Although OpenCV has bindings for Python, Java, and MATLAB, it is primarily built in C++. The cv2 Python bindings provide an easy-to-use interface for incorporating OpenCV into Python applications. OpenCV supports a wide range of image and video formats in addition to providing tools for image processing tasks including image filtering, edge detection, and picture segmentation. In addition, OpenCV provides advanced methods for object identification and detection, including feature matching, object tracking, and face recognition.One of the main benefits of OpenCV is support for. computer-based education. Among the machine learning models that may be trained and used using the library's resources are support vector machines (SVMs), decision trees, and neural networks. Projects like object identification, categorization, and image segmentation may be handled using these technologies. All things considered, the OpenCV library is robust and adaptable for computer vision and machine learning. It is a vital tool for programmers in fields like robotics, automation, and computer vision since it provides a wide variety of tools and techniques for object identification and recognition, machine learning, and image and video processing.

NUMPY

The Python library NumPy (Numerical Python) supports large, multi-dimensional arrays and matrices and provides a range of mathematical procedures for working with these arrays. Since its original presentation in 2005, it has developed into one of the most widely used libraries in the Python environment.NumPy can handle large arrays of data considerably more efficiently than pure Python programs since it is built on C and Fortran. It also provides many functions for performing complex mathematical operations on arrays, such as random number generation, Fourier transformations, and linear algebraic operations. One of NumPy's main benefits is its ability to manage large datasets efficiently. Compared to pure Python programs, it can perform operations on datasets with millions of rows and columns much more quickly. This makes it a popular choice for data processing and scientific computing. NumPy also provides a range of tools for working with arrays, including those for indexing, slicing, and reshaping. It is a versatile tool with applications in research and engineering as it integrates nicely with other Python libraries such as Matplotlib and pandas. In summary, NumPy is a powerful and versatile Python tool for working with arrays and performing mathematical operations. Its efficacy and versatility make it a popular choice for many scientific and engineering applications.

It is the fundamental scientific computing Python package. It has many qualities, among them the following vital ones:

Complex functions for N-dimensional arrays that are efficient for broadcasting

Tools for integrating C/C++ and Fortran code Practical knowledge of random numbers, Fourier transform, and linear algebra Apart from its obvious scientific uses, NumPy is a useful multi-dimensional general information container as well. NumPy can swiftly and easily connect with a broad number of databases since it can declare any data-type.

MATPLOTLIB

Publication-quality graphics may be produced in a variety of physical forms and in cross-platform interactive environments using the Python 2D plotting package Matplotlib. Matplotlib may be used with four graphical user interface toolkits, Python and IPython shells, Jupyter Notebooks, web application servers, and Python scripts. The goal of Matplotlib is to simplify complex ideas and make them practicable. Plots, histograms, power spectra, bar charts, error charts, scatter plots, and more may be made with a few lines of code.For examples, see the thumbnail galleries and sample graphs. When used with IPython, the pyplot module provides a rudimentary graphing interface akin to MATLAB. For the advanced user, there are two ways to manage parameters such as axis properties, font settings, and line styles: an object-oriented interface or a collection of MATLAB-friendly functions.The Python data visualisation toolkit Matplotlib offers a range of tools to assist you in creating excellent plots, charts, and graphs. Since its initial development by John D. Hunter in 2003, it has matured into one of the most widely used data visualisation frameworks in the Python environment. Matplotlib provides a variety of functions for creating several kinds of plots, including line, scatter, and bar plots, among others. It also provides possibilities for customizing charts to appear precisely the way you want them to by changing their colors, labels, and axis scales.

Matplotlib is built with the help of Because NumPy is employed, it can handle large arrays of data with effectiveness. Because it integrates nicely with other Python tools like pandas, it is a widely-liked choice for data visualisation in scientific and technical applications. One of the main advantages of Matplotlib is its ability to produce plots of publishable quality. With the range of formatting choices and plot layout features it provides, users may create plots that meet the requirements for scientific publications and presentations. Matplotlib is an all-around reliable and flexible Python tool for data visualization. It has a wide range of features and tools for creating excellent plots, making it a popular choice for many scientific and professional applications.

TKINTER

TK The Python graphical user interface (GUI) building library INTER Tkinter. It provides a range of widgets and building blocks for windows, menus, buttons, text fields, and other graphical user interface components. Tkinter is based on the Tk GUI toolkit, which was developed in the late 1980s as part of the Tcl programming language. The Tk toolkit provides a variety of cross-platform widgets, some of which are compatible with Python.

Tkinter is included with most Python installations, thus there's typically no need to install any other software to utilize it. Its ease of use and ease of learning makes it a popular choice for developing basic graphical user interface applications. A wide range of graphical user interface (GUI) components, including windows, checkboxes, radio buttons, scrollbars, buttons, labels, textboxes, and menus, are available with Tkinter. parts to build a range of programs, from simple calculator programs to more complex ones with several windows and state-of-the-art graphics.

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In addition to its built-in widgets, Tkinter offers a number of layout managers that allow you to organize widgets in a window. These, which simplify the construction of complex layouts, include the pack, grid, and location managers.Tkinter also provides event-driven programming, which enables your application to respond to keystrokes and button pushes from the user. Event handlers are widget-specific extensions that allow you to define what happens when a certain event occurs. Tkinter is an all-around reliable and approachable Python framework for creating graphical user interfaces. Its wide range of widgets, layout managers, and event-driven features make it a popular choice for developing graphical user interface programs.

PYTTSX3

The Pyttsx3 package in Python is used to translate text to voice. It provides a cross-platform interface for the installed Text-to-Speech (TTS) engines on the host system. Python programmers may include voice output into their programs and allow users to interact with the software by speaking instructions or hearing feedback by using pyttsx3.

Many TTS engines, including Microsoft Speech API (SAPI), eSpeak, and Google Text-to-Speech, are supported by the free and open-source Pyttsx3 package. The library provides a simple and intuitive API for text-to-speech conversion, which consists of creating a TTS engine object, modifying its voice and rate parameters, and then using some text to be said to invoke its say method. Pyttsx3 also provides a variety of event listeners that may be used to monitor the progress of voice synthesis and manage errors or pauses in the conversion process. Additionally, the library provides capabilities for altering word pronunciation and enhancing voice output with pauses and emphasis.All things considered, the pyttsx3 package is useful for giving Python programs voice output. Its ease of use and compatibility for many TTS engines make it a versatile and efficient option for developers looking to create speech-enabled apps.

MySQL

One popular open-source relational database management system (RDBMS) that helps users store, organize, and retrieve data efficiently is called MySQL. The MySQL Connector module, a Python package that enables Python programs to access MySQL databases, must be imported in order to use MySQL in Python.The MySQL Connector module provides a range of features for connecting to and working with MySQL databases. Supported are standard SQL queries, stored procedures, and transactions. Important features of MySQL in Python consist of:

Making use of a MySQL database link The MySQL Connector module provides methods for connecting to a MySQL database using a username and password.

executing SQL queries After establishing a connection, users may use the execute() method provided by the MySQL Connector module to perform SQL queries. This function takes in a SQL query string as input and returns the results of the query.

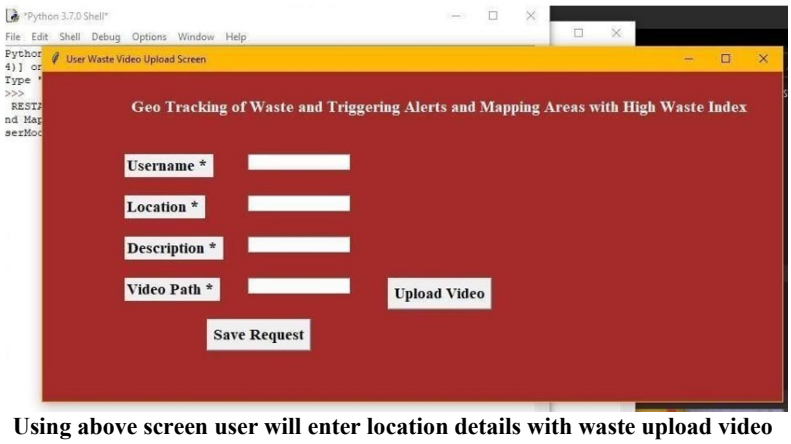
Controlling the results To get the results of a SQL query, utilize the fetchone() and fetchall() procedures. Fetchone() retrieves only one row from the result set, while fetchall() returns every row in the result set.

Data insertion: Users of the MySQL Connector module may additionally enter data into a MySQL database by using the execute() function and an input INTO SQL command.

Transactions allow several SQL statements to be concatenated into a single atomic operation. The MySQL Connector module provides a number of transaction management functions, including the commit() and rollback() functions.

Overall, MySQL in Python makes working with relational databases simpler and more adaptable. Because of its support for SQL queries and transactions, it is a well-liked choice for a wide range of applications, from simple data store and retrieval to complex data analysis and report production.

5.RESULTS AND DISCUSSION SCREENSHOTS



Using above screen user will enter location details with waste upload video

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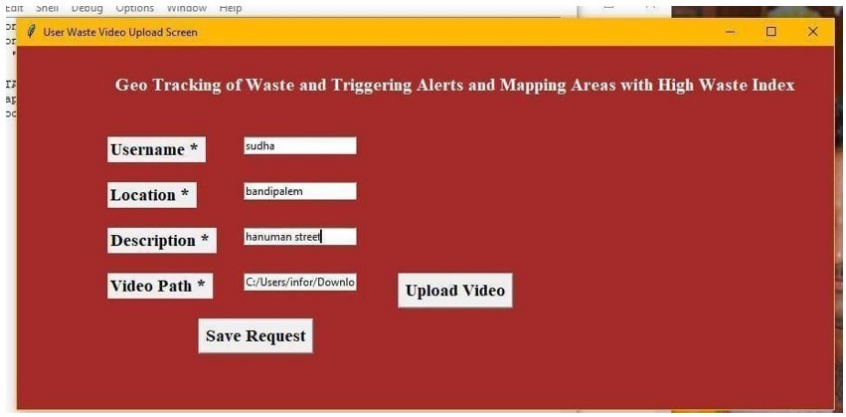
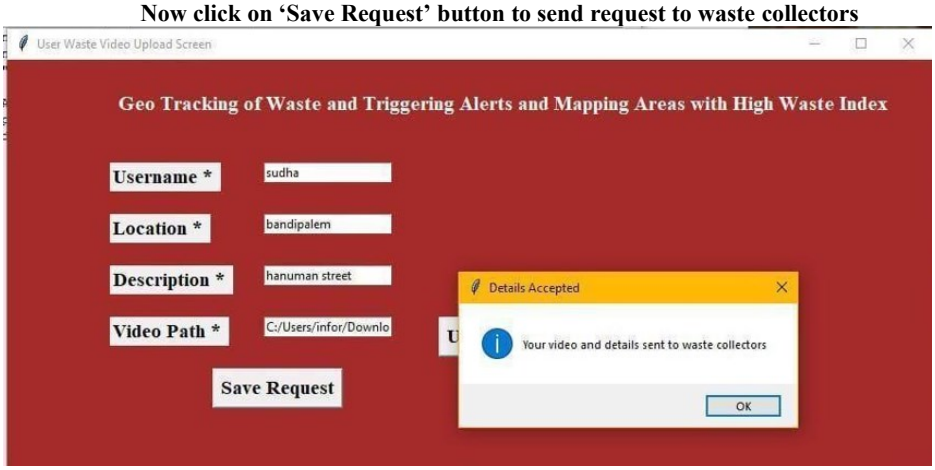
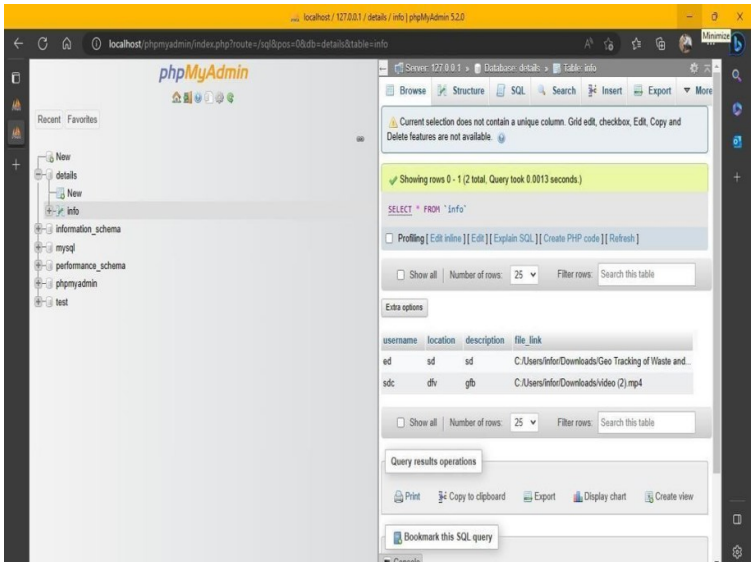


Now click on 'Save Request' button to send request to waste collectors





In above screen we can see user request details saved. Now close this application and run waste collector module by double click on 'Run_Waste_Collector.bat' file to get below screen

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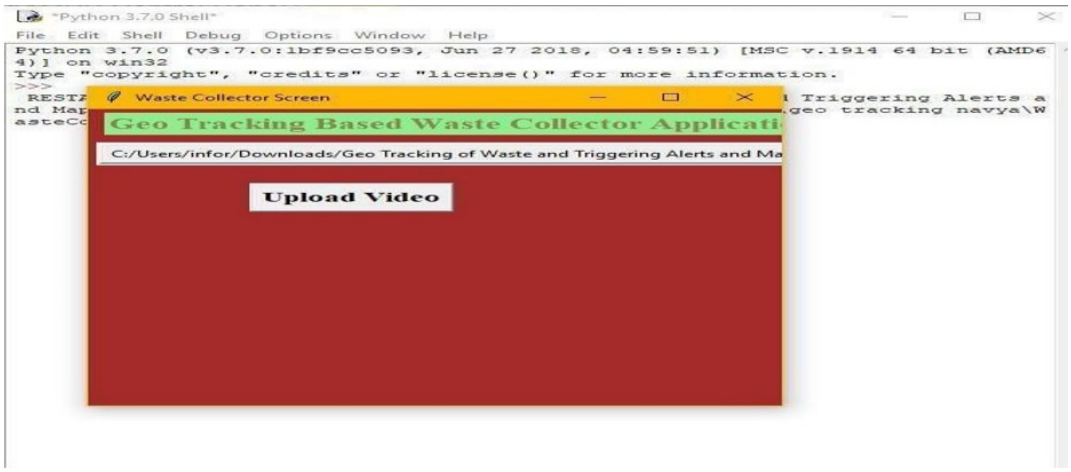

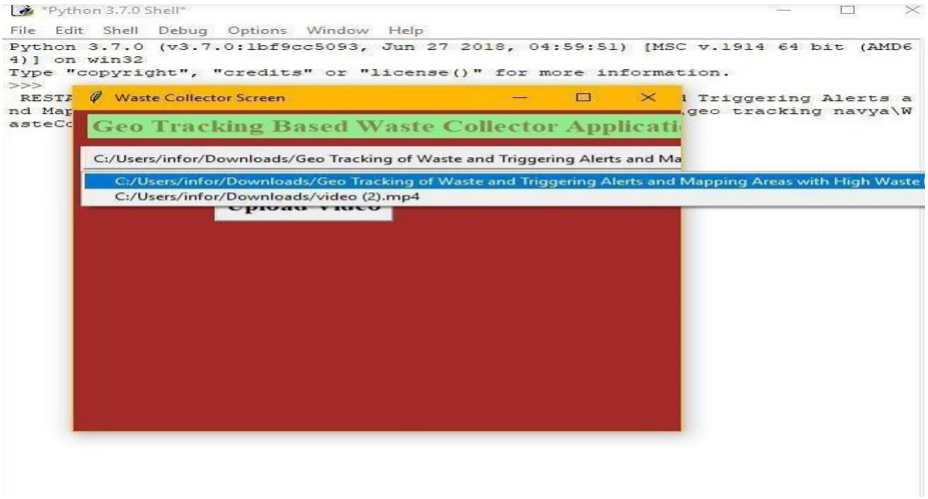

In above screen I am uploading one video and after uploading video will get below screen

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In the above video if the waste is present that waste can be detected with bounding box and also a small voice alert is triggered "there is a waste " from the OS

6.CONCLUSION

Model ideas and performance are modified in response to changing environmental conditions. It's critical to comprehend the factors that influence the model in order to make certain decisions. Regarding the interpretability research on plastic waste detection models, there is now a substantial gap in this field that has to be addressed. It is possible to identify between several forms of plastic using deep learning models. When it comes to predicting outcomes based on incoming data, these algorithms remain a "black box."

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