DIGITAL VIDEO RECORDER

A Project Report submitted in partial fulfillment of the requirements

for the award of the Degree of

BACHELOR OF SCIENCE

IN

COMPUTER SCIENCE

(ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

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CERTIFICATE

This is to certify that the project report, entitled **“DIGITAL VIDEO RECORDER”** submitted to the **BHARATHIAR UNIVERSITY, COIMBATORE** , in partial fulfillment of the degree of **BACHELOR OF SCIENCE in COMPUTER SCIENCE(ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)** is record of original work done by **PRIYADHARSHINI S (Reg No: 2328K0086)** during the period of study in the **DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE at VET INSTITUTE OF ARTS AND SCIENCE (CO-EDUCATION) COLLEGE, ERODE**, affiliated to Bharathiar University, Coimbatore, under my supervision, guidance and that project work has not formed the basis for the award of any Degree/ Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

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Submitted to the University Project Viva-Voce Examination held on

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DECLARATION

I hereby declare that this project entitled **"DIGITAL VIDEO RECORDER"** submitted to the **BHARATHIAR UNIVERSITY, COIMBATORE**, in partial fulfilment of the requirements for the award of the Degree of **BACHELOR OF SCIENCE in COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)** is a record of original research work done by me during the period under the supervision and guidance of **Mr.M.CHANDRU**, Assistant Professor, Department of Artificial Intelligence and Data Science, **VET INSTITUTE OF ARTS AND SCIENCE (CO- EDUCATION) COLLEGE, ERODE**, and this project work has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

Place: Erode Signature of the Candidate

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CONTENT

ABSTRACT

A Digital Video Recorder (DVR) with Object Recognition and Keyword-Based Identification is an intelligent surveillance system designed to enhance security and monitoring. This system integrates computer vision and deep learning to detect and classify objects captured through a camera in real time. By leveraging advanced models such as YOLO (You Only Look Once) and SSD (Single Shot MultiBox Detector), the DVR can accurately identify objects of interest, including weapons, vehicles, and other predefined items. A keyword-based search mechanism allows users to quickly retrieve relevant footage or trigger automated alerts based on terms like "knife," "vehicle," or "gun," reducing the need for manual video review.

One of the key advantages of this system is its ability to minimize manual oversight. Traditional surveillance methods require security personnel to continuously monitor video feeds, which is time-consuming and prone to human error. With automated object detection and keyword-based search, the system significantly reduces human intervention by filtering through vast amounts of footage and highlighting critical events. This not only enhances efficiency but also improves response times in high-risk situations by providing instant notifications when suspicious objects are detected.

By reducing reliance on manual supervision, this intelligent DVR system enhances security operations and situational awareness. It helps security personnel focus on responding to critical incidents rather than constantly monitoring video feeds. The implementation of such an automated, AI-powered surveillance solution can revolutionize threat detection, ensuring a proactive and efficient approach to safety and secure.

1. INTRODUCTION

1.1 ABOUT THE PROJECT

The project envisions the creation of a cutting-edge Digital Video Recorder (DVR) system, fundamentally transforming conventional surveillance practices through the seamless integration of artificial intelligence. This intelligent system leverages the power of computer vision and deep learning to achieve real-time object recognition, moving beyond simple motion detection to sophisticated classification of items within video streams. By employing state-of-the-art models like YOLO (You Only Look Once) and SSD (Single Shot MultiBox Detector), the DVR can accurately identify and categorize predefined objects of interest, such as weapons, vehicles, and individuals, providing a level of situational awareness previously unattainable.

A cornerstone of this project is the implementation of a robust keyword-based search mechanism. This feature empowers users to swiftly retrieve specific video segments by simply entering relevant terms, like "knife," "vehicle," or "gun," into the system. This capability significantly reduces the time and effort required for manual video review, which is a common bottleneck in traditional surveillance systems. Furthermore, the system is designed to trigger automated alerts based on these keyword searches or detected objects, ensuring immediate notification of potentially critical events.

The primary advantage of this intelligent DVR lies in its ability to dramatically minimize manual oversight. Traditional surveillance methods rely heavily on human operators, who must continuously monitor video feeds, a task that is both tedious and prone to human error. This project addresses this limitation by automating the process of object detection and video retrieval, allowing security personnel to focus on responding to actual incidents rather than passively observing video.

By reducing the reliance on manual supervision, the intelligent DVR system significantly enhances security operations and overall situational awareness. It enables security personnel to prioritize their efforts, focusing on responding to critical incidents rather than being overwhelmed by the sheer volume of video data. This proactive approach to surveillance not only improves response times but also reduces the potential for human error, ensuring that critical events are not missed.

The implementation of such an automated, AI-powered surveillance solution has the potential to revolutionize threat detection. By providing instant notifications and enabling rapid video retrieval, the system allows for a more proactive and efficient approach to safety and security. This technology can be deployed in a variety of settings, including public spaces, commercial buildings, and residential areas, providing a comprehensive and reliable security solution.

Beyond its immediate security applications, this project opens up possibilities for further advancements in video analytics. Future iterations could incorporate facial recognition, behavioral analysis, and anomaly detection, further enhancing the system's capabilities. Additionally, the integration of cloud-based storage and processing could enable scalability and remote access, making the system even more versatile and adaptable to evolving security needs. This project represents a significant step towards creating a more intelligent and responsive surveillance infrastructure.

1.2 ORGANIZATION PROFILE

VET Institute of Arts and Science (Co-Education) College (VETIAS) is a prestigious educational institution that strives to provide a unique and transformative learning experience to its students .As a part of the Vellalar family, VET Institute of Arts and Science (Co-Education) College upholds the same values of academic excellence, community service, and commitment to social justice that the family has been known for over the years.

VET Institute of Arts and Science (Co-Education) College offers a range of academic programs that are designed to foster intellectual curiosity, critical thinking, and creativity among students. The institution places a strong emphasis on collaborative learning, encouraging students to work together in order to develop their ideas and learn from one another. At the same time, individual intellectual development is also encouraged, with students being provided with ample opportunities to pursue their own interests and passions.

VET Institute of Arts and Science (Co-Education) College is also committed to promoting diversity and Inclusivity, and values the diverse perspectives and experiences that students bring to the institution. By providing a learning environment that respects and celebrates these differences, VET Institute of Arts and Science (Co-Education) College prepares students to become ethical leaders with a truly global perspective.

The institution also recognizes the importance of service to the larger community, and encourages its students and faculty to engage in meaningful service projects that make a positive impact on society. By fostering a sense of social responsibility and civic engagement among its students, VET Institute ofArts and Science (Co-Education) College prepares them to be active and engaged citizens who are committed to making a difference in the world.

1.3 SYSTEM SPECIFICATION

1.3.1 HARDWARE CONFIGURATION

Processor	:Intel(R)Core(TM)i5-6200UCPU@2.30GHz2.40GHz
Ram	:16.0 GB (7.89 GB usable)
Monitor	:Any
Hard Disk	:1 TB
Mouse	: Scrolling Mouse

1.3.2 SOFTWARE SPECIFICATION

Operating System	:Window 11
Front End	:HTML5 , Bootstrap, Jquery
Back End	: Node JS,Express JS
Database	: Elastic Search

FEATURES OF HTML

FRONT END:-

HTML5 is the fifth and latest version of the Hypertext Markup Language (HTML), and it brings numerous improvements and new features over its predecessors, making it the modern standard for creating web content.

HTML5 was developed to address the evolving needs of web development, supporting more dynamic, interactive, and multimedia-rich applications, while maintaining compatibility across various devices and platforms.

FEATURES OF BOOSTRAP

Bootstrap is a popular open-source front-end framework that helps developers build responsive and mobile-first websites and web applications quickly and easily.

It was originally developed by Twitter and has since become one of the most widely used frameworks in web development due to its ease of use, flexibility, and comprehensive set of design elements.

FEATURES OF JQUERY

jQuery is a fast, lightweight, and feature-rich JavaScript library designed to simplify tasks like HTML document manipulation, event handling, animation, and Ajax interactions

It was created to make web development easier by providing an easy-to-use API that works across different browsers, reducing the amount of code developers need to write.

BACK END:-

Node.js is a powerful, open-source runtime environment that allows developers to run JavaScript on the server-side. Built on the V8 JavaScript engine (the same engine that powers Google

Chrome), Node.js provides a non-blocking, event-driven architecture, which makes it highly efficient for building scalable network applications.

Express.js is a minimal, fast, and flexible **Node.js** web application framework that simplifies the development of web and mobile applications.

It provides a robust set of features for building dynamic web applications and APIs. Express is one of the most widely used frameworks in the Node.js ecosystem because of its simplicity and powerful functionality.

2. SYSTEM STUDY

2.1 EXISTING SYSTEM

The existing system for Digital Video Recorders (DVRs) primarily consists of traditional analog and digital recording methods. Here's how it functions in different domains:

HOME ENTERINMENT DVRs

Analog VCRs (Older System): Used cassette tapes for recording, limited storage, and lacked advanced playback features.

Set-Top Box DVRs: Provided by cable/satellite providers (e.g., TiVo, Dish Hopper) to record live TV.

Cloud-Based DVRs: Modern streaming services like YouTube TV and Hulu offer cloud DVRs, eliminating the need for physical storage.

Security & Surveillance DVRs

Standalone DVRs: Connected to analog CCTV cameras, recording video onto built-in hard drives.

Hybrid DVRs: Support both analog and IP cameras, providing a transition to digital surveillance.

Network Video Recorders (NVRs): Used for IP-based cameras, offering better video quality and cloud integration.

Broadcasting & Professional Use

Broadcast DVRs: Used in TV studios for content storage and time-shifted broadcasts.

Enterprise Video Management Systems: Feature-rich solutions integrating AI analytics, cloud storage, and real-time monitoring

2.1.1 DRAWBACKS

Traditional camera video footage has several limitations, particularly when compared to AI-enhanced or smart surveillance systems. Below are some key drawbacks:

Limited video quality

Low Resolution in Older Cameras – Traditional cameras may capture low-quality footage, making it hard to identify details like faces or license plates.

Poor Performance in Low Light – Standard cameras without night vision or IR sensors struggle in low-light conditions, leading to unclear images.

Frame Rate Issues – Some cameras record at low FPS (frames per second), causing blurry or choppy playback, making it difficult to analyze fast-moving objects.

Large storage requirements

Uncompressed or Poorly Compressed Video – Without advanced H.264, H.265, or AI-based compression, video files are large and take up excessive storage.

Redundant Footage Recording – Standard cameras record continuously, even when nothing important is happening, leading to wasted storage.

Lack of intelligent Analytics

No Motion Detection – Basic cameras record everything without distinguishing between important events and irrelevant activity.

No Object or Face Recognition – Unlike AI-based systems, general cameras cannot recognize faces, license plates, or objects, making searches difficult. No Behavioral Analysis – Cannot detect unusual activity, like someone loitering or a suspicious object being placed.

Poor security and Data protection

Footage Can Be Easily Tampered With – Lacks encryption or tamper-proof recording, making video evidence less reliable in legal cases.

No Secure Remote Access – Many traditional systems don't support encrypted remote viewing, making them vulnerable to cyber threats

No Redundancy or Backup – If the storage drive fails, all footage can be lost permanently.

Manual monitoring & Management

Requires Constant Human Supervision – Unlike smart cameras, traditional systems lack automated alerts and require manual review.
Difficult Footage Retrieval – Searching for a specific event is time-consuming due to the lack of AI-powered indexing.
No Integration with Smart Devices – Cannot connect with IoT, alarms, or mobile notifications for real-time

2.1.2.PROPOSED SYSTEM

Video Input and Preprocessing:

Camera Input: Accepts video streams from one or more cameras.

Video Decoding: Decodes the incoming video streams into individual frames.

Frame Preprocessing: Performs necessary preprocessing steps, such as resizing, normalization, and noise reduction, to optimize frames for object detection.

Object Detection and Recognition:

Object Detection Model: Utilizes a pre-trained deep learning model, such as YOLOv5, YOLOv8, or SSD, for real-time object detection.

Object Classification: Classifies detected objects into predefined categories (e.g., person, vehicle, weapon, etc.).

Object Tracking: Tracks the movement of detected objects across frames to maintain their identity and location.

Keyword-Based Identification and Alerting:

Keyword Database: Stores a list of predefined keywords associated with specific object categories (e.g., "knife" for weapon, "sedan" for vehicle).

Keyword Matching: Compares detected object labels with the keyword database to identify relevant events.

Alerting System: Generates real-time alerts (e.g., email, SMS, push notifications) when a keyword match is found.

Metadata creation: creates metadata for each detected object, including the time stamp, object type, and location of the object within the frame.

Video Storage and Retrieval:

Video Storage: Stores the encoded video streams along with the associated metadata (object detection results, timestamps, keywords).

Keyword-Based Search: Implements a search mechanism that allows users to retrieve video footage based on keywords, timestamps, or object categories.

Index creation: creates index of the metadata to increase search speed.

User Interface:

Real-time Video Display: Displays live video feeds with overlaid object detection bounding boxes and labels.

Search Interface: Provides a user-friendly interface for searching and retrieving stored video footage.

Configuration interface: Allows the user to change the models, keywords, and other system parameters

2.2.1 FEATURES

Real-time Object Detection:

Uses computer vision and deep learning models (e.g., YOLO, SSD) to analyze video streams in real-time.

Identifies and classifies objects within the camera's field of view.

Object Classification:

Categorizes detected objects into predefined classes (e.g., weapons, vehicles, people, specific items).

Customizable object libraries to adapt to specific security needs.

High Accuracy and Speed:

Leverages optimized deep learning models to ensure accurate and fast object detection.

Minimizes false positives and missed detections.

Region of Interest (ROI) Definition:

Allows users to define specific areas within the video feed for focused object detection.

Reduces processing load and improves accuracy in critical zones.

Keyword-Based Identification and Search Features:

Keyword Tagging:

Automatically tags video footage with keywords based on detected objects (e.g., "knife detected," "vehicle approaching").

Enables efficient indexing and retrieval of relevant video segments.

Keyword Search Functionality:

Provides a user-friendly interface for searching video footage using keywords.

Quickly locates specific events or incidents based on defined search terms.

Enhanced Surveillance and Management Features:

Reduced Manual Oversight:

Automates video analysis, minimizing the need for constant human monitoring.

Frees up security personnel to focus on other critical tasks.

Improved Response Times:

Instant alerts and keyword-based search enable rapid identification and response to security threats.

Enhances situational awareness and proactive threat detection.

Scalability:

Designed to handle multiple camera inputs and large volumes of video data.

Adaptable to different security environments and requirements.

Integration Capabilities:

Integration with other security systems such as alarm systems, access control, and other systems.

3. SYSTEM DESIGN AND DEVELOPMENT

3.1 FILE DESIGN

User Page

HTML Templates

index.html: Template for the user's homepage, displaying personalized content, recent
activity, and options to solve new problems or access educational resources.

index.html: Template for the user's profile page, displaying account information, preferences,
and options to manage account settings.

problempage.html: Template for displaying a list of solved problems, including details such as
problem statements, solutions, and timestamps.

Static Files

style.css: CSS style sheet for styling user-facing pages and elements, ensuring consistency and aesthetics.

Documentation and Resources

README.md: Mark down file containing documentation for user-facing features, usage
guidelines, and helpful tips for users.

requirements.txt: Directory containing additional resources for users, such as tutorials,
examples, and links to external educational materials.

Admin Page

HTML Templates

index.html: Template for the admin dashboard, displaying summary statistics, recent activities,
and options to manage users, problems, and system settings.

problempage.html: Template for managing mathematical problems,
displaying a list of problems, their details, and options to edit or delete problems.

3.2 INPUT DESIGN

Video Input and Preprocessing:

Camera Input: Accepts video streams from one or more cameras.

Video Decoding: Decodes the incoming video streams into individual frames.

Frame Preprocessing: Performs necessary preprocessing steps, such as resizing, normalization, and noise reduction, to optimize frames for object detection.

Object Detection and Recognition:

Object Detection Model: Utilizes a pre-trained deep learning model, such as YOLOv5, YOLOv8, or SSD, for real-time object detection.

Object Classification: Classifies detected objects into predefined categories (e.g., person, vehicle, weapon, etc.).

Keyword-Based Identification and Alerting:

Keyword Database: Stores a list of predefined keywords associated with specific object categories (e.g., "knife" for weapon, "sedan" for vehicle).

Keyword Matching: Compares detected object labels with the keyword database to identify relevant events.

Video Storage and Retrieval:

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Keyword-Based Search: Implements a search mechanism that allows users to retrieve video footage based on keywords, timestamps, or object categories.

Index creation: creates index of the metadata to increase search speed.

User Interface:

Real-time Video Display: Displays live video feeds with overlaid object detection bounding boxes and labels.

Search Interface: Provides a user-friendly interface for searching and retrieving stored video footage.

Configuration interface: Allows the user to change the models, keywords, and other system parameters.

Motion detection & Object recognition

A **keyword-based object detection** system further enhances DVR functionality. This feature allows the DVR to analyze video feeds and detect specific objects based on predefined keywords. For example, security DVRs can be programmed to recognize objects like "person," "vehicle," or "package," enabling smart alerts and automated actions.

In home entertainment, this feature can assist in indexing and searching for specific content within recorded media. By combining motion detection and object recognition, DVRs significantly improve their usability in surveillance and automated monitoring systems.

3.3 OUTPUT DESIGN

Output Design for a Digital Video Recorder (DVR) System

The output design of a Digital Video Recorder (DVR) is critical in ensuring smooth playback, real-time monitoring, data retrieval, security alerts, and user interaction. The DVR processes and delivers recorded video and audio through various output channels, allowing users to access and manage footage effectively. With advancements in technology, modern DVRs provide high-definition output, smart surveillance analytics, remote accessibility, and cloud integration, making them highly efficient in both entertainment and security applications.

1. Live Video Feed with Object Detection Overlay

The DVR system features a real-time video feed that captures footage from connected cameras. Detected objects, such as knives, vehicles, and firearms, are automatically highlighted with bounding boxes and labeled with confidence scores. To enhance clarity, the system employs a color-coded alert system—red for weapons or high-risk items, yellow for suspicious activities like unauthorized vehicle entry, and green for general objects such as parked cars. This allows security personnel to quickly identify potential threats without constantly monitoring the feed.

2. Keyword-Based Search & Filtering

To facilitate quick retrieval of relevant footage, the system includes a keyword-based search function. Users can enter predefined keywords like "knife," "vehicle," or "suspicious activity" to find specific events in the recorded footage. The search results display timestamped video thumbnails that allow instant playback. Additional filtering options, such as date, time range, camera location, and object confidence level, enable users to refine their searches and quickly locate critical moments without manually reviewing hours of footage.

Motion Detection & Object Recognition Output

Modern DVRs are equipped with AI-powered motion detection and keyword-based object recognition, which generate intelligent outputs to improve security monitoring.

When motion is detected or a specific object (such as a person, vehicle, or package) is identified, the DVR can generate event-based notifications that alert users through mobile apps, emails, or alarms.

Additionally, automated search and tagging features allow users to quickly locate relevant footage based on detected keywords, significantly improving retrieval efficiency.

Some DVRs also provide smart surveillance analytics, such as heat maps and movement tracking, which help security personnel analyze activity patterns over time.

These outputs enhance the efficiency of video surveillance by providing automated, real-time insights into recorded events. Real-Time Display (Live View):

Video Feed:

- The primary display area showing the live video feed from the connected camera(s).
- Overlay of bounding boxes around detected objects.
- Labels indicating the identified object (e.g., "Person," "Vehicle," "Knife").
- Confidence scores for each object detection (e.g., "Knife: 92%").

Object Detection List (Sidebar/Overlay):

A dynamic list displaying the objects currently being detected.

- Each entry includes:
    - Object label.
    - Timestamp of detection.
    - Confidence score.
    - A small thumbnail of the detected object.
- Option to filter this list by object type (e.g., show only "Weapon" detections).

2. Search and Playback Interface:

Search Bar:

A text input field for entering keywords (e.g., "vehicle," "gun," "person in red").

Autocomplete suggestions based on detected objects and past searches.

Search Results:

A list of video clips matching the search criteria.

Each result includes:

Thumbnail of the clip.

Timestamp of the event.

List of detected objects and keywords.

A short preview of the clip.

Playback Controls:

- Standard video playback controls (play, pause, stop, fast forward, rewind).

3.4 SYSTEM DEVELOPMENT

3.4.1 DESCRIPTION OF MODULES

The development of the digital video recorder involves several modules

interconnected modules, each responsible for specific functionalities. Below is an overview of the main modules and their descriptions:

Camera detection module:-

The Camera Detection Module in a Digital Video Recorder (DVR) system is responsible for automatically detecting cameras, analyzing video feeds, identifying objects, and triggering alerts based on predefined keywords.

This module reduces the need for manual oversight, making security and monitoring more efficient and automated.

The Camera Detection & Video Input Module is a crucial component of a Digital Video Recorder (DVR) system that enables automatic detection, configuration, and management of video feeds from multiple cameras.

This module ensures seamless acquisition of video streams, allowing for real-time object detection, motion analysis, and event-based monitoring.

By integrating advanced network protocols, video processing techniques, and AI-based optimizations, this module reduces manual oversight, improves security, and ensures efficient video recording and surveillance.

OBJECT DETECTION & REGOGNITION MODULE :-

The Object Detection & Recognition Module is a critical component of a Digital Video Recorder (DVR) system that enables the identification, classification, and tracking of objects within the video feed. Using computer vision, deep learning, and AI-based algorithms, this module can detect and recognize humans, vehicles, animals, weapons, and other predefined objects in real-time.

This module enhances security, automation, and surveillance efficiency by reducing manual monitoring efforts and providing automated alerts and event-based triggers based on detected objects.

KEY FEATURES :-

Identifies objects like:

Humans (faces, body posture, clothing attributes)
Vehicles (cars, trucks, motorcycles, bicycles, license plates)
objects(guns, knives, explosives)
Animals (dogs, cats, wild animals for perimeter security)
Baggage & unattended objects (for security in public spaces)

MOTION DETECTION & TRACKING MODULE :-

The Motion Detection & Tracking Module within a DVR system is a critical component that enhances surveillance capabilities by automating the process of identifying and following movement within the video feed.

This module goes beyond simply recording continuous video, instead focusing on intelligently detecting and highlighting significant events.

Motion Tracking:
Once motion is detected, the tracking component follows the moving object within the video feed.

This involves algorithms that identify and maintain a "track" of the object's movement, even as it changes direction or speed.

Advanced tracking can include:

Object identification: Distinguishing between different types of moving objects (e.g., people, vehicles).

Trajectory analysis: Predicting the object's future path based on its current movement.

KEYWORD BASED ANALYSIS MODULE:-

The Keyword-Based Analysis & Classification Module within a DVR system represents a significant leap towards intelligent video surveillance, going beyond simple motion detection to provide context-aware analysis.

This module aims to extract meaningful information from video feeds by recognizing and classifying events based on predefined keywords and patterns. Here's a detailed description:

Keyword Definition:
Users can define specific keywords or phrases that represent events of interest.

These keywords can be related to objects (e.g., "vehicle," "person," "package"), actions (e.g., "entering," "leaving," "stopped"), or behaviors (e.g., "loitering," "abandoned").

Object Recognition and Classification:
The module employs object recognition algorithms to identify and classify objects within the video feed.

It can then associate these objects with the defined keywords. For example, it might identify a "vehicle" and then detect if it "stopped" for an extended period.

Behavioral Analysis:

This module can analyze patterns of behavior, such as:

Loitering: Identifying individuals who remain in a specific area for an extended period.

4. SOFTWARE TESTING AND IMPLEMENTATION

SOFTWARE TESTING

Camera Input and DVR Functionality:

Camera: The system starts with one or more cameras capturing video footage. These can be standard CCTV cameras, IP cameras, or even specialized cameras.

DVR: The DVR (Digital Video Recorder) handles the recording and storage of the video footage. Modern DVRs often have network connectivity and processing capabilities beyond basic recording.

Video Encoding: The video stream from the camera is encoded (e.g., H.264, H.265) to reduce file size for storage.

Object Detection and Identification (AI/Computer Vision):

Object Detection:

This is the first step, where the system identifies the presence of objects within the video frame. Algorithms like YOLO (You Only Look Once), SSD (Single Shot MultiBox Detector), or Faster R-CNN are commonly used.

These algorithms use deep learning models (Convolutional Neural Networks - CNNs) trained on vast datasets of images to recognize patterns and locate objects.

Once an object is detected, the system needs to identify what it is. This is done through object classification.

The detected object is passed to another CNN model that has been trained to categorize objects into specific classes (e.g., person, car, dog, cat, etc.)

The model outputs a label or name for the object, along with a confidence score indicating the certainty of the identification.

Display and User Interface:

Overlay: The identified object's name is typically displayed as an overlay on the video feed. This can be a text label or a bounding box with the object's name inside.

User Interface: The DVR's user interface allows users to view the live video feed, review recorded footage, and configure the object detection and identification settings.

4. Hardware Requirements:

Powerful Processor: Object detection and identification are computationally intensive, so the DVR needs a powerful processor (CPU or GPU) to handle the processing in real time.

Sufficient Memory: Adequate RAM is necessary for storing and processing video data and running the AI algorithms.

Storage: The DVR needs sufficient storage capacity to store the recorded video footage.

Network Connectivity: If cloud processing or remote access is required, the DVR needs reliable network connectivity.

IMPLEMENTATION

Installation Steps

To install Visual Studio Code (VSCode), follow the steps below based on your operating system:

Download VSCode:

Go to the official VSCode download page.

Click on the "Windows" download option. This will download an installer (.exe) file.

Run the Installer:

Locate the .exe file in your downloads and double-click it to launch the installer.

Follow the Installation Steps:

License Agreement: Agree to the license terms and click Next.

Install Location: Choose the install location or leave it as the default, and click Next.

Additional Tasks:

You may want to check options like "Add to PATH" and "Create a desktop icon" to make VSCode more accessible.

Click Next and then Install.

Launch VSCode:

Once the installation is complete, click the Finish button to launch VSCode.

5. CONCLUSION

This DVR system, designed for automated object detection and identification, significantly reduces the need for constant manual oversight. By leveraging real-time motion detection and sophisticated object recognition algorithms, the system efficiently captures and analyzes video footage, identifying objects and their associated locations.

This automation streamlines security monitoring, providing timely alerts and detailed records without requiring continuous human attention. The integration of keyword-based identification further enhances the system's accuracy and usability, allowing users to tailor the system to specific monitoring needs.

Ultimately, this DVR system offers a powerful solution for enhancing security and efficiency through intelligent video analysis, minimizing manual intervention and maximizing situational awareness.

In conclusion, the development of this automated object detection DVR system represents a significant advancement in video surveillance technology.

By automating the process of object identification and reducing manual oversight, this system enhances security, improves efficiency, and provides users with a powerful tool for monitoring and managing their environments. The system's adaptability and scalability make it suitable for a wide range of applications, from residential security to large-scale commercial surveillance, ultimately contributing to a safer and more secure environment.

FUTURE ENHANCEMENT

Keyword-Augmented Object Detection:

Semantic Object Attributes**:**

Beyond just identifying "car," the system will recognize attributes like "red car," "damaged car," or "car with a roof rack."

This could involve integrating natural language processing (NLP) to understand descriptive keywords and link them to visual features.

Action and Behavior Keywords:

The system will understand keywords related to actions, such as "person running," "package being delivered," or "vehicle turning."

This requires analyzing object motion and interactions over time.

Location-Based Keywords:

If the system has mapping data, it can associate keywords with specific locations, like "person near the back gate" or "vehicle in the loading zone."

Advanced Keyword Search and Filtering:

Natural Language Search:

Users will be able to search for video footage using natural language queries, like "show me all videos of a person wearing a blue jacket entering the building." The system will understand the intent of the query and retrieve relevant footage.

Complex Keyword Combinations:

Users will be able to combine multiple keywords and filters to refine their searches, like "show me all videos of a red car between 2 PM and 4 PM on Tuesday."

BIBILIOGRAPHY

REFERENCE:-

HTML5:

HTML5 is the latest major revision of the Hypertext Markup Language (HTML), the standard markup language for creating web pages.

Website References

1. W3Schools (https://www.w3schools.com/) - This website offers comprehensive tutorials and references for learning HTML.

BOOTSTAMP:

Bootstrap is highly customizable. You can easily modify the default styles and components to match your specific design requirements.

Website Reference

(Bootstrap Tutorial - GeeksforGeeks)

JQUERY: jQuery is a fast, small, and feature-rich JavaScript library. Its primary goal is to simplify HTML Document Object Model (DOM) manipulation, event handling, CSS animation, and Ajax. In essence, it makes it much easier to write JavaScript code that interacts with a webpage.

Website Reference: jQuery Tutorial

NODEJS:

Node.js is a powerful and versatile open-source, cross-platform JavaScript runtime environment. It allows developers to execute JavaScript code outside of a web browser, making it possible to use JavaScript for server-side scripting.

Website Reference:

(Node.js Introduction)

EXPRESS JS:

Express.js, often simply referred to as Express, is a fast, unopinionated, minimalist web framework for Node.js. It provides a robust set of features for web and mobile application.

Website Reference

(Introduction to Express.js)

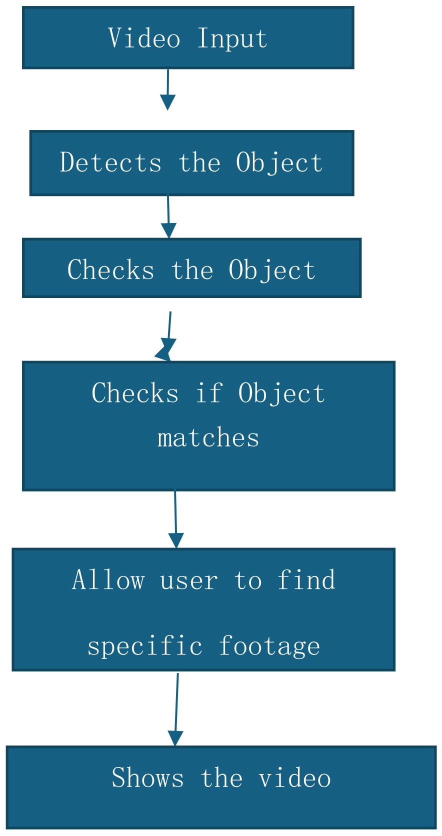
Elastic Search: Elasticsearch is, at its core, a distributed, RESTful search and analytics engine capable of storing, searching, and analyzing large volumes of data quickly and in near real-time.

Website Reference:

Elasticsearch Tutorial – GeeksforGeeks

7. APPENDICES

A. DATA FLOW DIAGRAM



B. SAMPLE CODING

NODE JS

```
const express = require('express') var bodyParser = require('body-parser')
const app = express()

app.use(bodyParser.json({ type: 'application/json' }))

const port = 5001; const path = require('path')

app.use(express.static(__dirname + '/public'));

app.set('views', __dirname + '/views');

app.set('view engine', 'html'); app.engine('html', require('ejs').renderFile);

app.get('/', (req, res) => { res.redirect("/login"); });

app.post('/upload', (req, res) => { res.json({status:true}) });

app.get('/login', (req, res) => { res.render('sign-in.html') })

app.get('/home', (req, res) => { res.render('home.html') })

app.get('/analyzer', (req, res) => { res.render('analyzer.html') })

app.get('/digest', (req, res) => { res.render('digest.html') })

app.listen(port, () => { console.log(One POR app listening on port ${port}) })
```

JSON

```
{
  "name": "NIDVR",
  "version": "1.0.0",
  "lockfileVersion": 2,
  "requires": true,
  "packages": {
    "": {
      "name": "NIDVR",
      "version": "1.0.0",
      "dependencies": {
        "body-parser": "^1.20.2",
        "dotenv": "^16.0.3",
        "ejs": "^3.1.8",
        "express": "^4.18.2",
        "jwt-decode": "^3.1.2",
        "path": "^0.12.7"
      }
    },
    "node_modules/accepts": {
      "version": "1.3.8",
      "resolved": "https://registry.npmjs.org/accepts/-/accepts-1.3.8.tgz",
      "integrity": "sha512-
PYAthTa2m2VKxuvSD3DPC/Gy+U+sOA1LAuT8mkmRuvw+NACSaeXEQ+NHcVF7rONl6q
caxV3Uuemwawk+7+SJLw==",
      "dependencies": {
        "mime-types": "~2.1.34",
        "negotiator": "0.6.3"
      },
      "engines": {
        "node": ">= 0.6"
      }
    },
    "node_modules/ansi-styles": {
      "version": "4.3.0",
      "resolved": "https://registry.npmjs.org/ansi-styles/-/ansi-styles-4.3.0.tgz",
      "integrity": "sha512-
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2wVALIheZJQSEg==",
      "dependencies": {
        "color-convert": "^2.0.1"
      },
      "engines": {
        "node": ">=8"
      },
      "funding": {
        "url": "https://github.com/chalk/ansi-styles?sponsor=1"
      }
    },
    "node_modules/array-flatten": {
      "version": "1.1.1",
      "resolved": "https://registry.npmjs.org/array-flatten/-/array-flatten-1.1.1.tgz",
      "integrity": "sha512-
PCVAQswWemu6UdxsDFFX/+gVeYqKAod3D3UVm91jHwynguOwAvYPhx8nNlM++NqRc
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    },
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      "resolved": "https://registry.npmjs.org/balanced-match/-/balanced-match-1.0.2.tgz",
      "integrity": "sha512-
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    },
    "node_modules/body-parser": {
      "version": "1.20.2",
      "resolved": "https://registry.npmjs.org/body-parser/-/body-parser-1.20.2.tgz",
      "integrity": "sha512-
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      "dependencies": {
        "bytes": "3.1.2",
        "content-type": "~1.0.5",
        "debug": "2.6.9",
        "depd": "2.0.0",
        "destroy": "1.2.0",
        "http-errors": "2.0.0",
        "iconv-lite": "0.4.24",
        "on-finished": "2.4.1",
            "qs": "6.11.0",
            "raw-body": "2.5.2",
            "type-is": "~1.6.18",
            "unpipe": "1.0.0"
        },
        "engines": {
            "node": ">= 0.8",
            "npm": "1.2.8000 || >= 1.4.16"
        }
    },
    "node_modules/brace-expansion": {
        "version": "1.1.11",
        "resolved": "https://registry.npmjs.org/brace-expansion/-/brace-expansion-1.1.11.tgz",
        "integrity": "sha512-
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        "dependencies": {
            "balanced-match": "^1.0.0",
            "concat-map": "0.0.1"
        }
    },
    "node_modules/bytes": {
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        "resolved": "https://registry.npmjs.org/bytes/-/bytes-3.1.2.tgz",
        "integrity": "sha512-
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6fzO6F0pBdcYbEg==",
        "engines": {
```

```
        "node": ">= 0.8"
      }
    },
    "node_modules/call-bind": {
      "version": "1.0.2",
      "resolved": "https://registry.npmjs.org/call-bind/-/call-bind-1.0.2.tgz",
      "integrity": "sha512-
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GueWJGTYsqrA==",
      "dependencies": {
        "function-bind": "^1.1.1",
        "get-intrinsic": "^1.0.2"
      },
      "funding": {
        "url": "https://github.com/sponsors/ljharb"
      }
    },
    "toidentifier": {
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      "resolved": "https://registry.npmjs.org/toidentifier/-/toidentifier-1.0.1.tgz",
      "integrity": "sha512-
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hEz608PlAHRA=="
    },
    "type-is": {
      "version": "1.6.18",
      "resolved": "https://registry.npmjs.org/type-is/-/type-is-1.6.18.tgz",
      "integrity": "sha512-
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ma9BGm06XQBy8g==",
      "requires": {
        "media-typer": "0.3.0",
        "mime-types": "~2.1.24"
      }
    },
    "unpipe": {
      "version": "1.0.0",
      "resolved": "https://registry.npmjs.org/unpipe/-/unpipe-1.0.0.tgz",
      "integrity": "sha512-
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PNqRksA3hztKQ=="
    },
    "util": {
      "version": "0.10.4",
      "resolved": "https://registry.npmjs.org/util/-/util-0.10.4.tgz",
      "integrity": "sha512-
0Pm9hTQ3se5ll1XihRic3FDIku70C+iHUdT/W926rSgHV5QgXsYbKZN8MSC3tJtSkhuROzvs
QjAaFENRXr+19A==",
      "requires": {
        "inherits": "2.0.3"
      },
      "dependencies": {
        "inherits": {
          "version": "2.0.3",
          "resolved": "https://registry.npmjs.org/inherits/-/inherits-2.0.3.tgz",
                "integrity": "sha512-
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            }
        }
    },
    "utils-merge": {
        "version": "1.0.1",
        "resolved": "https://registry.npmjs.org/utils-merge/-/utils-merge-1.0.1.tgz",
        "integrity": "sha512-
pMZTvIkT1d+TFGvDOqodOclx0QWkkgi6Tdoa8gC8ffGAAqz9pzPTZWAybbsHHoED/ztMtk
v/VoYTYyShUn81hA=="
    },
    "vary": {
        "version": "1.1.2",
        "resolved": "https://registry.npmjs.org/vary/-/vary-1.1.2.tgz",
        "integrity": "sha512-
BNGbWLfd0eUPabhkXUVm0j8uuvREyTh5ovRa/dyow/BqAbZJyC+5fU+IzQOzmAKzYqYR
AISoRhdQr3eIZ/PXqg=="
    }
  }
}
```
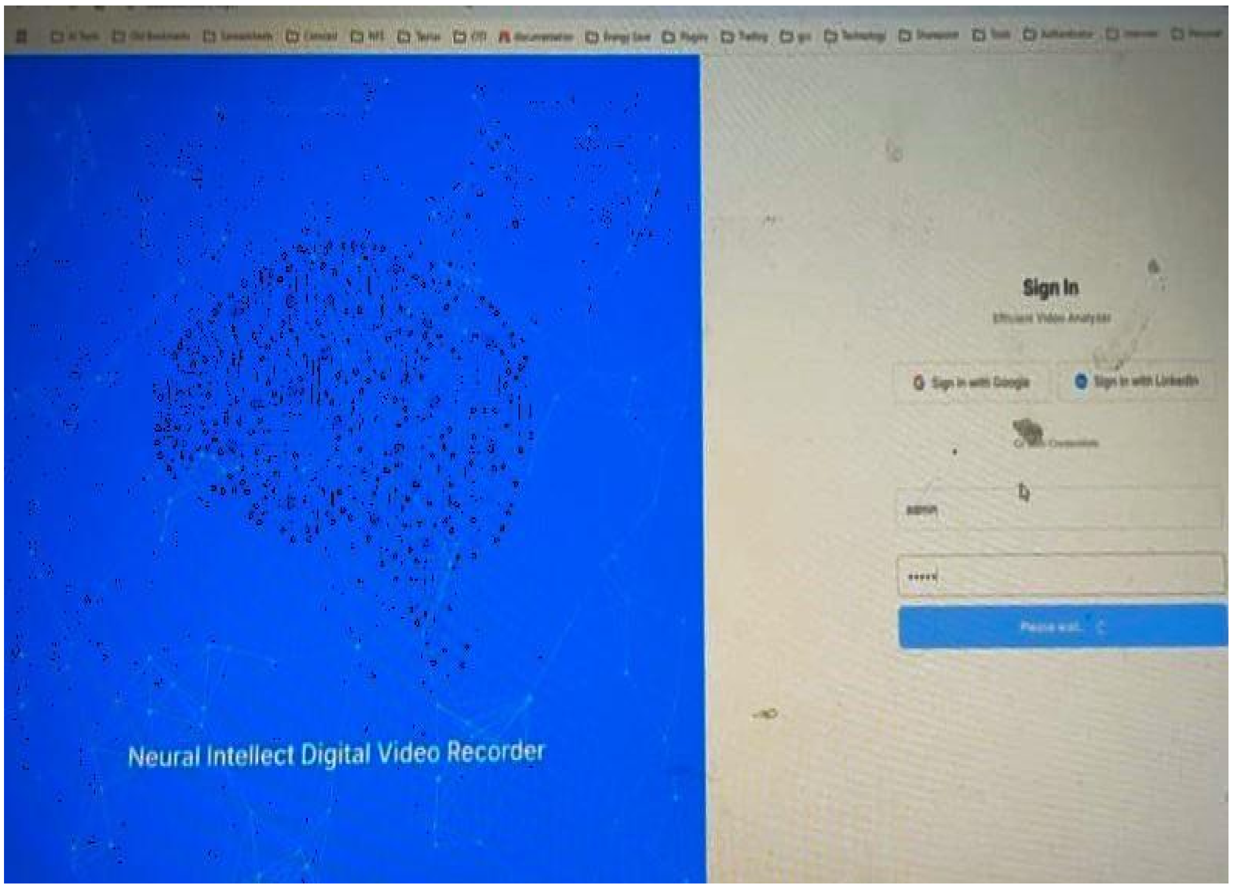
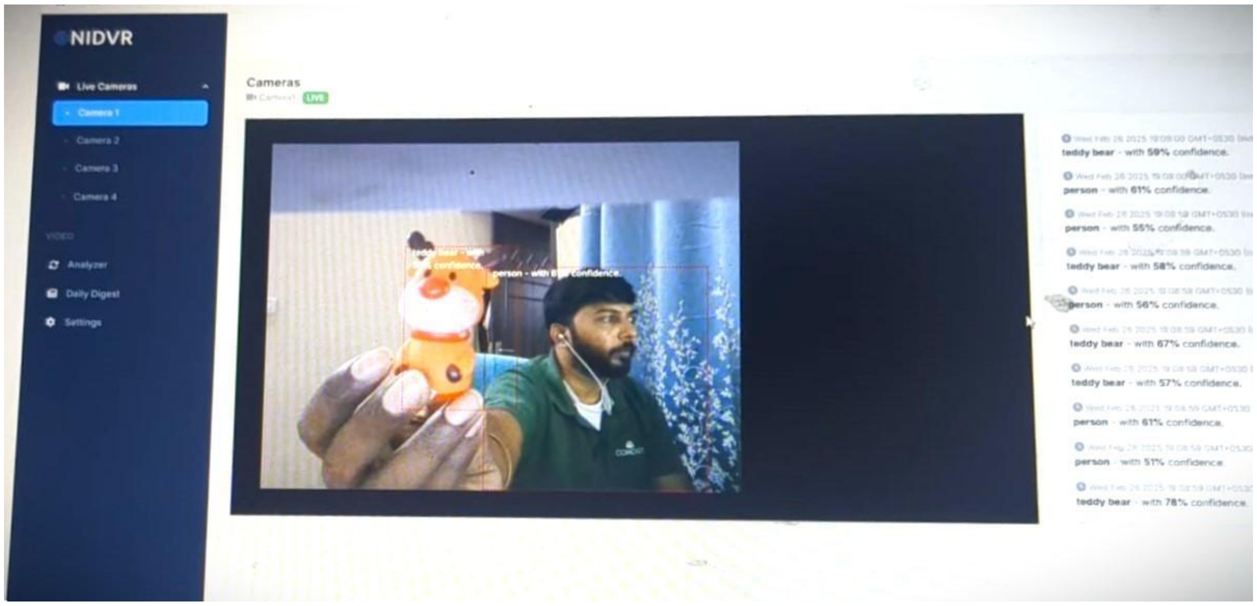
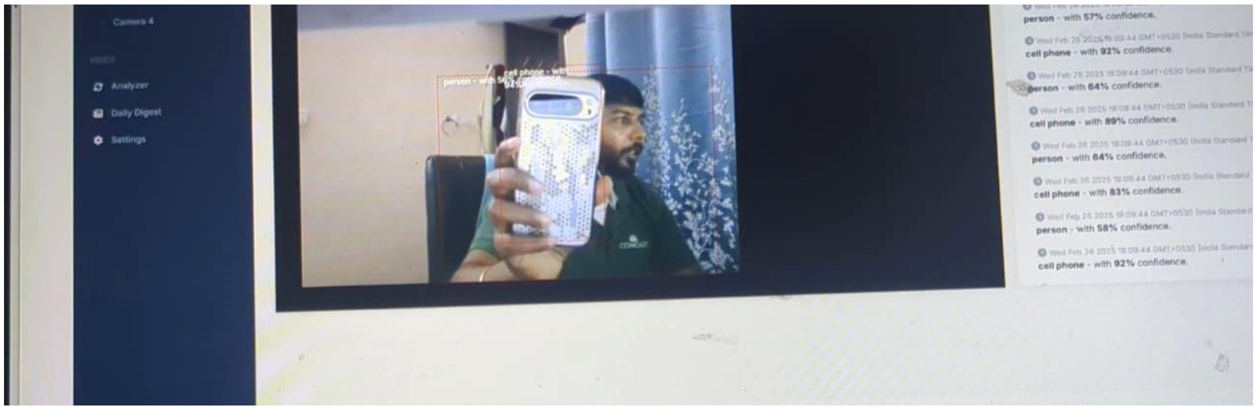

C.SAMPLE INPUT



D.SAMPLE OUTPUT



```
Wed Feb 26 2025 19:09:00 GMT+0530
teddy bear - with 59% confidence.
Wed Feb 26 2025 19:09:00 GMT+0530
person - with 61% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
person - with 55% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
teddy bear - with 58% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
person - with 56% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
teddy bear - with 67% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
teddy bear - with 57% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
person - with 61% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
person - with 51% confidence.
Wed Feb 26 2025 19:08:59 GMT+0530
teddy bear - with 78% confidence.
```



```
person - with 57% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard Ti
cell phone - with 92% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard Ti
person - with 64% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard T
cell phone - with 89% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard T
person - with 64% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard
cell phone - with 83% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard
person - with 58% confidence.
Wed Feb 26 2025 19:09:44 GMT+0530 (India Standard
cell phone - with 92% confidence.
```