iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** III **Month of publication:** March 2025

DOI: https://doi.org/10.22214/ijraset.2025.67655

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

AI-Driven Traffic Light Controller Based on Vehicle Density Analysis

Dr. Prakash N. Kalavadekar[1], Avanti Joshi[2], Vaishnavi Mohadkar[3], Pranjal Jagtap[4], Savari Jawale [5]
Department of Computer Engineering, Sanjivani College of Engineering, Kopargaon, Maharashtra, India

Abstract: Managing urban traffic efficiently has become a pressing challenge due to the increasing number of vehicles on the road. Traditional fixed-timing traffic systems fail to adapt to fluctuating traffic conditions, resulting in prolonged delays, unnecessary stops, and heightened environmental impact. Manual interventions by traffic personnel add to the inefficiency, demanding significant manpower while remaining static and error-prone. This project proposes a smart, AI-driven traffic management system which uses the YOLO model for real-time vehicle detection and density analysis. By dynamically adjusting signal durations based on vehicle flow, the system ensures optimal traffic movement, prioritizing heavily congested lanes. This adaptive approach reduces wait times, minimizes fuel consumption, and lowers emissions, addressing both commuter convenience and environmental sustainability. The system operates autonomously, eliminating human errors and reducing the need for manual control. It promotes smoother traffic flow, reduces operational costs, and improves safety for all road users. With its ability to respond to real-time data, this AI-powered traffic controller provides a transformative solution to urban traffic challenges, contributing to a more efficient and eco-friendly transportation ecosystem.
Keywords: Traffic density analysis, Object detection, Traffic flow optimization, Automated traffic control

I. INTRODUCTION

Urban traffic congestion is a growing challenge in modern cities due to the rising population and the increasing number of vehicles on the road. This issue leads to frequent traffic jams, causing significant delays, driver stress, increased fuel consumption, higher transportation costs, and severe air pollution. Traditional traffic control systems, which operate on fixed timings and predefined patterns, fail to adapt to real-time traffic conditions. As a result, these systems are inefficient in managing dynamic traffic flow, leading to wasted time at signals and unnecessary stops across multiple intersections. Currently, many traffic systems rely heavily on manpower to manage traffic flow, with traffic police assigned to various signals. This manual system is not only static but also labor-intensive, requiring a large workforce to function effectively. Furthermore, fixed-schedule traffic signal systems allocate equal time for green, yellow, and red lights, irrespective of the actual vehicle density on the road. This lack of flexibility results in prolonged delays, inefficient traffic flow, and increased environmental harm due to idling vehicles. These issues directly affect the daily lives of millions of commuters, leading to lost productivity, heightened stress levels, and increased costs for both individuals and businesses.

Moreover, vehicle idling contributes to air pollution and greenhouse gas emissions, worsening climate change and urban air quality. To address these challenges, we design an innovative solution: "AI-Driven Traffic Light Controller Based on Vehicle Density Analysis." This project uses the YOLO (You Only Look Once) model for real-time object detection and traffic density analysis. By analysing the number of vehicles in each lane, the system dynamically adjusts traffic signal timings to optimize the flow of vehicles at intersections. This ensures that traffic signals operate in harmony with actual traffic conditions, making traffic management smarter and more responsive. Our AI-driven system measures vehicle density and calculates the optimal green signal duration for each lane, giving priority to heavily congested directions. This approach minimizes wait times, reduces traffic congestion, and significantly lowers fuel consumption and environmental impact. Unlike traditional fixed-schedule systems, this smart traffic controller adapts to real-time data, improving overall efficiency and reducing delays. The system also reduces the need for human intervention, eliminating errors associated with manual monitoring and control. By automating the decision-making process, it enhances road safety and convenience for commuters.

One of the unique aspects of our system is its ability to significantly reduce fuel wastage by minimizing unnecessary stops and delays. This not only lowers transportation costs for commuters but also helps reduce harmful emissions, contributing to a cleaner and more sustainable urban environment. Furthermore, the system enhances road safety by removing the unpredictability caused by human error in manual traffic control, creating a smoother and safer driving experience for everyone.

The severity of urban traffic congestion makes it essential to adopt innovative solutions like our AI-driven traffic controller. By addressing the inefficiencies of traditional systems, our project not only solves an immediate problem but also contributes to the broader goals of sustainability, efficiency, and safety in urban transportation. This transformative solution holds the potential to revolutionize traffic management, reduce environmental impact, and significantly improve the everyday experience of city dwellers.

II. OBJECTIVE

1) To develop a Deep Learning-based adaptive traffic control system that dynamically adjusts traffic signals based on real-time traffic density at intersections.
2) To enhance traffic flow efficiency by reducing average waiting times at intersections, thereby decreasing traffic congestion.
3) To demonstrate the effectiveness of using Deep Learning in managing and optimizing urban traffic systems.

III. LITERATURE REVIEW

The field of traffic management has seen significant advancements in recent years, particularly with the integration of machine learning, image processing, and deep learning techniques. These technologies offer dynamic and data-driven approaches to optimizing traffic flow, improving efficiency, and reducing congestion. Several key studies contribute to the development of these modern traffic control systems.

1) The study on Traffic Management System using Machine Learning Algorithm presents a system that leverages machine learning algorithms to predict and manage urban traffic flows. By analysing real-world traffic data, this system optimizes signal timings, which results in reduced congestion and delays. The use of predictive modeling, where algorithms learn from historical and real-time data, allows for proactive traffic management. This approach is a significant improvement over traditional systems, which rely on fixed schedules. The system's ability to predict traffic patterns and adjust signal timings in real time demonstrates the potential of machine learning for enhancing urban traffic management and supporting the development of smart cities.
2) Another notable work, Smart Traffic: Integrating Machine Learning and YOLO, combines YOLO (You Only Look Once), a real-time object detection algorithm, with machine learning to enhance traffic control. YOLO detects vehicles and pedestrians in real time, while machine learning analyzes the data to dynamically adjust signal timings. This integration makes the system adaptive to changing traffic conditions, reducing wait times and improving traffic throughput. The study's success in simulated environments supports the feasibility of this approach for real-world traffic systems. The combination of computer vision and machine learning reflects a promising direction for developing intelligent traffic systems that can respond to dynamic urban conditions.
3) The research on Traffic Control System Using Image Processing focuses on using image processing techniques to analyze traffic flow. Camera images are processed to determine vehicle density, and based on this data, signal timings are adjusted to prioritize congested routes. Unlike sensor-based systems, which can be costly and difficult to maintain, image processing offers a cost-effective solution for traffic management. The accuracy of vehicle detection and density analysis from camera images enables real-time adjustments to traffic signal timings, providing an efficient and scalable alternative. Additionally, integrating this system with machine learning could further enhance its adaptability and effectiveness in real-world applications.
4) The Self-Adaptive Traffic Light Control System Based on YOLO explores the use of YOLO for real-time vehicle detection at intersections. The system adjusts traffic light durations based on vehicle counts and types, reducing congestion and improving flow. This dynamic system is a significant advancement over traditional fixed-timing traffic lights, as it tailors the green light duration to the actual traffic conditions. The study's success in simulated environments demonstrates the potential of YOLO and real-time vehicle detection for transforming traffic light control, making it more efficient and responsive to traffic demand.
5) In Vehicle Counting for Traffic Management System using YOLO, the focus is on accurate vehicle detection and counting using YOLO combined with correlation filters. This vehicle count data is essential for managing traffic density and optimizing signal timings. The high accuracy achieved in vehicle detection, even under challenging conditions such as occlusion and varying lighting, highlights the potential of YOLO for real-world traffic applications. This system allows for precise monitoring of traffic volume, enabling better signal prioritization and more efficient traffic flow, which can be crucial for managing congestion in busy urban areas.
6) The foundational study, Density-Based Traffic Signal System, introduces a simple yet effective method of adjusting traffic signals based on vehicle density using sensors.

Although lacking the advanced capabilities of machine learning and YOLO, this system laid the groundwork for more sophisticated adaptive traffic systems. By prioritizing congested routes, it provides a practical solution for improving traffic flow. While the system is effective in simpler environments, it highlights the need for further technological advancements, such as computer vision and machine learning, to handle the complexities of modern urban traffic.

7) Lastly, the review Techniques for Smart Traffic Control: An In-depth Review provides a comprehensive overview of various methods used in smart traffic control, including sensor-based systems, machine learning, and image processing. This review discusses the evolution of these technologies, their benefits, and the challenges associated with their implementation. It emphasizes the growing trend of integrating multiple technologies to create adaptive, real-time traffic management systems. The review also highlights the challenges of large-scale data processing and the integration of different systems, which are key considerations for future advancements in traffic control. This resource is invaluable for researchers seeking to understand the state of the art and the future directions of smart traffic management systems.

IV. METHODOLOGY

This system improves traffic flow at intersections by adjusting traffic light timings based on the number of vehicles detected. It uses YOLO (You Only Look Once), an AI model, to detect and count vehicles in real-time from images. The traffic lights are adjusted to help traffic move more smoothly. The system also considers factors like traffic flow, saturation flow, and amber time to manage traffic efficiently.

1) Technologies Used:

- YOLO (You Only Look Once): An AI model that detects and counts vehicles quickly from images in real-time.
- TensorFlow: A framework that helps run YOLO and process vehicle detection.
- OpenCV: A library that prepares images before passing them to YOLO, handling tasks like resizing.

2) How the System Works:

- Capturing Images: The system captures images from the traffic intersection at regular intervals. These images help detect and count vehicles, which are used to adjust the traffic light timings.

3) Detecting Vehicles:

YOLO detects vehicles in each image and counts them. It works quickly to ensure real-time processing.

- Estimating Vehicle Flow: After counting the vehicles, the system calculates the flow of traffic and adjusts the green light timing based on the flow:
- High Flow: The green light stays on longer to let more cars pass.
- Low Flow: The green light is shorter to reduce waiting times for other directions.

4) Adjusting Traffic Signals:

The system changes the traffic light timing based on vehicle flow:

- High Flow: The green light stays on longer if many vehicles are detected, based on the maximum number of vehicles that can pass in a given time (saturation flow).
- Medium Flow: The green light stays for a normal amount of time based on usual traffic patterns.
- Low Flow: The green light is shortened to avoid unnecessary delays for other directions.

5) Saturation Flow:

The system uses saturation flow, which is the maximum number of vehicles that can pass through a lane when the light is green. The green light stays longer when traffic is heavy, ensuring that all vehicles pass through. This depends on vehicle types, road conditions, and the intersection's design.

6) Logging Data for Future Use:

The system saves vehicle flow data and light timings in a database. This data helps identify patterns and can be used to adjust light timings in the future. For example, during peak hours, the system can adjust the green light duration based on previous traffic patterns.

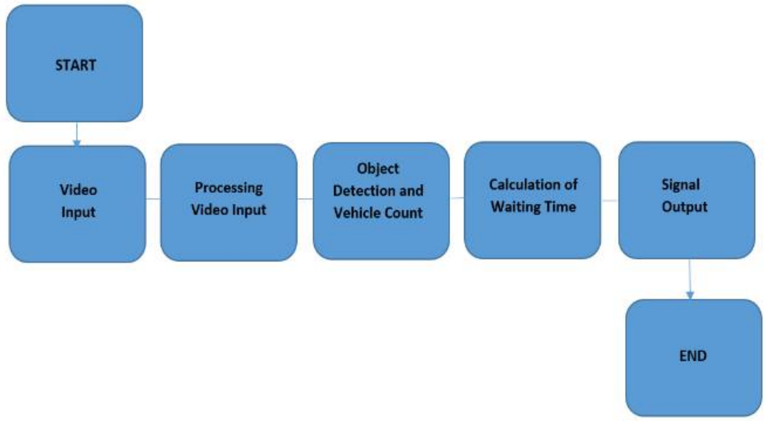


Figure 1. Working of the system

This workflow outlines a systematic approach to managing traffic efficiently by leveraging advanced technologies and real-time processing. Here's a detailed step-by-step breakdown:

1) Video Input: Input can be given as a real time video of traffic or can be given in the form of images.
2) Processing Video Input:
a) Convert the video feed into frames for easier analysis.
b) Apply image enhancement techniques (e.g., noise reduction, contrast adjustment).
c) Convert video frames into grayscale or other color spaces if needed.
d) Normalize the video frame size to ensure consistent input for processing.
e) Apply filters (e.g., Gaussian blur) to improve object detection accuracy.

3) Object Detection and Vehicle Count:
a) Use AI-based algorithms (e.g., YOLO) to detect vehicles.
b) Identify and classify vehicles within the video frames.
c) Count the number of vehicles detected in each frame or segment.
d) Filter out irrelevant objects (e.g., pedestrians, bicycles) for accurate vehicle count.

4) Calculation of Waiting Time:
a) Calculate the waiting time for vehicles at the traffic signal using timestamps.
b) Determine the time vehicles have been waiting since arriving at the intersection.
c) Estimate vehicle flow rates to adjust waiting times dynamically.
d) Use vehicle count and density to calculate traffic congestion.
e) Measure average waiting time for all lanes or specific directions.
f) Update and display waiting time data for traffic management adjustments.

5) Calculation of Waiting Time:
a) Analyze vehicle count and waiting time to determine signal phases.
b) Adjust green, yellow, and red light durations based on traffic density.
c) Sync signal timings across multiple intersections for coordinated traffic flow.
d) Generate output signals (green/red) to the traffic lights in real-time.
e) Monitor signal output and adjust dynamically for changing traffic conditions.

- Working Principle:
➢ Input Image: The image is first resized to a fixed size (typically 416x416 or 608x608) and fed into the YOLO network.

- Grid Division: The image is divided into a grid of S x S cells. For each cell, the algorithm predicts a set of bounding boxes, along with the confidence score and class probability for each box.
- Bounding Box Prediction: Each grid cell predicts several bounding boxes. For each box, the network outputs:
- (x, y): Coordinates of the box center (relative to the grid cell).
- w, h: Width and height of the bounding box.
- Confidence Score: A measure of how confident the model is that the box contains an object.
- Class Probabilities: For each grid cell, YOLO predicts the probability of each object class within the bounding box (e.g., car, pedestrian, traffic light). The class prediction is typically based on a softmax function.
- Final Output: The output of YOLO consists of a set of predicted bounding boxes, class labels, and confidence scores for each object. Non-max suppression (NMS) is used to eliminate duplicate detections, leaving only the most confident bounding boxes.

V. RESULTS AND DISCUSSIONS

This section outlines the results and features of the Intelligent Traffic Manager system. The following figures highlight essential components, such as the system's interface, image processing functionality, dynamic traffic signal control, and data storage capabilities. Each feature contributes significantly to enhancing traffic management.

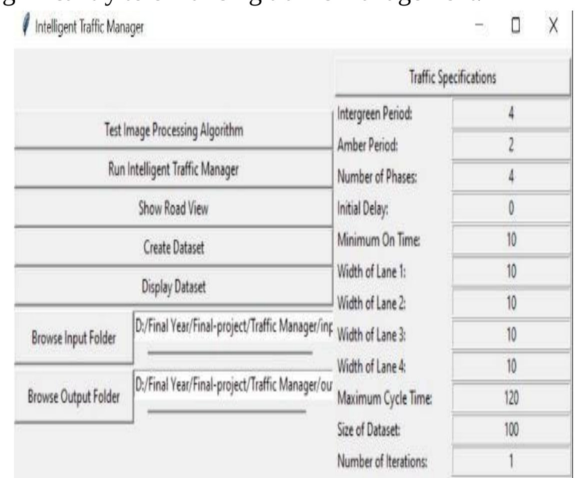


Figure 2: Intelligent Traffic Manager Interface

1) Intelligent Traffic Manager Interface: The Intelligent Traffic Manager interface provides functionalities to configure traffic parameters (e.g., intergreen period, amber period, lane widths), test algorithms, create and manage datasets, and set input-output directories for data processing.

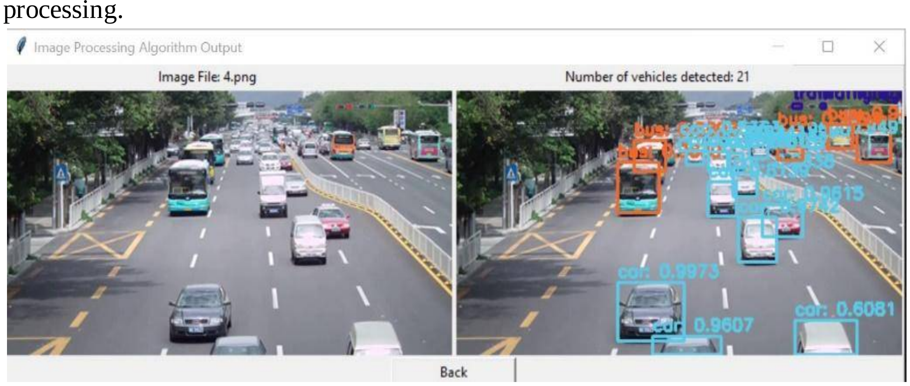


Figure 3: Image Processing

2) Image Processing Algorithm: The system processes traffic images to detect vehicles using object detection algorithms. Detected vehicles are highlighted with bounding boxes and confidence scores, enabling accurate vehicle count estimation for traffic management.

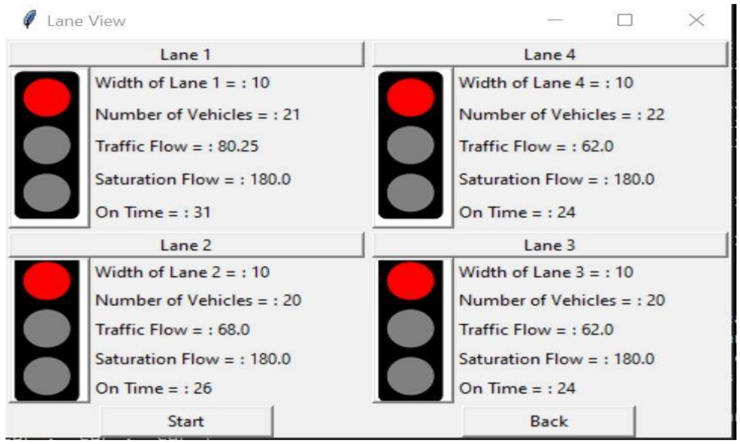
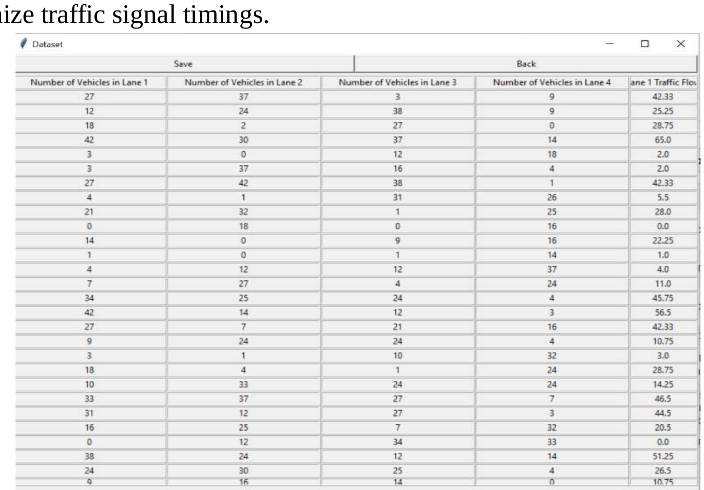


Figure 4: Lane View

3) Lane view: The system calculates lane-wise signal timings dynamically based on traffic parameters such as the number of vehicles, traffic flow, and saturation flow, ensuring efficient signal management to minimize congestion.

Figure 5: Road View

4) Show Road View: The system uses road images to detect vehicles using the YOLO (You Only Look Once) algorithm. This method identifies vehicles quickly and accurately by placing bounding boxes around them. The detected vehicles are highlighted in the images, allowing for easy counting. Accurate vehicle counting is crucial for managing traffic flow, helping to reduce congestion and optimize traffic signal timings.



Dataset

Save | Back

Number of Vehicles in Lane 1	Number of Vehicles in Lane 2	Number of Vehicles in Lane 3	Number of Vehicles in Lane 4	ane 1 Traffic Flo
27	37	3	9	42.33
12	24	38	9	25.25
18	2	27	0	28.75
42	30	37	14	65.0
3	0	12	18	2.0
3	37	16	4	2.0
27	42	38	1	42.33
4	1	31	26	5.5
21	32	1	25	28.0
0	18	0	16	0.0
14	0	9	16	22.25
1	0	1	14	1.0
4	12	12	37	4.0
7	27	4	24	11.0
34	25	24	4	45.75
42	14	12	3	56.5
27	7	21	16	42.33
9	24	24	4	10.75
3	1	10	32	3.0
18	4	1	24	28.75
10	33	24	24	14.25
33	37	27	7	46.5
31	12	27	3	44.5
16	25	7	32	20.5
0	12	34	33	0.0
38	24	12	14	51.25
24	30	25	4	26.5
9	16	14	0	10.75

Figure 6: Dataset Display

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue III Mar 2025- Available at www.ijraset.com

5) Dataset Display: The system displays traffic data in an organized way, including the number of vehicles, types of vehicles, and lane-specific information. This data is arranged so it is easy to understand and use in the system. Having a clear and consistent dataset helps the Intelligent Traffic Manager system make better decisions about traffic signal timings and traffic flow, and it ensures the data can be used for future improvements.

Dataset Display

	Number of	Number of	Number of	Number of	Lane 1 Tra	Lane 2 Tra	Lane 3 Tra	Lane 4 Tra	Lane 1 On	Lane 2 On	Lane 3 On	Lane 4 On	Lane 1 Sat	Lane 2 Sat	Lane 3 S
1	18	38	12	27	21.25	51.25	19.50	42.33	16.00	38.00	14.00	31.00	180.00	180.00	180.00
2	34	18	26	42	45.75	21.25	29.41	56.50	31.00	14.00	20.00	38.00	180.00	180.00	180.00
3	42	38	9	24	56.50	51.25	12.50	29.00	39.00	35.00	10.00	20.00	180.00	180.00	180.00
4	38	30	10	9	66.75	43.75	14.25	10.75	50.00	33.00	11.00	10.00	180.00	180.00	180.00
5	37	25	5	17	53.25	37.25	10.50	26.50	36.00	25.00	10.00	18.00	180.00	180.00	180.00
6	14	24	22	17	16.25	32.25	32.58	26.50	10.00	19.00	19.00	16.00	180.00	180.00	180.00
7	42	16	24	18	65.00	23.00	26.50	21.25	50.00	18.00	20.00	16.00	180.00	180.00	180.00
8	9	12	4	25	12.50	19.50	5.50	42.50	10.00	10.00	10.00	23.00	180.00	180.00	180.00
9	18	0	42	7	21.25	0	65.00	11.00	11.00	10.00	34.00	10.00	180.00	180.00	180.00
10	16	18	17	26	20.50	21.25	30.50	41.50	12.00	12.00	17.00	23.00	180.00	180.00	180.00
11	42	0	33	4	56.50	0	46.50	5.50	32.00	10.00	27.00	10.00	180.00	180.00	180.00
12	37	5	0	26	50.33	10.50	0	41.50	27.00	10.00	10.00	22.00	180.00	180.00	180.00
13	0	12	26	4	0	14.25	29.41	4.00	10.00	10.00	17.00	10.00	180.00	180.00	180.00
14	16	1	3	4	23.00	0.33	2.00	5.50	14.00	10.00	10.00	10.00	180.00	180.00	180.00
15	12	9	24	27	25.25	10.75	33.00	34.25	13.00	10.00	18.00	18.00	180.00	180.00	180.00
16	4	30	0	12	4.00	43.75	0	25.25	10.00	22.00	10.00	12.00	180.00	180.00	180.00
17	3	26	38	22	2.00	29.41	66.75	32.58	10.00	21.00	49.00	24.00	180.00	180.00	180.00
18	4	34	12	1	5.50	45.75	14.25	0.33	10.00	25.00	10.00	10.00	180.00	180.00	180.00
19	2	3	14	10	2.75	2.00	16.25	14.25	10.00	10.00	13.00	11.00	180.00	180.00	180.00
20	9	2	24	14	10.75	2.75	26.50	22.25	10.00	10.00	13.00	11.00	180.00	180.00	180.00
21	3	0	24	9	3.00	0	33.00	12.50	10.00	10.00	17.00	11.00	180.00	180.00	180.00
22	14	30	3	24	22.25	33.50	3.00	29.00	11.00	18.00	10.00	15.00	180.00	180.00	180.00
23	5	30	19	24	10.50	43.75	26.75	33.00	10.00	25.00	15.00	19.00	180.00	180.00	180.00
24	3	0	17	19	2.00	0	26.50	26.75	10.00	10.00	14.00	15.00	180.00	180.00	180.00
25	14	27	2	3	16.25	42.33	2.75	3.00	10.00	24.00	10.00	10.00	180.00	180.00	180.00
26	3	29	0	24	2.00	41.25	0	29.00	10.00	20.00	10.00	14.00	180.00	180.00	180.00

100 rows x 33 columns

Figure 7: Save Dataset

6) Save Dataset: The Save Dataset feature stores traffic data, such as vehicle counts and traffic density, in structured formats like CSV or JSON files. This ensures the data is securely saved and can be accessed later for analysis. Storing the data this way makes it easier to use in the future, helping the system improve traffic management over time and ensuring reliable performance.

VI. APPLICATIONS

1) Real-Time Traffic Optimization:
a) The system uses AI-based traffic density analysis to dynamically adjust signal timings at busy intersections.
b) By monitoring the number of vehicles in each lane, it reduces congestion during peak hours, ensuring smoother traffic flow and shorter waiting times for commuters.
2) Reduction in Fuel Consumption:
a) By minimizing unnecessary idling of vehicles at signals, the system helps reduce fuel wastage.
b) This directly lowers transportation costs for commuters and contributes to sustainable energy usage.
3) Environmental Impact Reduction:
a) The optimization of traffic flow significantly decreases harmful emissions caused by idling vehicles.
b) With reduced carbon emissions, the system plays a role in combating climate change and improving urban air quality.
4) Road Safety:
a) Automating traffic signal management eliminates the unpredictability and errors associated with manual control.
b) This improves overall road safety, reducing accidents at intersections and ensuring a smoother driving experience.
5) Smart City Traffic Coordination:
a) The system can integrate into a broader smart city infrastructure, coordinating multiple traffic signals across a city.
b) This seamless communication between intersections can optimize urban mobility, reducing city-wide congestion and enhancing commuter experience.
6) Data-Driven Urban Planning:
a) Traffic data, such as vehicle counts and flow patterns, are logged and stored for long-term analysis.
b) City planners can use this data to improve road layouts, plan new infrastructure, and better manage traffic during special events or construction work.

VII. FUTURE SCOPE

1) Enhanced Emergency Vehicle Prioritization:

The system can be improved to detect emergency vehicles like ambulances and fire engine. It can adjust traffic signals in real-time to create a clear path, reducing response times during emergencies.

2) Urban Mobility Integration:

The project can be integrated with Mobility-as-a-Service (MaaS) platforms. This would allow it to coordinate with buses, shared vehicles, and bicycles, creating a smoother, multi-modal transportation system.

3) Predictive Traffic Management:

By using historical data, weather information, and event schedules, the system could predict traffic patterns. This would enable it to adjust signals proactively, preventing congestion before it occurs.

4) Augmented Reality (AR) Traffic Management:

Future systems might use AR to display live traffic information to drivers, helping them plan routes or identify traffic conditions in real time through smartphone apps or vehicle dashboards.

5) Solar-Powered Infrastructure:

The traffic signal system could run on renewable energy, like solar panels, to reduce energy consumption and promote sustainable practices.

6) Accident Detection and Management:

The system could be enhanced to detect accidents at intersections using AI and notify authorities instantly. It can also redirect traffic around the affected area to minimize congestion.

VIII. CONCLUSION

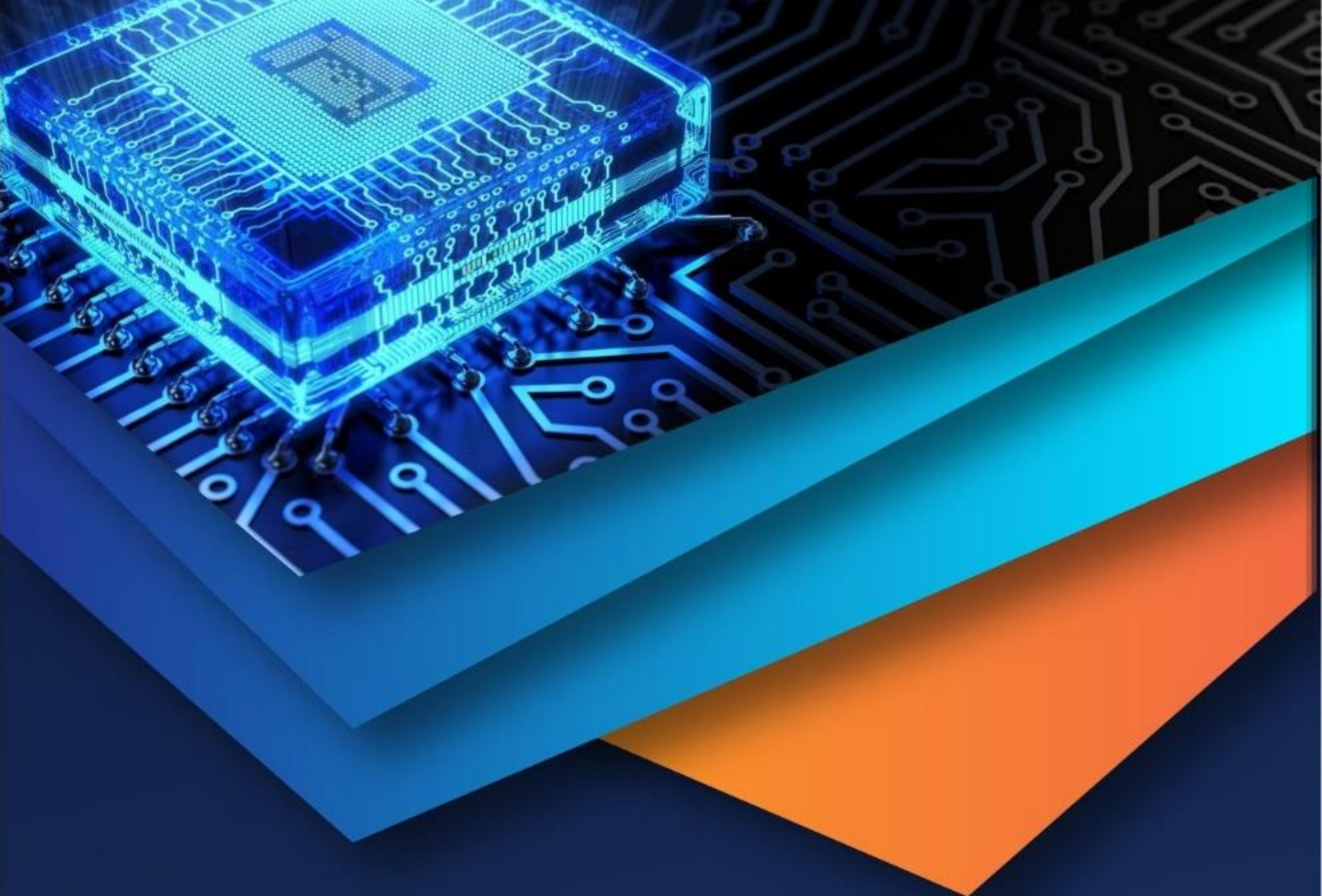
Managing urban traffic has become an increasingly difficult task due to the rapid rise in vehicle numbers on the roads. Traditional traffic signal systems that operate on fixed timings fail to adapt to real-time traffic conditions, leading to significant issues such as longer wait times, unnecessary fuel consumption, increased air pollution, and elevated stress for drivers. Additionally, manual traffic management by personnel is prone to errors and demands a considerable workforce. To address these inefficiencies, this project introduces an AI-driven traffic light controller that utilizes the YOLO (You Only Look Once) model for real-time vehicle detection and density analysis. The system dynamically adjusts signal durations based on the actual number of vehicles at an intersection, ensuring smoother and faster traffic movement while prioritizing heavily congested lanes. The proposed system offers several advantages over traditional methods. By reducing traffic congestion through adaptive signal control, it minimizes delays and vehicle idling at intersections, thereby enhancing the overall flow of traffic. This also contributes to environmental sustainability by cutting down on fuel consumption and reducing greenhouse gas emissions, which helps improve urban air quality. Moreover, the system enhances the commuting experience by saving drivers' time, lowering frustration, and boosting productivity. With automated traffic management, it eliminates the potential for human error, promoting safer road usage for everyone.

The system uses advanced AI tools such as TensorFlow and OpenCV to process images, detect vehicles in real-time, and optimize signal timings. Factors like traffic flow rates and saturation flow are analysed to calculate the appropriate green light durations, ensuring that the system adjusts dynamically to changing traffic conditions. Additionally, it stores and logs traffic data for future analysis, enabling continuous improvement in traffic planning and management, particularly during peak hours. This adaptive approach makes the system highly responsive and efficient.

This project represents a significant step toward smart city infrastructure, offering a scalable and transformative solution to urban traffic challenges. By integrating cutting-edge AI techniques, the system not only resolves immediate traffic issues but also supports long-term goals such as sustainability, efficiency, and safety. In doing so, it lays a solid foundation for future advancements in intelligent transportation systems, helping create eco-friendly, efficient, and commuter-friendly urban environments.

REFERENCES

[1] Dr.A. Ravi, R.Nandhini, K.Bhuvaneshwari, J.Divya, K.Janani, "Traffic Management System using Machine Learning Algorithm",International Journal of Innovative Research in Technology,Volume 7, Issue 11,April 2021.
[2] Nitin Sakhare, Mrunal Hedau, Gokul B. Omkar Malpure, Trupti Shah, Anup Ingle, "Smart Traffic: Integrating Machine Learning, and YOLO for Adaptive Traffic Management System",International Journal of Intelligent Systems and Applications in Engineering,VOL. 12 NO. 12S (2024).
[3] Dakshayani Ijeri, Prasanna Maidargi, Raju Sunagar, "Traffic Control System Using Image Proccesing".
[4] Khaled Zaatouri, Tahar Ezzedine, "A Self-Adaptive Traffic Light Control System Based on YOLO", International Conferences on Internet of Things, Embedded Systems and Communications, December 2018.
[5] C S Asha,A V Narasimhadhan, "Vehicle Counting for Traffic Management System using YOLO and Correlation Filter",IEEE, International Conference on Electronics, Computing and Communication Technologies (CONECCT),March 2018.
[6] K. Vidhya, A. Bazila Banu, "Density Based Traffic Signal System", International Journal of Innovative Research in Science,Engineering and Technology, Volume 3, Special Issue 3, March 2014.
[7] Roxanne Hawi, George Okeyo, Michael Kimwele, "Techniques for Smart Traffic Control: An In-depth Review", International Journal of Computer Applications Technology and Research, Volume 4– Issue 7, 566 - 573, 2015, ISSN: 2319–8656.



10.22214/IJRASET

INDEX COPERNICUS
45.98

ISRA JIF
IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL
IMPACT FACTOR:
7.429

ISI

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)