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# Smart Ambulance System Using GPS and IoT

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**Abstract**: The Smart Ambulance System Using GPS and IoT is designed to improve ambulance monitoring and support faster emergency response through real-time location tracking and communication. The proposed system uses an ESP32-WROOM microcontroller integrated with a NEO-6MGPS module to collect the ambulance's geographical location and transmit important vehicle information to a web-based monitoring dashboard. The system uses Wi-Fi connectivity to send data to a PHP backend and MySQL database, with Firebase Real time Database considered as an alternative for data storage. The dashboard displays the ambulance's GPS coordinates; speed, connectivity status, battery level, and emergency status, helping users monitor the ambulance remotely.AWS2812BNeoPixelLEDindicatorprovidesdifferent visual signals for Wi-Fi connectivity, GPS availability, and emergency mode. A push button is included to activate the emergency indication. The system also provides map-based visualization to support the identification of nearby hospitals and traffic signals. By combining GPS technology, IoT communication, and web-based monitoring, the proposed system provides an affordable and practical approach to ambulance tracking and emergency monitoring. The system aims to improve information availability and coordination during emergency situations.

**Index Terms**: Smart Ambulance, Internet of Things (IoT), Global Positioning System (GPS),ESP32-WROOM,NEO-6MGPSModule, Real-Time Location Tracking, Emergency Monitoring, Wireless Communication, Web-Based Dashboard, Ambulance Tracking System, Healthcare Technology.

## I. INTRODUCTION

Emergency medical services play an important role in saving human lives by providing timely medical assistance and transportation to hospitals. In emergency situations such as road accidents, cardiac emergencies, and other critical health conditions, reaching the hospital at the right time is very important. However, ambulance services may face challenges such as traffic congestion, delays in communication, difficulty in tracking vehicle locations, and lack of real-time information. These challenges can affect emergency response and coordination. With the development of the Internet of Things (IoT), it is possible to connect physical devices to the internet and exchange information in real time. IoT technology can be used in ambulance systems to monitor vehicle location, connectivity, and emergency status. By combining GPS and IoT, ambulance information can be collected and shared with a remote monitoring platform, helping users observe ambulance movement and status. The proposed Smart Ambulance System Using GPS and IoT aims to provide real-time ambulance tracking and monitoring. The system uses an ESP32-WROOM microcontroller as the main control unit and a NEO-6M GPS module to obtain geographical coordinates. The ESP32 processes the collected information and sends it through Wi-Fi to a web-based backend. The backend stores the information in a MySQL database, while Firebase Real-time Database can also be considered as an alternative data storage option. A web-based dashboard is developed to display important ambulance information, including GPS location, vehicle speed, GPS availability, Wi-Fi signal strength, battery status, and emergency status. The dashboard also provides map-based visualization to help users view the ambulance location and identify nearby hospitals and traffic signals. This makes ambulance monitoring easier and provides useful information for emergency coordination. The system also includes a WS2812B Neo Pixel LED indicator to display different operating conditions. Different LED colors indicate Wi-Fi disconnection, GPS unavailability, normal connectivity, and emergency mode. A push button is provided to activate the emergency indication. These features help users understand the current system status through visual alerts. Technology, IoT communication, and web-based monitoring. The proposed system focuses on improving ambulance location visibility, providing real-time status information, and supporting better coordination during emergency situations.

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## II. RELATED WORK

### A. IoT-Based Ambulance Monitoring and GPS Tracking

IoT-based ambulance monitoring systems use connected devices to collect and transmit ambulance information for remote monitoring. Kumar and Sharma discussed an IoT-based smart ambulance monitoring system that combines GPS and communication technologies for ambulance tracking and patient monitoring [1]. Patel et al. presented a GPS and IoT-enabled emergency vehicle tracking approach to provide real-time vehicle location information [2]. Fasate et al. proposed a smart IoT-based emergency ambulance system to support rapid response through real-time communication and emergency monitoring [3]. Verma and Gupta discussed an IoT-based real-time ambulance tracking and alert system that monitors ambulance location and provides emergency alerts [4]. These approaches highlight the importance of location tracking and timely information sharing. However, continuous monitoring may be affected by GPS signal availability and internet connectivity.

### B. IoT Communication and Cloud-Based Monitoring

IoT communication enables ambulance devices to transmit information to remote servers for storage and monitoring. Cloud-based platforms can support data collection, processing, and access through web applications. In the proposed system, the ESP32-WROOM acts as the main controller and sends GPS and device-status information through Wi-Fi to a PHP backend. The PHP backend processes the received telemetry and stores it in a MySQL database. XAMPP provides the local server environment; whilengrok enables remote HTTPS access to the backend. Firebase Realtime Database is considered as an optional alternative data path when the primary PHP backend is unavailable, if configured. This architecture provides a practical approach to connecting embedded hardware with a web-based monitoring platform.

### C. Emergency Vehicle Traffic-Signal Coordination

Traffic-signal coordination is an important factor in reducing delays faced by emergency vehicles. Chen et al. proposed an emergency vehicle traffic-signal preemption system that considers queues pill backs along routes and the negative effects on non-priority traffic [5]. Mannar Mannan et al. presented a cloud-based scheduling approach for traffic signals to support emergency vehicles using IoT technology [6]. Obrusník et al. studied queue-discharge-based emergency vehicle traffic-signal preemption [7]. Venkatesh et al. proposed an IoT-enabled radius-based traffic-signal preemption framework for ambulance priority in smart cities [8]. These studies demonstrate the importance of integrating vehicle location information with traffic-management systems. The proposed Smart Ambulance System displays nearby hospitals and traffic-signal information on its dashboard; automatic traffic-signal control is considered a possible future extension rather than an implemented feature.

### D. Location-Based Ambulance Services and the Proposed System

Chavan et al. presented a location-based ambulance booking and tracking system using real-time data and geo fencing [9]. Their work highlights the use of geographical information to support ambulance booking and tracking services. Based on these existing approaches, the proposed system integrates GPS-based location acquisition, IoT communication, emergency indication, and web-based monitoring. The ESP32 receives geographical information from the NEO-6M GPS module and monitors the emergency push button. A WS2812B NeoPixel LEDs trip provides visual indications for Wi-Fi disconnection, GPS unavailability, normal connectivity, and emergency mode. The web dashboard displays ambulance location, speed, GPS status, Wi-Fi signal strength, battery estimate, and emergency status

## III. RESEARCH GAP AND CONTRIBUTIONS

The main research gap addressed by this project is the integration of continuous GPS telemetry, emergency-state monitoring, visual status indication, and web-based ambulance tracking with an alternative data-storage path. The system also considers connectivity and GPS availability as important operating conditions.

**Table I** – Literature foundations and their role in this project

| Work | Established contribution | Role in this project | Boundary of applicability |
|---|---|---|---|
| GPS-based tracking [1],[2] | Real-time geographical location tracking of emergency vehicles. | NEO-6MGPS Module obtains ambulance coordinates and speed. | GPS accuracy depends on satellite signal availability and surrounding conditions. |
| IoT-based ambulance Monitoring[3],[4] | Connected devices support real-time ambulance monitoring and emergency alerts | ESP32 collects ambulance data and transmits telemetry through Wi-Fi. | Continuous remote monitoring depends on network connectivity. |
| Cloud-based monitoring [6] | Cloud communication supports remote data storage and Information sharing. | PHP backend and MySQL Database store and manage ambulance telemetry. | Primary backend availability and internet connectivity can affect data transmission. |
| GPS and IoT communication | Wireless communication enables the transfer of location and Device-status information. | ESP32 sends GPS,Wi-Fi RSSI, Battery estimate, and emergency status to the backend. | Data transmission may be interrupted during network failure. |
| Emergency alert systems[3],[4] | Emergency alerts help identify critical vehicle conditions. | Push-button activation triggers emergency mode and red/white NeoPixel indication. | Emergency activation is manual; automatic accident detection is not implemented. |
| GPS-based tracking [1], [2] | Real-time geographical location tracking of emergency vehicles. | NEO-6MGPS Module obtains ambulance coordinates and speed. | GPS accuracy depends on satellite signal availability and surrounding conditions. |

| | | | |
|---|---|---|---|
| IoT-based ambulance monitoring[3], [4] | Connected devices support real-time ambulance monitoring And emergency alerts. | ESP32 collects ambulance data and transmits telemetry through Wi-Fi. | Continuous remote monitoring depends on network connectivity. |

**The contributions are deliberately limited:**

1. Pilot Federated Learning Prototype: A pilot federated learning prototype involving three sites with different data modalities is developed. The sites share a common patch-projection encoder while maintaining site-specific classification heads. Training is performed using the FedProx objective.
2. Per-Site Experimental Results: Per-site results from a single-seed experimental run are reported with confidence intervals and majority-class reference rates. This allows the performance of the prototype to be assessed against simple baseline predictions.
3. Implementation Status Documentation: The status of each proposed system component is explicitly identified as implemented, intended, recorded but unverified, or future work. These details are summarized in Tables III and IV.
4. Limited CKKS and Noise Experiments: A limited CKKS encryption and decryption round-trip test is conducted. The noise experiment is described according to its actual implementation. Neither experiment is presented as proof of system security.
5. Future Experimental Requirements: A prioritized list of additional experiments is provided to identify the work required to develop the pilot prototype into stronger experimental evidence supporting the original research objectives.

## IV.SYSTEM ARCHITECTURE

Fig. 1 shows the pipeline. The proposed Smart Ambulance System Using GPS and IoT is designed to monitor ambulance location and status in real time. The system uses an ESP32-WROOM microcontroller, NEO-6M GPS module, Wi-Fi communication, and a web-based dashboard to collect, transmit, and display ambulance information. It also includes an emergency push button and WS2812B NeoPixel LED strip to provide visual indications of different operating conditions.

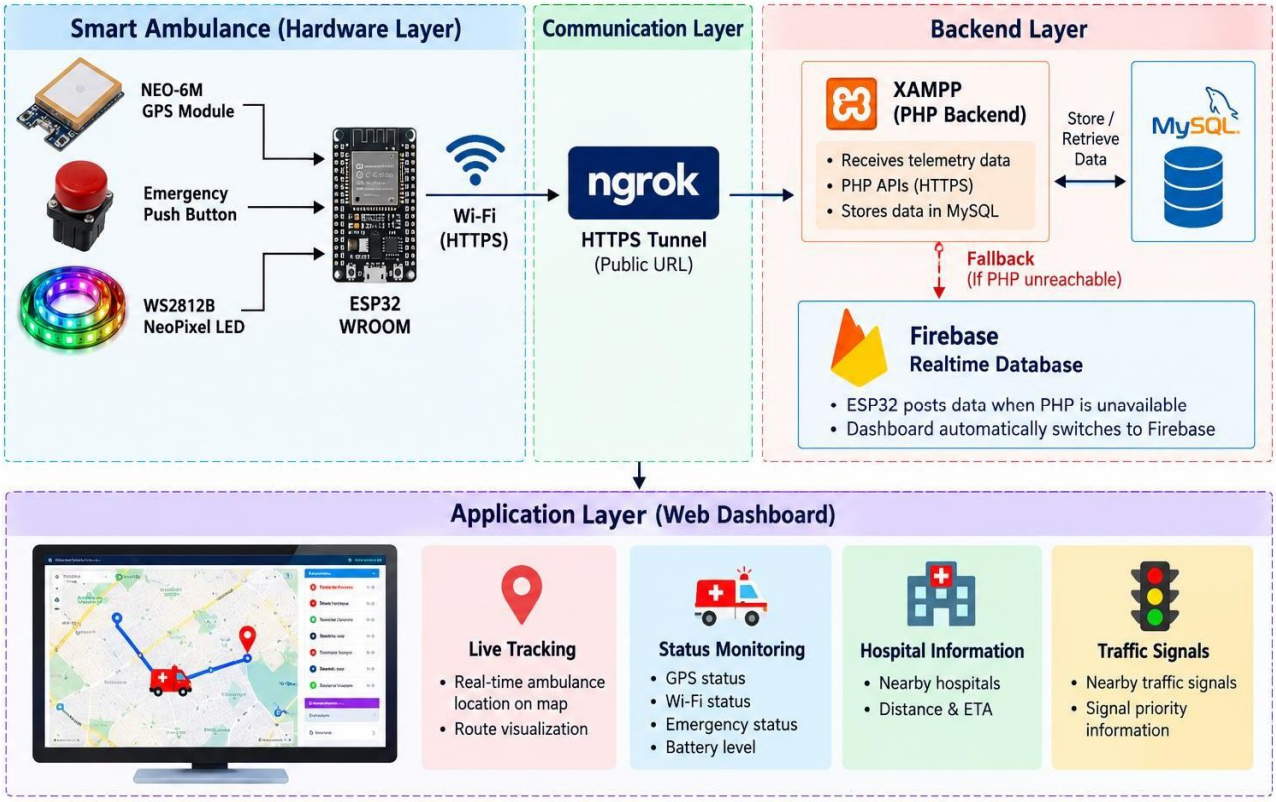



**Fig.1.** Overall architecture and working of the proposed Smart Ambulance System Using GPS and IoT. The NEO-6MGPS module collects the ambulance's location and speed, which are processed by the ESP32-WROOM microcontroller.

### A. Hardware Components and DataFlow

The proposed Smart Ambulance System consists of an ESP32-WROOM microcontroller, a NEO-6M GPS module, a WS2812B NeoPixel LEDstrip, an emergency pushbutton, and a power supply unit. The NEO-6M GPS module receives satellite signals and obtains the ambulance's geographical coordinates and speed. The GPS information is transferred to the ESP32-WROOM through UART communication. The ESP32 acts as the main processing unit of the system. It collects GPS information and monitors Wi-Fi connectivity, GPS availability, battery estimate, and emergency button status. Based on the operating condition, the WS2812B LED strip displays different colours. Orange indicates Wi-Fi disconnection, yellow indicates GPS signal unavailability, soft green indicates successful Wi-Fi connection and GPS availability, and red/white flashing indicates emergency mode. The collected information is transmitted through Wi-Fi to the PHP backend.

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The backend communicates with the MySQL database, where the ambulance information is stored and made available to the web-based monitoring dashboard.

### B. Controller and Hardware Modules

The ESP32-WROOM microcontroller is used as the central processing unit. It receives location information from the NEO-6M GPS module and processes the ambulance's operating status. The NEO-6M GPS module provides latitude, longitude, and speed information. The WS2812B NeoPixel LED strip is used to indicate the system status through different lighting patterns. An emergency push button allows the user to manually activate emergency mode. The power supply consists of a lithium-ion battery pack, Battery Management System (BMS), and LM2596 voltage regulator to provide the required power to the components.

### C. Web-Based Monitoring Dashboard

A web-based dashboard is developed using HTML, CSS, and JavaScript to display the received ambulance information. The dashboard provides a map-based view of the ambulance's current location along with speed, GPS status, Wi-Fi connectivity, battery estimate, and emergency status.

## V. METHODOLOGY

### A. Hardware Components and System Setup

The proposed Smart Ambulance System is developed using an ESP32-WROOM microcontroller integrated with a NEO-6M GPS module, WS2812B NeoPixel LED strip, emergency push button, and power supply unit. The ESP32 acts as the main controller and manages the communication between the hardware components and the monitoring dashboard. The NEO-6M GPS module receives satellite signals and provides the ambulance's latitude, longitude, and speed. The GPS module communicates with the ESP32 through UART serial communication. The emergency push button is connected to the ESP32 to activate emergency mode manually. The NeoPixel LED strip provides visual indications based on the system's operating conditions.

### B. Data Transmission and Database Storage

The ESP32-WROOM uses Wi-Fi connectivity to transmit the collected ambulance information to the PHP backend. The backend receives the data and stores it in the MySQL database for further access through the monitoring dashboard. The transmitted information includes device ID, latitude, longitude, speed; GPS fix status, Wi-Fi signal strength (RSSI), battery estimate, emergency status, and LED mode. The system is designed to send updates approximately every three seconds. The database helps maintain the received ambulance information, which can be retrieved by the dashboard to display the ambulance's current location and operating condition.

**Table II** – Hardware Components and Their Functions

| Component | Function in the proposed system |
|---|---|
| ESP32-WROOM | Main controller for processing and communication |
| NEO-6M GPS module | Obtains ambulance location and speed |
| WS2812B NeoPixel LED | Displays system and emergency status |
| Emergency push button | Manually activates emergency mode |
| Lithium-ion battery pack | Supplies power to the system |
| BMS | Provides battery management |
| LM2596 voltage regulator | Regulates the required input voltage |

### C. Data Processing

The NEO-6M GPS module receives geographical information from GPS satellites and sends the data to the ESP32-WROOM through UART communication. The ESP32 processes the received GPS coordinates, speed, and other system-status information. It checks whether the GPS signal is available and whether the Wi-Fi connection is active. The system also monitors the emergency push button and battery estimate. Based on the collected information, the ESP32 selects the appropriate LED indication. The processed information is organized into telemetry data before being transmitted to the backend server. The proposed system includes an emergency push button to manually activate emergency mode. When the button is pressed, the ESP32 detects the input and updates the emergency status. The WS2812B NeoPixel LED strip provides visual indications for different operating conditions. Orange represents Wi-Fi disconnection, yellow represents GPS signal unavailability, soft green represents successful Wi-Fi connection and GPS availability, and red/white flashing represents emergency mode. The emergency status is also transmitted to the backend and displayed on the web-based monitoring dashboard.

### D. Web Dashboard Monitoring

The web-based dashboard is developed using HTML, CSS, and JavaScript. It retrieves the ambulance information from the backend and displays the received data in an organized format. The dashboard provides a map-based visualization of the ambulance's location and displays speed, GPS status, Wi-Fi connectivity, battery estimate, and emergency status. It also provides information about nearby hospitals and traffic signals to support location awareness.

## VI. IMPLEMENTATION

The Smart Ambulance System Using GPS and IoT is implemented by integrating hardware components with software technologies to enable real-time ambulance tracking and monitoring. The ESP32-WROOM microcontroller acts as the central processing unit, while the NEO-6M GPS module collects location information. Wi-Fi communication is used to Transfer the collected data to the backend server, and a web-based dashboard displays the ambulance information.

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**TABLE III**- Implementation Status and Available Evidence

| Component | Status | Available evidence | Missing evidence |
|---|---|---|---|
| ESP32-WROOM controller | Implemented | ESP32 Program code and hardware integration. | Hardware testing photographs and execution logs. |
| NEO-6M GPS module | Implemented | GPS interface code for receiving latitude, longitude, and speed. | Long-duration GPS Accuracy and Signal Testing results. |
| GPS data processing | Implemented | Code for reading and processing GPS Information | Detailed GPS Performance evaluation. |
| Wi-Fi communication | Implemented | ESP32Wi-Fi connection and data transmission code | Network reliability testing under different conditions |
| PHP backend | Implemented | PHP files for receiving ambulance telemetry | Detailed server execution logs. |
| MySQL database | Implemented | Database configuration and telemetry storage Implementation | Database performance and storage evaluation. |
| Web-based dashboard | Implemented | HTML,CSS, and JavaScript dashboard implementation | Extended real-time testing records. |
| Emergency pushbutton | Implemented | Button input handling and Emergency- mode logic. | Repeated hardware Testing results. |
| WS2812B NeoPixel LED | Implemented | LED control code for Wi-Fi, GPS, and emergency | LED testing photographs or videos. |
| Battery monitoring | Implemented | Battery estimate included in the Telemetry information. | Battery-life and measurement Accuracy evaluation. |
| Nearby hospital information | Implemented | Hospital information displayed Through the dashboard. | Field verification of hospital Information |
| Traffic-signal information | Implemented | Traffic-signal information displayed Through the dashboard. | Automatic traffic-signal Communication and control |
| Firebase Real time Database | Optional | Considered as an alternative data storage method. | Verified integration and testing results |
| Ngrok remote access | Implemented | Ngrok configuration for remote HTTPS access to the local backend. | Long-duration remote connectivity testing. |
| Automatic accident detection | Not Implemented | Not available in the current implementation. | Accident detection mechanism and validation |
| Automatic traffic-signal control | Not Implemented | Not available in the current implementation. | Integration with traffic-signal infrastructure. |

## VII. SYSTEM EVALUATION METHODOLOGY

### A. GPS Tracking Evaluation

The GPS tracking functionality is evaluated by checking whether the NEO-6M GPS module receives satellite information and provides the ambulance's latitude, longitude, and speed. The received GPS information is compared with the location displayed on the web-based dashboard to verify successful data transmission and visualization.

### B. Wi-Fi Communication Evaluation

The Wi-Fi communication is evaluated by checking whether the ESP32-WROOM successfully connects to the wireless network and transmits ambulance information to the PHP backend. The system also monitors Wi-Fi signal strength using the Received Signal Strength Indicator (RSSI).

### C. Emergency Mode Evaluation

The emergency functionality is evaluated by pressing the emergency push button and checking whether the ESP32 activates emergency mode. The WS2812B NeoPixel LED strip is expected to display a red and white flashing pattern, while the emergency status is transmitted to the backend and displayed on the dashboard.

### D. Database and Dashboard Evaluation

The backend functionality is evaluated by checking whether the PHP server receives the telemetry information and stores it in the MySQL database. The dashboard is checked to verify whether the received ambulance location, speed, GPS status, Wi-Fi connectivity, battery estimate, and emergency status are displayed correctly.

## VIII. PERFORMANCE EVALUATION AND RESULTS

The proposed Smart Ambulance System is evaluated based on the working of GPS tracking, Wi-Fi communication, emergency activation, database storage, and web-based monitoring. The evaluation focuses on checking whether the system successfully collects, transmits, stores, and displays ambulance information.

### A. System Functionality Evaluation

The system functionality is evaluated by checking the operation of each hardware and software component. GPS coordinates and speed are checked to verify location acquisition. Wi-Fi communication is checked to confirm that the ESP32 successfully sends information to the PHP backend. The received data is also checked in the MySQL database and monitoring dashboard.

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## VIII. SECURITY AND PRIVACY CONSIDERATIONS

### A. Threat Model

The proposed Smart Ambulance System uses GPS and IoT communication to transmit ambulance location and operating information to a backend server. Since the system communicates through Wi-Fi and a web-based dashboard, it may face security risks such as unauthorized access, data interception, and misuse of ambulance location information. An attacker with access to the communication network may attempt to observe transmitted information or access the backend without authorization. Unauthorized modification of GPS coordinates or emergency status may also affect the reliability of the displayed information. Therefore, protecting communication, database access, and dashboard information is important for the secure operation of the system.

### B. Security Considerations in the Implemented System

The ESP32-WROOM communicates with the PHP backend through Wi-Fi. The backend receives ambulance telemetry and stores it in the MySQL database. The system uses Ngrok to provide remote HTTPS access to the locally hosted backend when required.

### C. Communication and Performance Evaluation

The proposed system uses Wi-Fi communication to transfer ambulance telemetry from the ESP32-WROOM microcontroller to the PHP backend. The transmitted information includes GPS coordinates, speed, GPS fix status, Wi-Fi signal strength, battery estimate, and emergency status. The backend stores the received information in a MySQL database, and the web-based dashboard displays the ambulance information for monitoring.

## IX. EXPERIMENTAL SETUP

The experimental setup is designed to verify the working of the proposed Smart Ambulance System using GPS and IoT. The system combines an ESP32-WROOM microcontroller, NEO-6M GPS module, Wi-Fi communication, a PHP backend, a MySQL database, and a web-based monitoring dashboard. The experiments focus on GPS data collection, wireless data transmission, database storage, dashboard monitoring, and emergency indication through the push button and NeoPixel LED strip.

**TABLE V** – Experimental Setup and Configuration

| Item | Value |
|---|---|
| Microcontroller | ESP32-WROOM |
| GPS module | NEO-6M |
| GPS communication | UART |
| Wireless communication | Wi-Fi |
| Programming environment | Arduino IDE |
| Programming language | Embedded C/C++ |
| Backend technology | PHP |
| Database | MySQL |
| Local server | XAMPP |

## X. RESULTS

### A. Verified System Functionality Results

The proposed Smart Ambulance System was developed to monitor ambulance location and operating status using GPS and IoT technologies. The system integrates the ESP32-WROOM microcontroller with the NEO-6M GPS module to collect location and speed information. The collected data is transmitted through Wi-Fi to the PHP backend and stored in a MySQL database. The web-based dashboard displays the ambulance information for remote monitoring.

### B. System Functionality Evaluation

The proposed Smart Ambulance System is evaluated based on the working of its hardware components, communication system, backend, and monitoring dashboard. The NEO-6M GPS module provides the ambulance's geographical coordinates and speed information to the ESP32-WROOM microcontroller. The ESP32 processes the collected information and transmits it through Wi-Fi to the PHP backend. The received information is stored in the MySQL database and displayed on the web-based dashboard.

**Table VII** – Functional Evaluation of the Proposed System

| Component | Function evaluated |
|---|---|
| ESP32-WROOM | Processing system information |
| NEO-6MGPS | Receiving location and speed |
| Wi-Fi | Transmitting telemetry data |
| PHP backend | Receiving device information |
| MySQL database | Storing ambulance telemetry |
| Web dashboard | Displaying location and status |
| Emergency push button | Activating emergency mode |
| NeoPixelLED | Displaying operating conditions |

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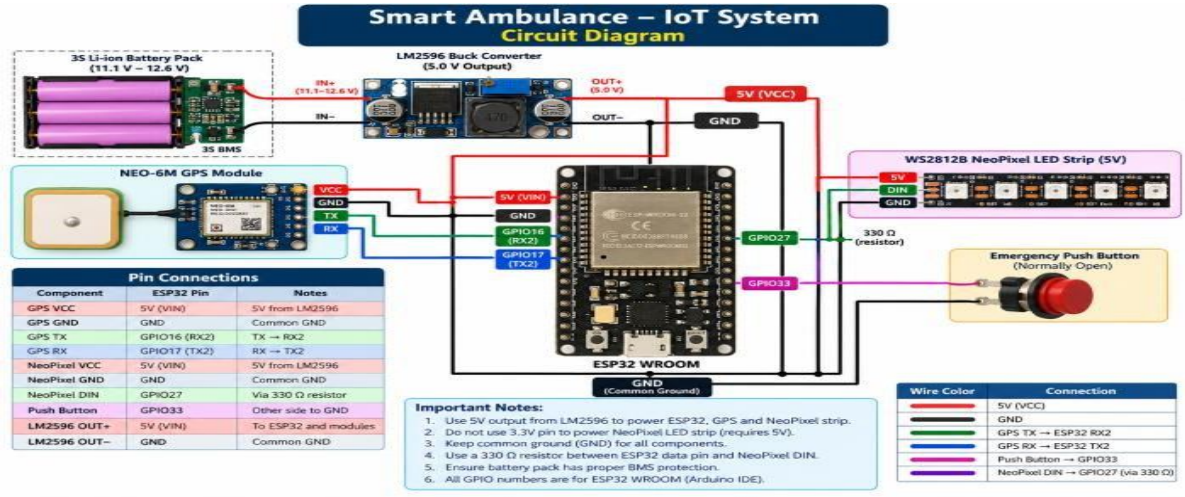



**Fig 2.** Hardware Connection Diagram

## XI . Limitations and Threats to Validity

**Hardware Limitations:** The proposed system uses an ESP32-WROOM microcontroller and a NEO-6M GPS module for ambulance tracking. GPS availability and location accuracy may be affected by environmental conditions, buildings, and weak satellite signals. The system also depends on a stable power supply and functioning hardware components.

**Communication Limitations:** The system uses Wi-Fi to transmit ambulance information to the PHP backend. Network interruptions or weak connectivity may delay the transmission of GPS coordinates and emergency status. Continuous monitoring depends on the availability of network connectivity and backend services.

**Data and Monitoring Limitations:** The systems to res ambulance telemetry in a MySQL database and displays it through a web-based dashboard. However, detailed long-term testing of data storage, GPS accuracy, and dashboard update performance has not been conducted. Nearby hospital and traffic-signal information may also require regular updates to maintain accuracy Quantitative performance measurements such as GPS accuracy, network latency, battery life, and communication reliability have not been recorded. The system has also not been evaluated through large-scale real-world ambulance trials.

**Operational Limitations:** Emergency mode is activated manually using a push button. Automatic accident detection, automatic traffic-signal control, and direct integration with hospital emergency services are not included in the current implementation. The system is intended for ambulance monitoring and does not replace professional emergency-response services.

## XII. FUTUREWORK

The proposed Smart Ambulance System can be improved in several ways to provide better ambulance monitoring and emergency response support. Future development can focus on improving GPS accuracy, communication reliability, security, and system functionality. The first improvement is to integrate a more reliable communication method so that ambulance location and emergency information can be transmitted even when Wi-Fi connectivity is unavailable. Additional GPS testing can be performed to improve location accuracy under different environmental conditions. A mobile application can be developed to allow authorized users, hospitals, and emergency coordinators to monitor ambulance location and status. User authentication and role-based access control can also be introduced to improve data security and protect sensitive location information. The system can further be enhanced by integrating automatic accident detection and emergency notifications. Integration with hospital systems can help share ambulance location and emergency details with nearby hospitals. Automatic traffic-signal coordination can also be explored to provide priority to ambulances during emergency situations. Further testing can be conducted under real-world conditions to evaluate GPS accuracy, network latency, battery performance, and communication reliability. These improvements can help make the proposed system more reliable and suitable for practical ambulance monitoring applications.

## XIII.CONCLUSION

The Smart Ambulance System Using GPS and IoT is designed to support ambulance tracking and emergency monitoring through GPS technology and wireless communication. The proposed system uses an ESP32-WROOM microcontroller integrated with a NEO-6M GPS module to collect ambulance location and speed information. The collected data is transmitted through Wi-Fi to a PHP backend and stored in a MySQL database. A web-based dashboard is developed to display ambulance location, speed, connectivity status, battery estimate, and emergency information. The system also includes a manual emergency push button and a WS2812B NeoPixel LED strip to indicate different operating conditions, including emergency mode. The proposed system combines GPS tracking, IoT communication, database storage, and web-based monitoring into a single platform. It provides a practical approach to monitoring ambulance location and status. However, further testing and improvements are required to evaluate its performance under real-world conditions. Features such as automatic accident detection, traffic-signal control, and hospital integration can be considered for future development.

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Validation: Sania Zehra K, Nithya Sri V
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Resources: Mrs.Jyothi M
Writing original draft preparation: Sania Zehra K, Nithya Sri V
Writing review and Editing: Pavana S, Purnima T
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