

SMART HELMET

USING AI-BASED CRASH
DETECTION AND LOCATION
TRACKING

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INTRODUCTION

A Smart Helmet with AI-based crash detection, GSM/GPS tracking, and automatic emergency alerts to enhance road safety..

WHAT IS TECHNOLOGY CONSULTING?

1.

IT Strategy and Planning

Consultants help companies create a clear roadmap for how technology can support their business objectives.

2.

System Design and Implementation

They assist in selecting and setting up the right software and hardware systems.

3.

Process Optimization

Consultants analyze how a company currently works and suggest technology-based improvements.

4.

Cybersecurity and Data Protection

Protecting sensitive data is a major focus of technology consulting

Explanation of technology consulting and its role in advising businesses on leveraging technology to achieve strategic objectives.

Artificial Intelligence (AI)

AI helps the helmet detect accidents quickly by analyzing sensor data. It can also recognize voice commands and predict unsafe riding behavior.



Augmented Reality (AR)

AR shows speed, navigation, and alerts on the helmet visor, helping riders stay focused on the road without distractions.

Blockchain Technology

Blockchain keeps accident and location data safe and unchangeable, allowing only trusted people to access verified information.

Internet of Things (IoT)

IoT connects sensors, GPS, and apps, enabling the helmet to send live location and emergency alerts instantly after an accident.

PROBLEM & SOLUTION



Problem 1

Accidents occur, and help doesn't reach quickly.

Solution 1

The Smart Helmet detects accidents, sends location alerts, and ensures rider safety using sensors and IoT.

Problem 2

Many riders face accidents without anyone knowing or reaching them in time.

Solution 2

The Smart Helmet automatically senses accidents and alerts emergency contacts to save lives quickly.

IMPLEMENTATION & CHALLENGES

Sensors detect accidents, Arduino processes data, and GPS/GSM sends alerts to contacts.

Tested for accuracy and reliability.

Detecting real accidents, battery life, GPS accuracy, module integration, comfort, and cost.



Strategic Planning

Goal: Smart Helmet alerts accidents.

Plan: Build, code, connect sensors.

Monitor: Test and improve.

Ongoing Support

Provide regular updates, maintain sensors and software, fix issues, and ensure the helmet works reliably over time.

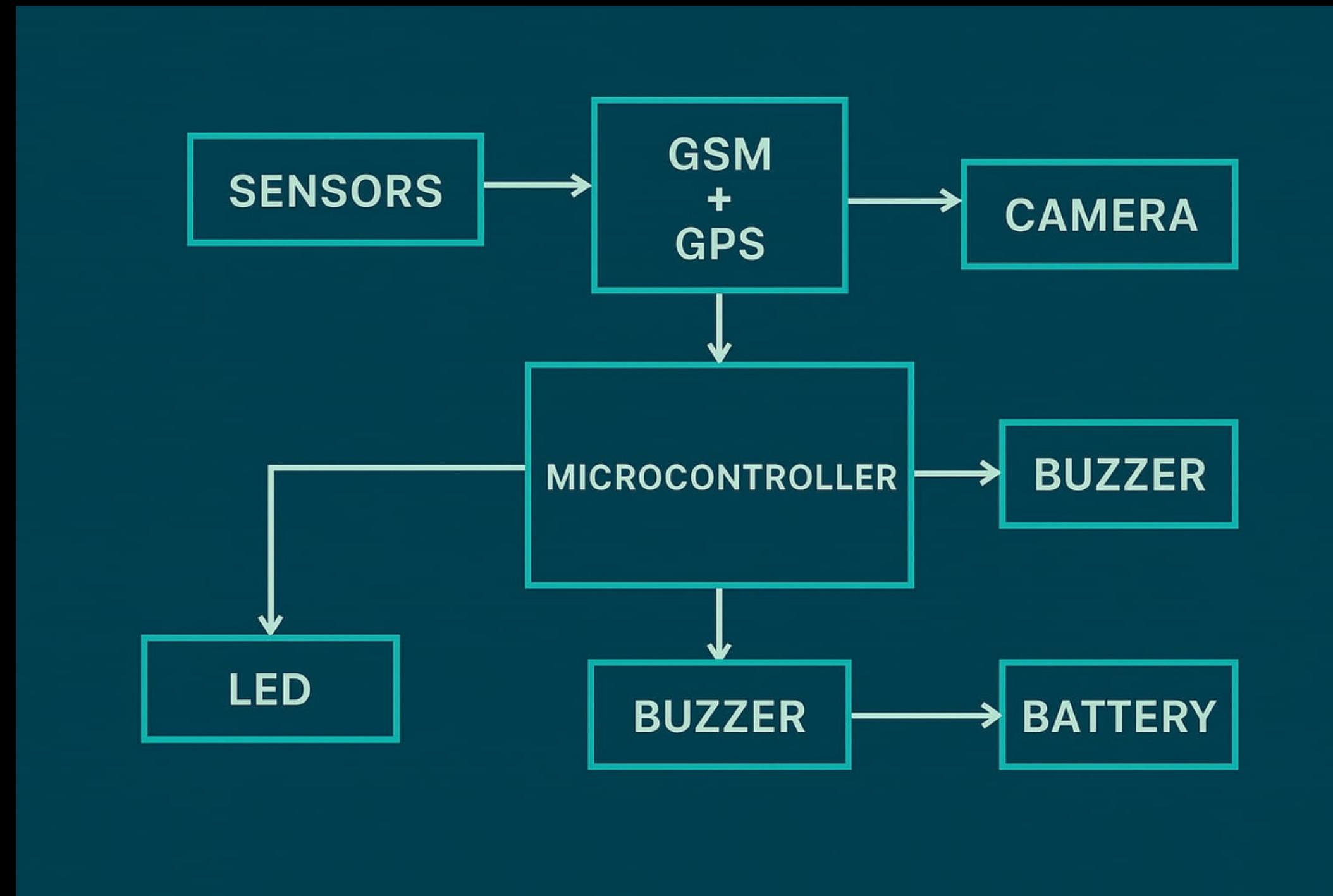
Technology Implementation

Use sensors, GPS, GSM, and IoT to detect accidents, send alerts, and track location in real time.

KEY COMPONENTS

The Smart Helmet uses an Arduino/ESP32, accelerometer and gyroscope to detect impacts, GPS and GSM for location and alerts, a camera for monitoring, and buzzers/LEDs for warnings. A battery powers the system, connected via IoT for real-time updates.

CIRCUIT DIAGRAM



| Component | Function | Range / Specs | Quantity |
|-----------------------------------|-----------------------------|--|----------|
| Arduino Uno / NodeMCU ESP32 | Main microcontroller | 16 MHz, 3.3V logic | 1 |
| MPU9250 Accelerometer + Gyroscope | Accident detection | >5g to <1g (accel) >20% to <200% (gyro) | 1 |
| NED-EM GPS Module | Location tracking | Accuracy: <5m, baud rate 9600 | 1 |
| SIM800L / SIM900 GSM Module | Calling & SMS | 850/900/1300/1800 MHz | 1 |
| ESP32 CAM Module | Camera + WiFi module | 2MP OV2640, WiFi 802.11 b/g/n | 1 |
| Pushbutton / Reset | Manual reset / Power button | | 1 |

| Component | Function | Range / Specs | Quantity | Unit Price |
|----------------------------|-------------------|---------------------------|--------------|------------|
| Rotor | Local orientation | Stainless Rotor | 1 20-40 | |
| EDU rotors | Starwheels | 3mm/5mm red/green/blue | 1 25 each | |
| Motors | Current Rating | 2000, 24W | 2 25 each | |
| EDUs | | | | |
| Battery Pack (LiPo) | Power supply | 14.8V 22000 mAh Ni | 1 200.00 | |
| DSLR | | | | |
| Brushless Motor Protection | Protecting | 40x0.00001 ampere | 1 unit | 50.00 |
| Wires | | | | |
| Storage Bag | | | | |
| Memory Card | Storage Memory | SD 4.4GB capacity | 2 50.00 | |
| Universal | | | | |
| Velvet Blue Cloth | Velvet Blue cloth | Standard & certified | 1 1000.00 | |
| Gloves | Hand protection | Velvet | 2 20.00 each | |
| Bracelets | Stainless Steel | 2000P - 2500L mm | 2 20.00 each | |

EXISTING SYSTEM AND DRAWBACK

- **Usual Helmets**

- Provide only head protection.
- No electronic safety features.

- **Smart Helmets with Basic Sensors**

- Some helmets have sensors for accident detection.
- Use simple vibration or tilt sensors.
- Few models integrate GPS for location sharing.

- **IoT-Enabled Helmets**

- Some research prototypes use GSM/GPS modules for accident alerts.
- Alerts are sent to pre-stored numbers.
- Limited to SMS or buzzer alerts.

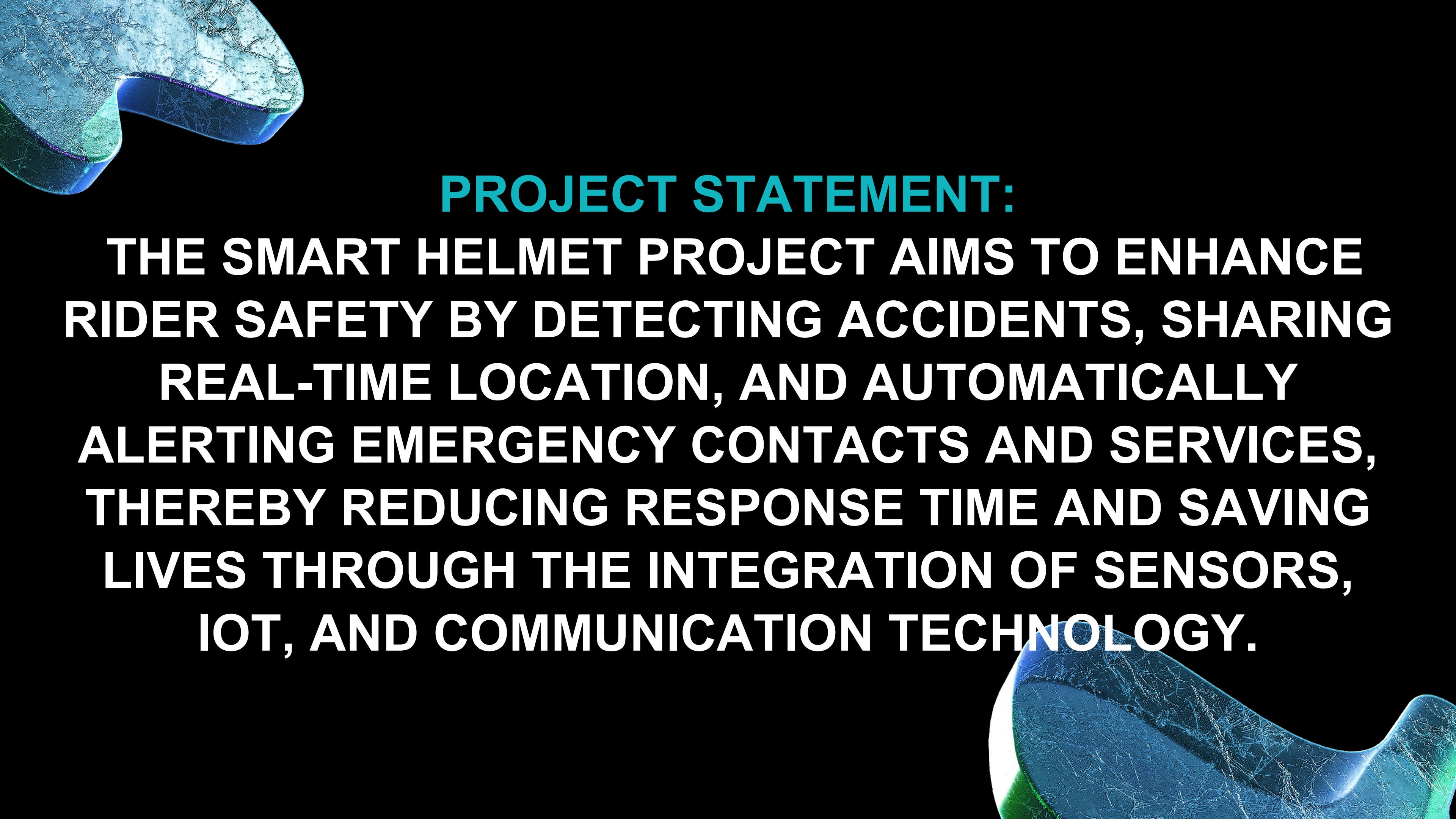
FUTURE OUTLOOK & CONCLUSION

The Smart Helmet will advance with IoT and AI features for real-time safety and accident prediction. It marks a major step toward smarter and safer transportation through intelligent technology.



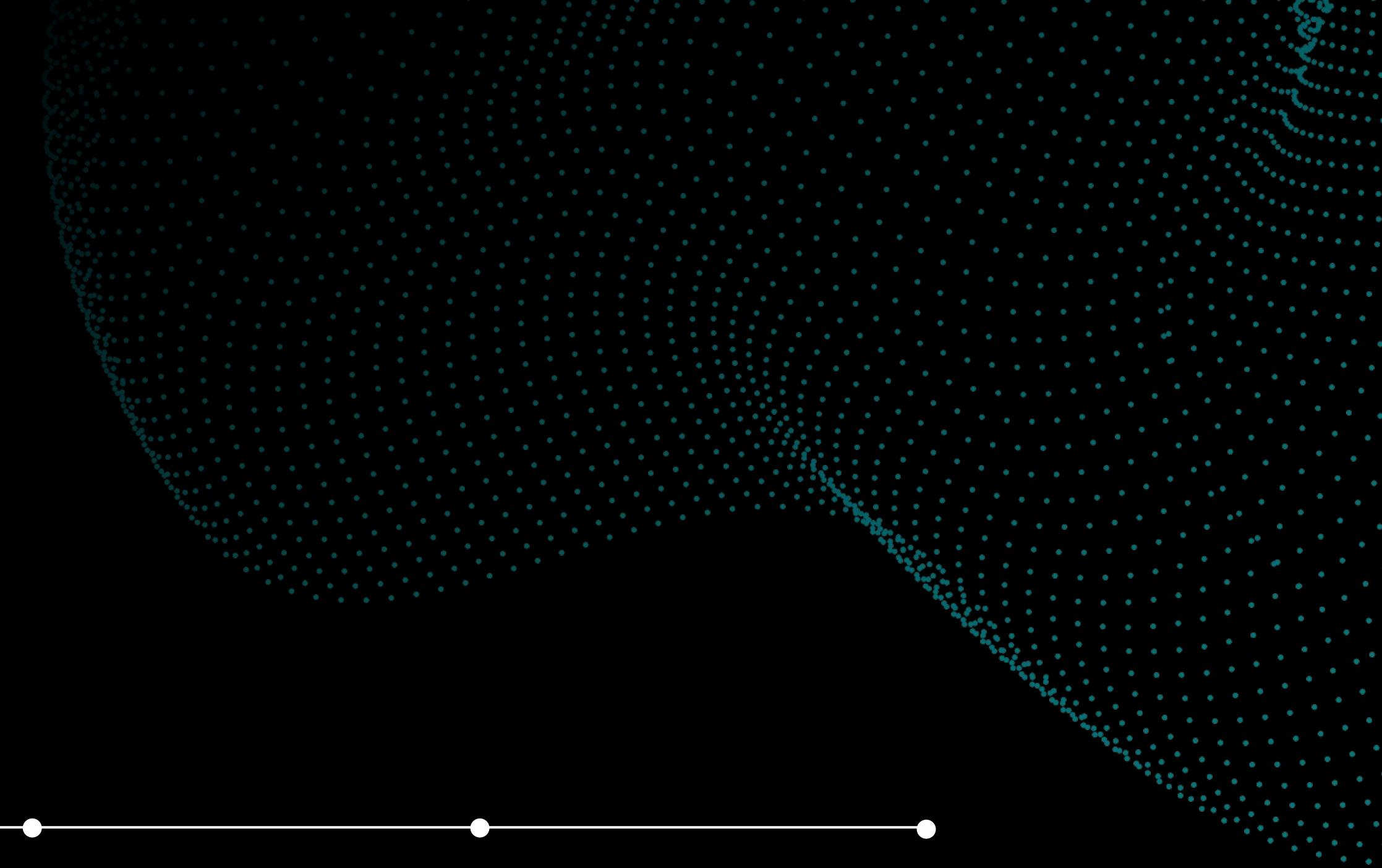
APPLICATIONS

1. Road safety for two-wheeler riders.
 2. Real-time accident monitoring.
 3. Emergency medical response.
 4. Location sharing for family tracking.
 5. AI-driven crash detection research
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PROJECT STATEMENT:
THE SMART HELMET PROJECT AIMS TO ENHANCE RIDER SAFETY BY DETECTING ACCIDENTS, SHARING REAL-TIME LOCATION, AND AUTOMATICALLY ALERTING EMERGENCY CONTACTS AND SERVICES, THEREBY REDUCING RESPONSE TIME AND SAVING LIVES THROUGH THE INTEGRATION OF SENSORS, IOT, AND COMMUNICATION TECHNOLOGY.

ADVANTAGE S

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- 1 Immediate accident detection and alert
 - 2 Real-time location tracking
 - 3 Automatic emergency calling.
 - 4 Improved rider safety
 - 5 Integration with mobile application.

HARDWARE REQUIREMENT



Core Components

- ESP32 DevKit V1 – main controller (Wi-Fi/BLE)
- SIM800L GSM Module – SMS/call feature
- NEO-6M GPS Module – location tracking

Power:

- 18650 Li-ion Battery + Holder
- TP4056 Charging Module (with protection)
- 1000 μ F Capacitor (for SIM800L stability)
- 3.3V Regulator / Buck Converter

Sensors & Alerts:

- MPU6050 (Accelerometer + Gyro) – crash detection
- Helmet-wear detection sensor (Reed switch / FSR)
- Buzzer + LED – emergency alert
- Push button – cancel false alarm

MOUNTING & MISC:

- Switch, Jumper wires, Perfboard/PCB, Enclosure inside helmet

SOFTWARE REQUIREMENT

- **Arduino IDE – for coding and uploading programs**
- **Embedded C / C++ – programming language**
- **Required Libraries – MPU6050, GPS, GSM**
- **Google Maps API – location tracking**
- **Operating System – Windows / Linux / macOS**

CONCLUSION

The Smart Helmet with AI-based crash detection and GSM/GPS integration is an innovative solution to improve road safety. By ensuring quick emergency response and real-time monitoring, this project has the potential to save countless lives.

