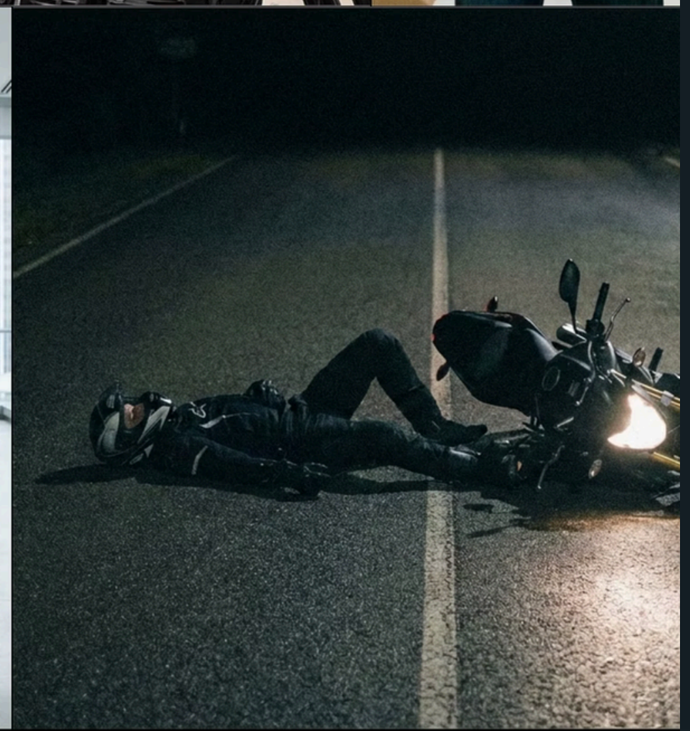
PROJECT SPLIT-JAW

Secure Your Ride. Save Your Life.

HexaCore Engineering

A self-sustaining, robotic smart helmet designed for the modern rider.



The Problem Statement

Riders face persistent helmet theft in urban environments. Carrying helmets everywhere creates inconvenience and vulnerability.

When riders lose consciousness in accidents, who calls for help? Existing systems lack automated emergency detection.

Current smart helmets offer audio features, but fail to address physical security or emergency response.

Three Pillars of Protection

Our engineering philosophy centers on autonomous security, active safety, and zero-maintenance operation.

Robotic Security

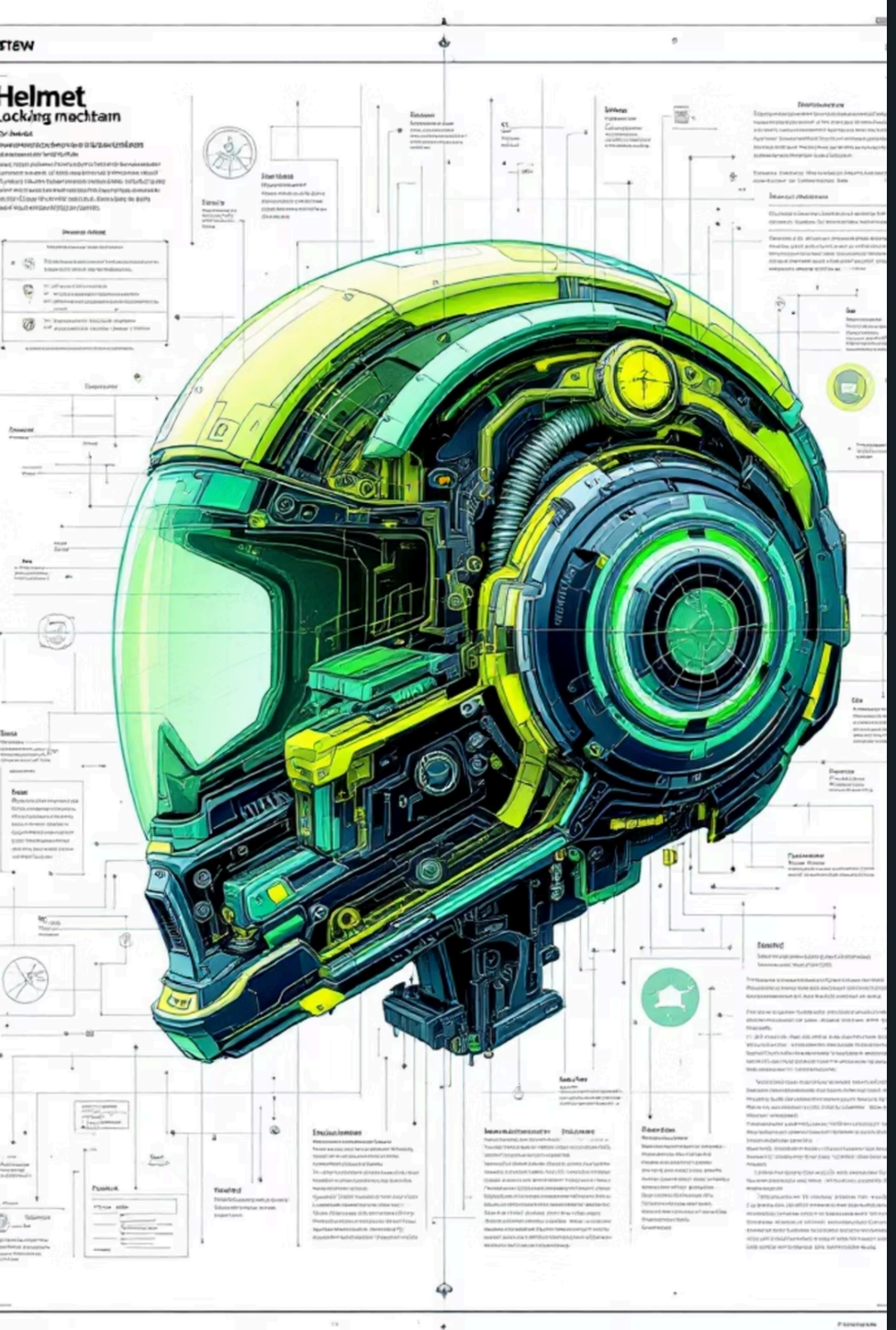
Automated "Vertical Split-Jaw" locking mechanism secures helmet to motorcycle in seconds.

Active Safety

Real-time accident detection with automatic SOS alerts to emergency contacts and GPS location.

Zero Maintenance

Solar-powered "Infinite Standby" system eliminates battery concerns and charging cycles.



Mechanical Innovation: The "Split-Jaw" Lock

Automated Curved Vertical Deadbolt

01

Vertical Cut Design

Hidden polycarbonate plate housed in left chin bar vertical gap.

02

Stainless Core

4mm stainless steel reinforcement provides anti-cut protection against theft tools.

03

Motor-Driven Action

N20 metal gear motor with high torque drives curved rack & pinion mechanism.

Smart Locking & Unlocking Mechanism

Unlocking

Action: Tap the NFC card or use the App.
Result: A 3-inch vertical gap opens on the left side, allowing you to remove the helmet.

Locking

Action: Place the helmet on the bike bar and press the physical button.
Mechanism: The motor pushes the plate out across the open gap.

Anti-Pinch Safety

Obstruction: If a finger is in the gap

Response: The motor instantly stops, reverses 2cm, and flashes a Red LED warning

Active Safety (SOS Crash Detection)

Smart Detection: The MPU6050 sensor triggers only if it detects a heavy impact (>4G force)

False-Alarm Check: A 15-second pre-alarm (beeps and flashes) gives the rider time to cancel if the helmet was just accidentally dropped.

Emergency Alert: If the button is not pressed, the system confirms the crash and auto-sends an SMS with a live Google Maps link to 3 emergency contacts.

The Guardian Eye: Visual Interface

WS2812B RGB Ring Display (Side-Mounted)

Operational Status

✓ Solid Green: Access granted / unlocked

↻ Spinning Orange: Motor in motion (keep hands clear)

✗ Rapid Red Flash: Error / wrong card / obstruction detected

Battery Monitor

Short press activates:

Green: 50–100% charge

Yellow: 20–49% charge

Red: <20% charge

Flashing Red: CRITICAL (<10%) — Lockout active

SOS Mode

Strobing Red + White: Crash detected — Visual beacon for emergency responders

Power Architecture & Energy Flow

Energy System Overview

Inputs: Solar trickle charge (maintenance mode) + USB-C (rapid charging capability)

Storage: Samsung 21700 battery (5000mAh capacity)

Standby Consumption: <10µA in deep sleep mode

Battery Life: Weeks of standby time between charges

Fail-Safe: USB-C power injection enables unlocking even with 0% battery

Multi-Mode Access Control

Tap & Go

Instant unlock with NFC "Master Key" card. No phone required. Sub-second response time for seamless access.

Guardian App

Bluetooth-enabled unlock, real-time battery monitoring, emergency contact configuration, and usage analytics.

Emergency Backup

USB-C power injection wakes dead system. Physical override ensures access even during complete battery failure.

Hardware Architecture

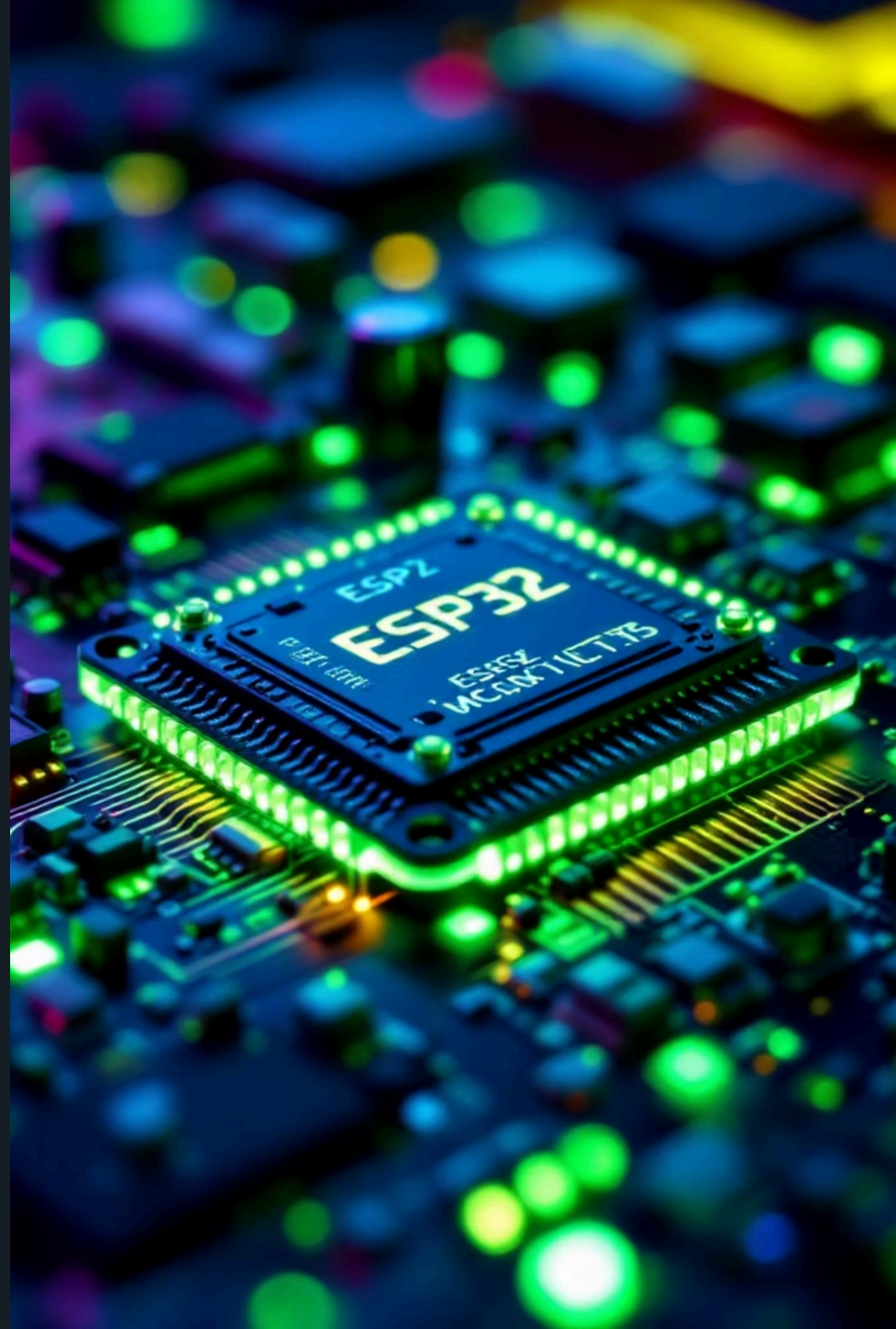
Brain
ESP32-WROOM-32D Dual Core processor with integrated BLE and Wi-Fi connectivity

Senses
MPU6050 Gyro for accident detection + RC522 NFC for secure authentication

Power
Samsung 21700 Li-ion (5000mAh) + 1W flexible solar panel for extended operation

Safety Pod
Battery housed in rear nape with fire-retardant ABS and thermal cutoff protection

45+ days of battery life in continuous rain with zero sunlight on single charge



"The Shield" & Hardware Weather Protection

Integrated "Shield" Cover:

A retractable 190T Nylon rain cover (deploys in 3s from a hidden pouch) that provides 100% waterproof and UV protection, featuring a clear TPU window for continuous solar charging.

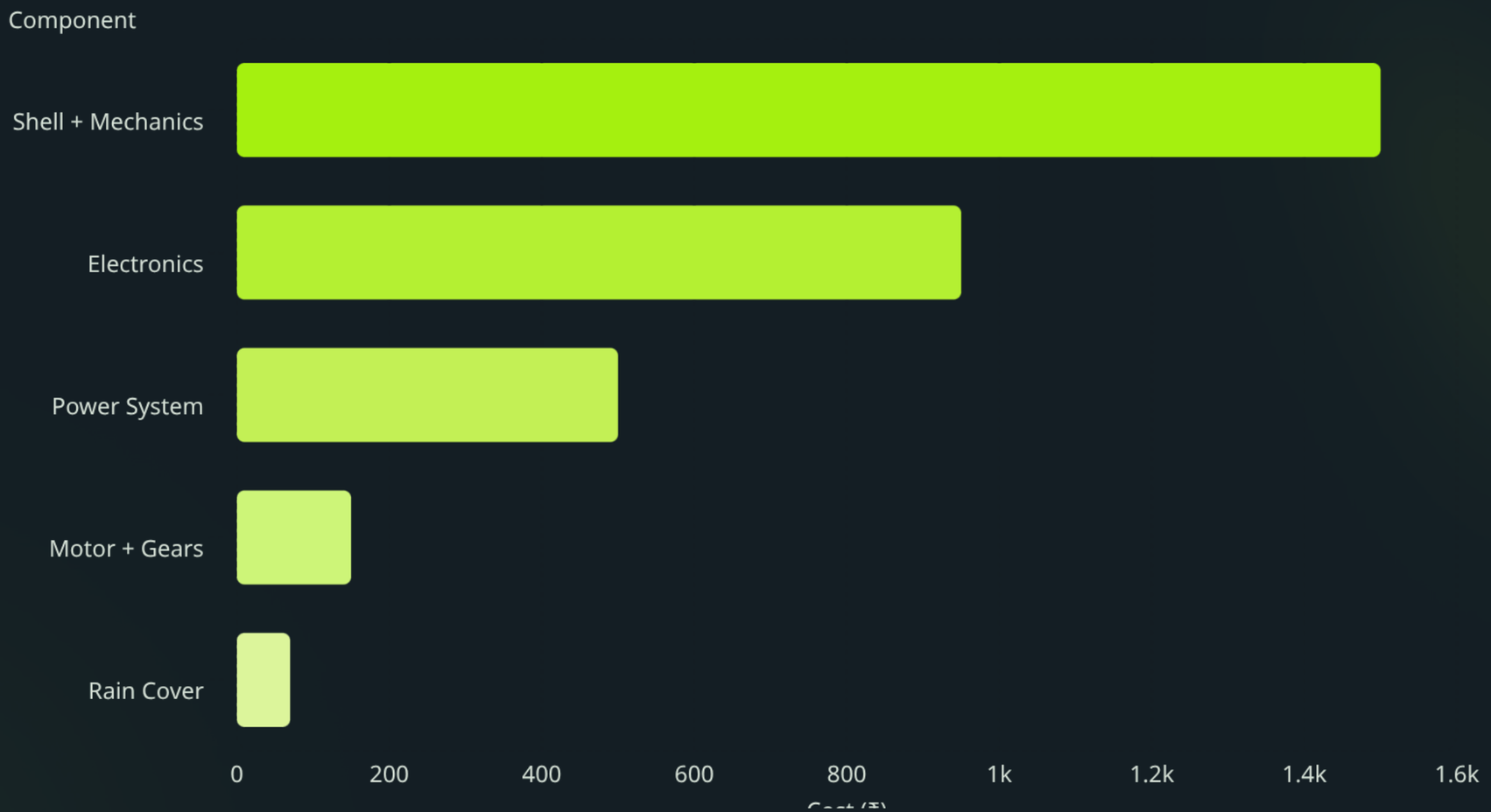
Internal Waterproofing:

All PCBs, exposed wires, and the ESP32 are completely sealed with industrial silicone to prevent short circuits from high humidity or condensation.

Thermal Safety (Anti-Overheat):

The battery is housed in a fire-retardant ABS pod and uses an NTC Thermistor to automatically cut off charging if the internal temperature exceeds 45°C in direct sunlight.

Cost Analysis & Viability



₹3,170
Manufacturing Cost
Total component cost per unit

₹4,499
Retail Price
Recommended market pricing

42%
Margin
Healthy profit margin for production

Market Fit

- The Trap: Buy a standard helmet for ₹2,000.
- The Hidden Cost: It gets stolen. Buy a replacement (₹2,000) + a bulky wire lock (₹500).
- Total Spent = ₹4,500.
- The Guardian Solution: Priced at ₹4,499. It completely breaks the theft cycle.
- Zero Hassle: Built-in robotic lock means no carrying dirty chains.
- The Bonus: Includes life-saving SOS crash detection for the exact same price.

Future Scope

Integrated Dashcam:

A built-in, flush-mounted 1080p camera with loop recording to capture accident evidence and ride footage.

Standalone GPS Tracking:

Upgrading from phone-dependent GPS to an inbuilt GPS module for live anti-theft tracking, even if the rider's phone is destroyed.

Project Split-Jaw

Summary

Premium smart features

Advanced sensors, connectivity, and intelligent controls

Mid-range price

Affordable positioning for broad market adoption

Lifesaving technology

Designed to improve safety and emergency response

Questions?

Thank You