

EV.Engineer

The Future of eMobility & EV Software Development



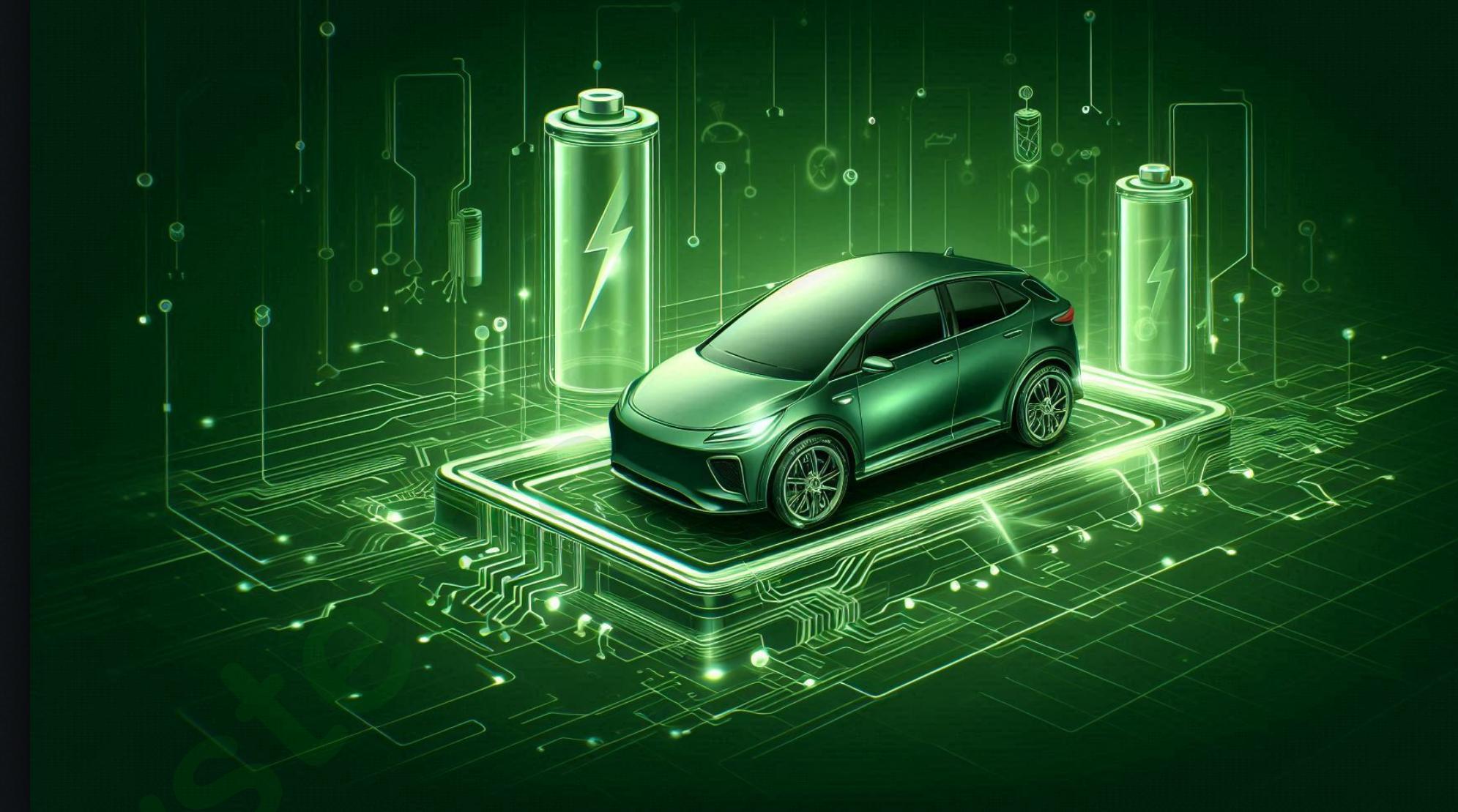
EV Cybersecurity

EV.Engineer

The Future of eMobility & EV Software Development

Sudarshana Karkala

Co-founder - EV.Engineer, CAR Software Systems
Advisor @ iTelematics Software Private Limited



Agenda

[YouTube | Creative Etc Made a Solar Electric Car at Home](#)

- EV Innovation
 - The Future of eMobility & EV Software Development
 - Research - EV Battery Safety
- EV Jobs & Career Opportunities
 - EV.Engineer - Workshop | Personal Branding

Introduction

iTelematics Software Private Limited is a Bengaluru-based company, specialising in EV & Automotive Telematics Engineering, focusing on In-Vehicle Communication and Vehicle-to-Vehicle Communication.

The company supports

- Research & Development,
- Academic partnerships,
- Startup projects and
- Researcher assistance in patents and doctoral theses.

Telematics Engineering

EV Battery Safety

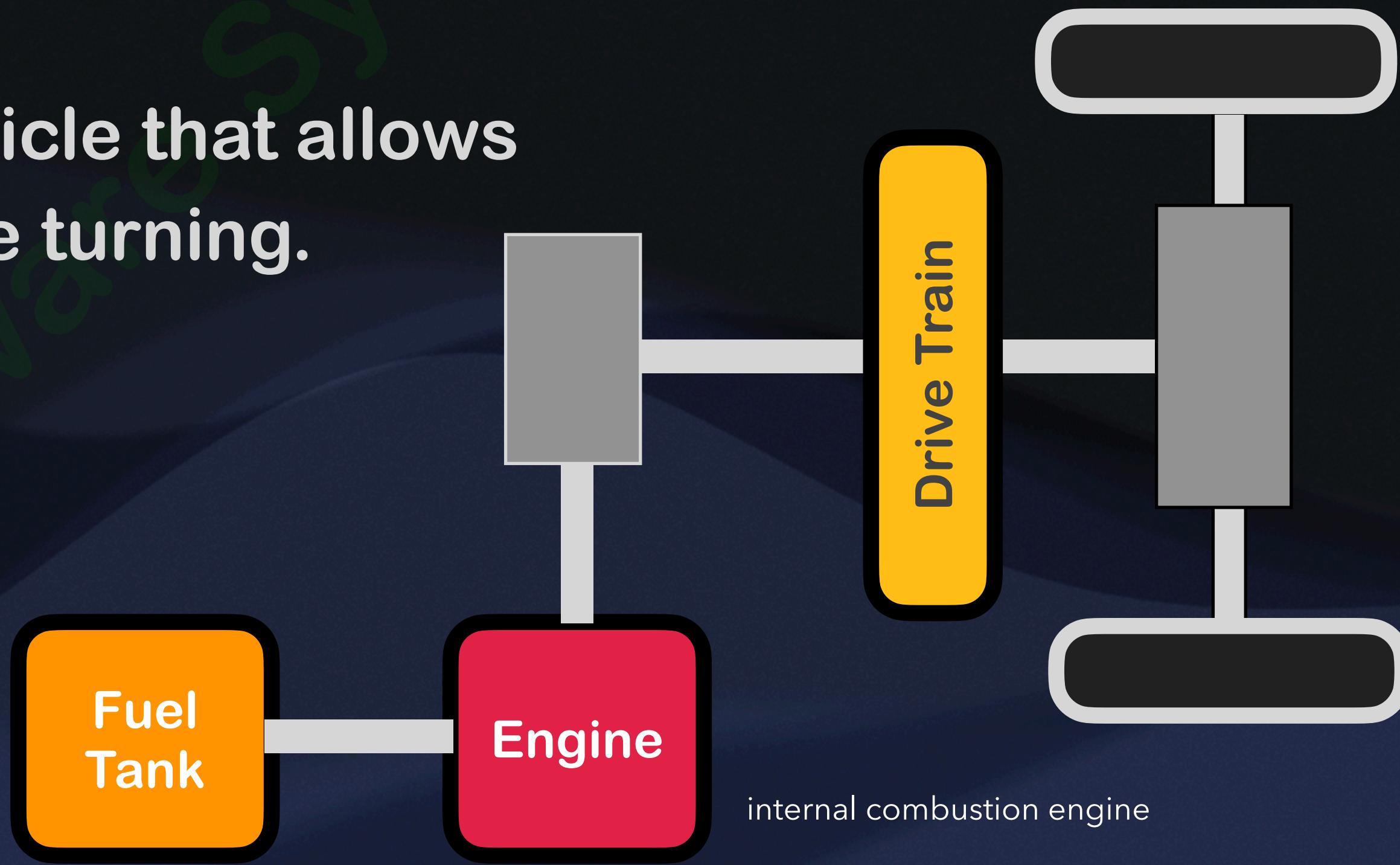
Automotive Cybersecurity

Drive Train for Petrol Vehicles

The drivetrain in a petrol vehicle is the system that transfers power from the engine to the wheels, allowing the car to move.

It includes the engine, transmission, driveshaft, differential and axles.

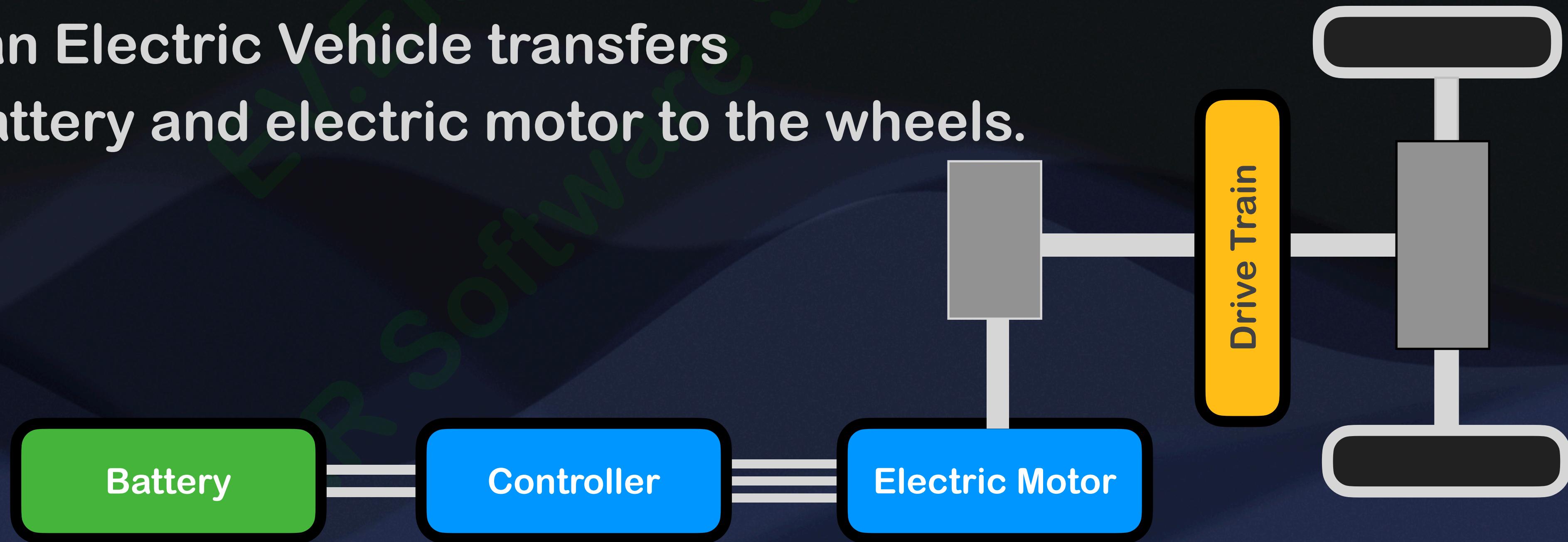
A differential is a mechanical system in a vehicle that allows the wheels to rotate at different speeds while turning.



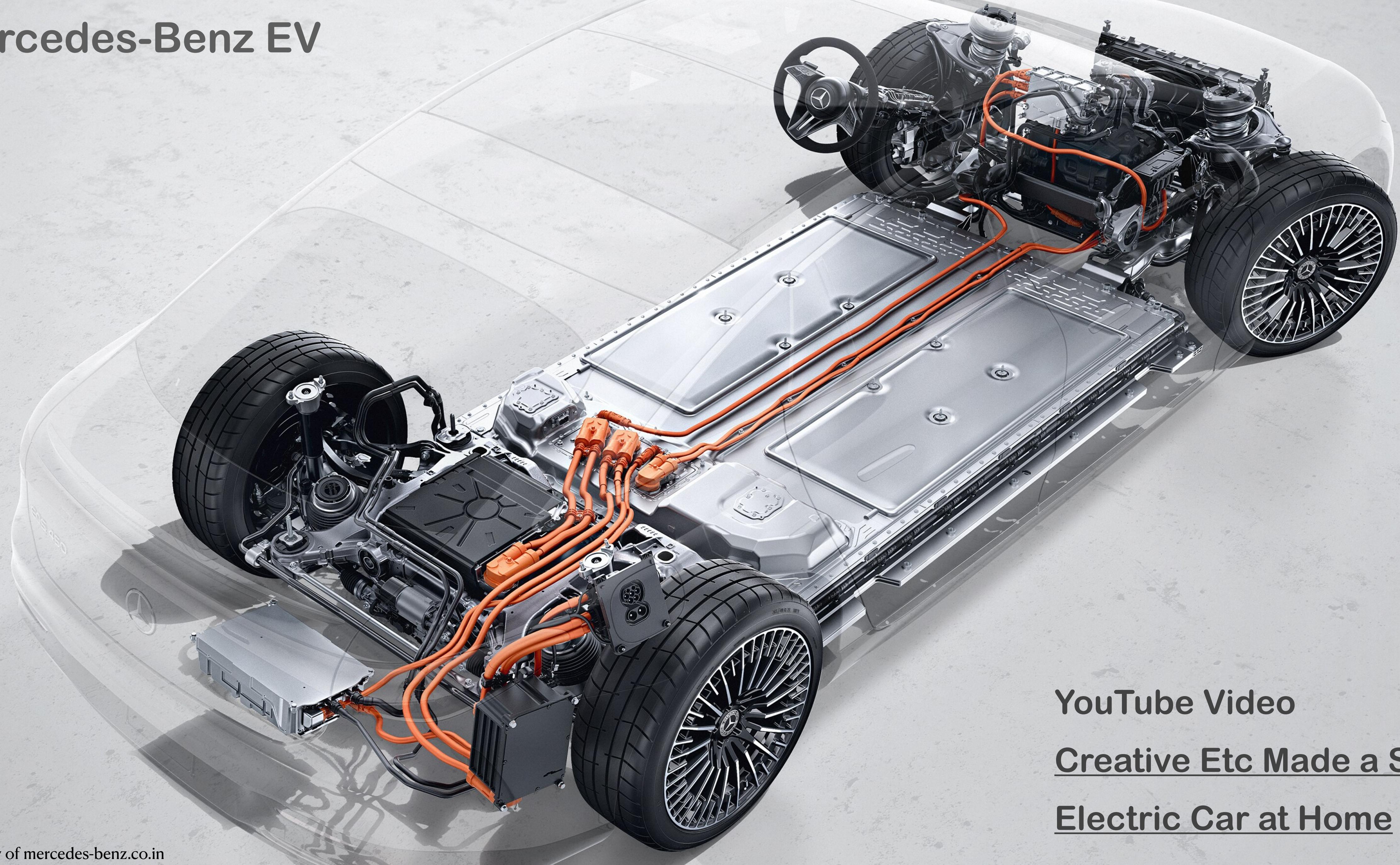
Drive Train for Electric Vehicles

Electric Vehicles (EVs) are automobiles powered by electric motors, using energy stored in rechargeable batteries or alternative energy sources such as hydrogen fuel cells.

The drivetrain in an Electric Vehicle transfers power from the battery and electric motor to the wheels.

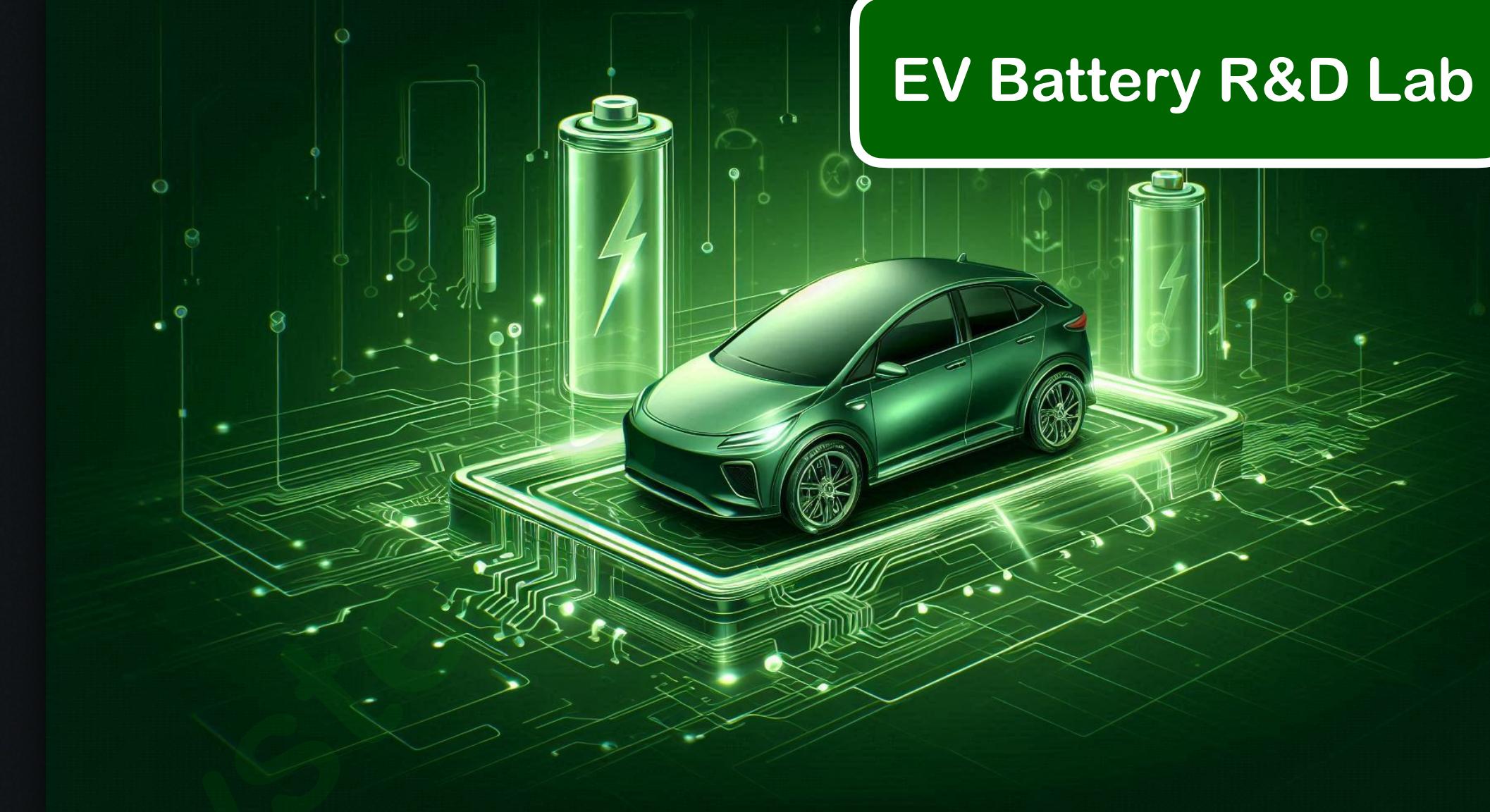


Mercedes-Benz EV



YouTube Video
Creative Etc Made a Solar
Electric Car at Home

EV Battery R&D Lab



AI-Powered EV Battery Fire Prevention System

Ensuring a Fire-Free, Secure & Sustainable EV Future

Sudarshana Karkala

EV.Engineer, iTelematics Software Private Limited

Information Technology, NIT Karnataka, Surathkal

Electric Vehicle Engineering & Development, CODE, IIT Madras

AI-Powered EV Battery Fire Prevention System

The Problem

EV Battery Fires are a Major Concern

- Frequent thermal runaway incidents leading to fire hazards.
- Lack of real-time battery health monitoring & risk alerts.
- Fleet operators & EV owners suffer from unexpected breakdowns and expensive battery replacements.
- Regulatory pressure (AIS-156) for stricter safety measures.

Example : Bangalore has seen a 300% increase in EV fire incidents in 2023-24.

Project / Module Details

AI-Powered EV Battery Fire Prevention System

- Battery Temperature Monitoring System
- Battery Voltage & Current Analysis
- State of Charge (SOC) Estimation
- EV Battery Health Prediction
- Real-Time Battery Monitoring with IoT
- Intrusion Detection in Battery Management System (BMS)

The Solution

Leverages AI & Machine Learning to predict battery failures before thermal runaway.

Real-Time Monitoring of critical parameters:

- Temperature fluctuations
- Voltage imbalances
- Cell inconsistencies

AI-Driven Predictive Analytics for early detection of anomalies.

Automated Preventive Actions:

- Controlled discharge to prevent overheating
- Active cooling mechanisms (liquid/air cooling)
- Emergency shutdown & alerts

Seamless BMS Integration:

- Works with existing Battery Management Systems
- Adds AI-powered safety layer

Cloud-Based Analytics & OTA Updates:

- Continuous learning from real-world battery failures
- Over-the-Air (OTA) updates for AI model improvements

Access devices / sensors from connected EV / Software Defined Vehicles

CONNECT

Connect to the Vehicle from Mobile device and Authenticate.

DETECT

Detect Devices & Sensors (Battery Details, Telematics Information.. etc)

READ

Read the status of the Devices & Sensors

WRITE

Change the device / sensor status

DISPLAY

Display Device / Sensor's info on Dashboard

COLLECT

Collect and upload device details to Cloud for Analysis

ANALYSE

Device analysis using Machine Learning

CONTROL

Control vehicle using mobile (Lock, Unlock, Start, Stop | CAN Bus)

Intrusion detection in connected EV / Software Defined Vehicles

SCAN

Scan the Devices | Sensors | Battery | Telematics | WiFi in the Vehicle (On demand basis)

MONITOR

Monitor the vehicle system for accidental attack

DETECT

Detect Intrusion of attack from Network | Internet | Other IoT | Apps

ALERT

Alert the user about the issues / problems

COLLECT

Collect and upload Intrusion details to Cloud for Analysis

ANALYSE

Intrusion analysis using Machine Learning

REPORT

Generate the report (Detected Issues and other analysis information)

RECOMMEND

Recommendation | Recovery | Protection

Intrusion detection in Battery Management System

Collect Battery Data Logs (or Use Sample Data)

Analyse Normal vs. Anomalous Data

Implement an Anomaly Detection Model

Real-Time Intrusion Detection Simulation

Secure Battery Data with Encryption

Potential Cyber Threats:

Spoofing Attack: Fake voltage readings injected

Man-in-the-Middle Attack: soc data modified

Malware in BMS: Unauthorised data manipulation

Battery Diagnostics Reports / Fault Status

Short Circuit

Deep Discharge

Health

Imbalance

Over Heating

Safety Level

BMS Fault

Reserve Current

Energy Level

Charger Fault

Voltage Drop

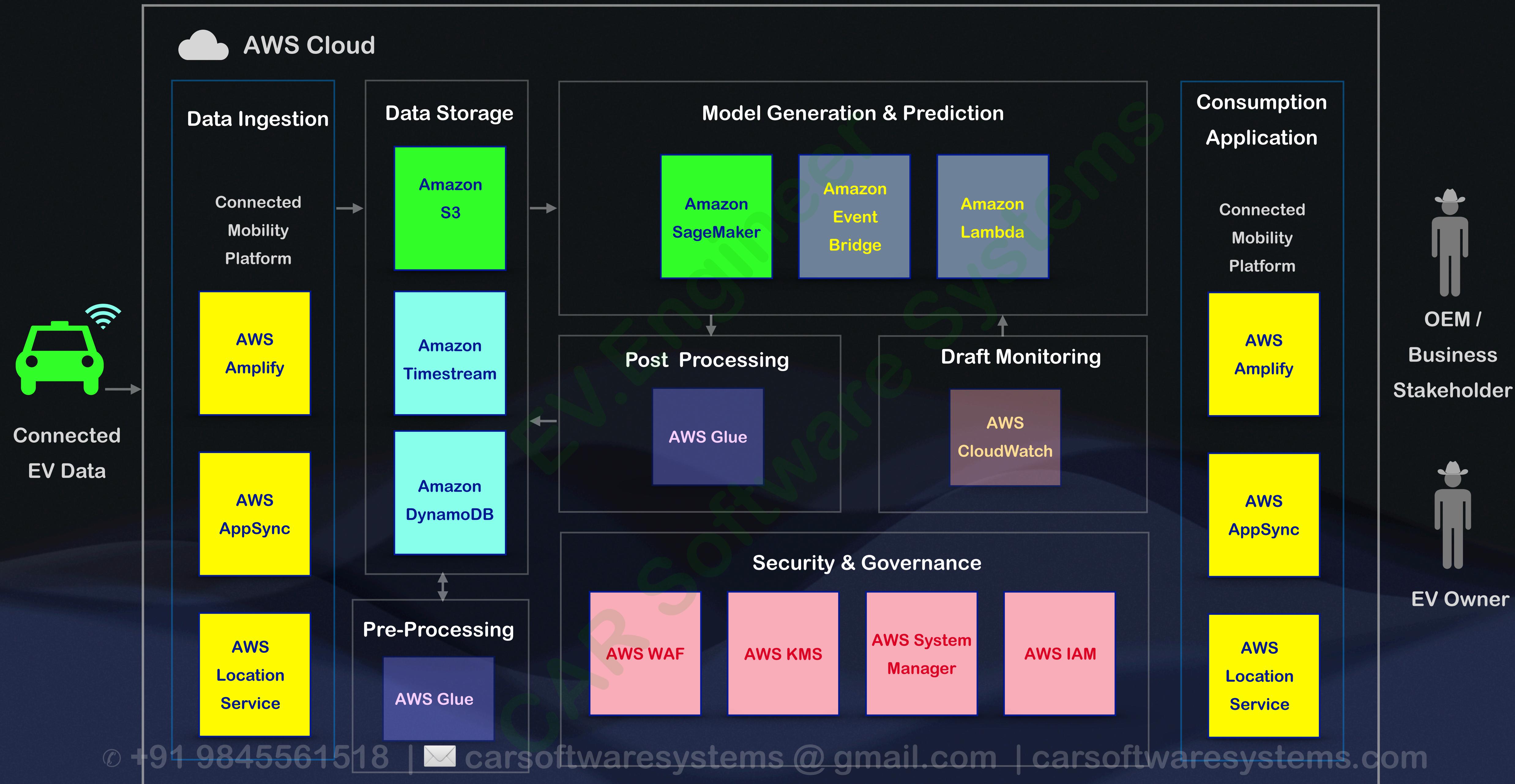
soc

Aging

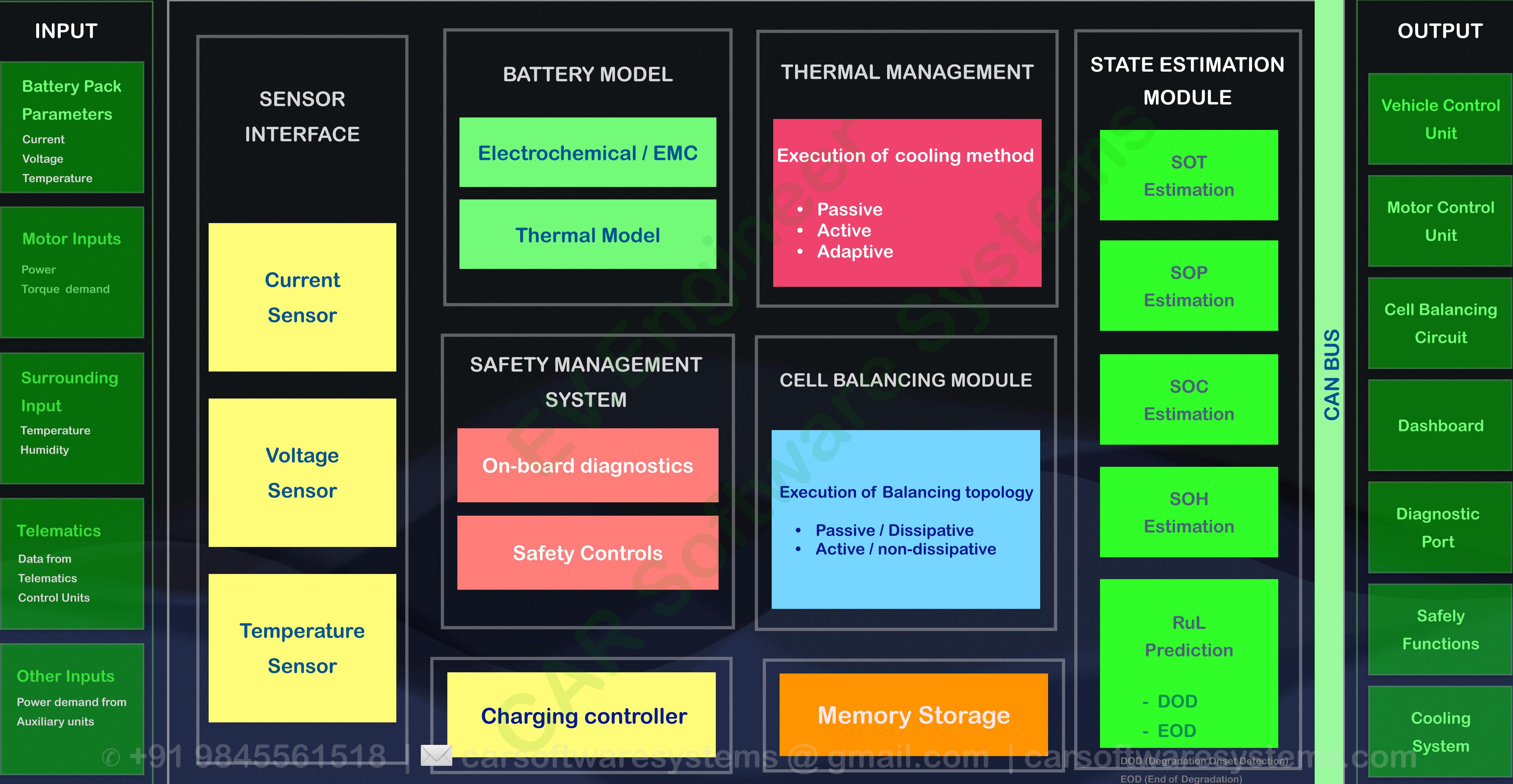
Water Damage

SOH

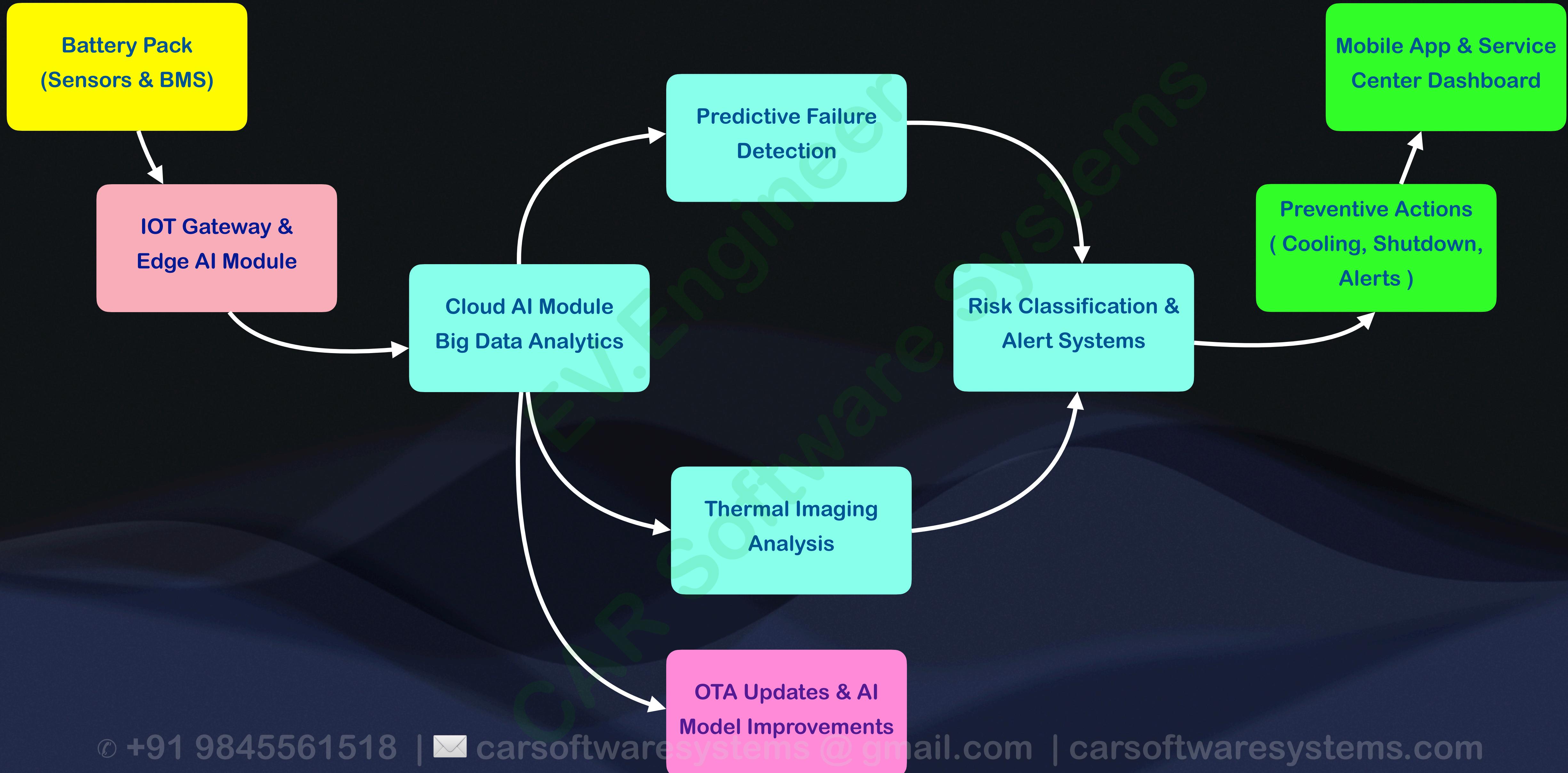
Cloud Architectural Design



Architecture of EV Battery Management Systems



AI-Powered EV Battery Fire Prevention System



AI & Quantum Computing - Layered Architecture

Cloud & Edge Quantum Computing Infrastructure

(Top-Level Control & Computation)

Secure Quantum Cryptography Layer

(Ensures Data Integrity & Security)

AI-Powered Anomaly Detection & Prediction Layer

(Early Warning System - Classical AI Approach)

Quantum Computing Optimisation & Decision Making

(Advanced AI with Quantum Computing)

EV Battery Data Collection & Monitoring Layer

(Real-Time Execution & Sensor Data Processing)

Hybrid Quantum - Classical AI System :

- Uses IBM Qiskit, Microsoft Azure Quantum, Google Cirq for cloud-based quantum simulations.
- Supports real-time Quantum AI execution for battery analytics.
- Balances computational workload between Classical AI and Quantum AI for optimised processing.

Quantum Edge Computing for Real-Time Battery Monitoring

- Processes data locally for fast response and battery failure prevention.
- Reduces latency by executing Quantum AI models at the edge.



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Quantum Key Distribution (QKD) for Secure Over-the-Air (OTA) Updates

- Ensures BMS firmware updates remain protected against cyber threats.
- Integrates with AI-driven cybersecurity to detect and mitigate potential breaches.

Post-Quantum Cryptography (PQC) for Secure EV Data Storage

- Encrypts battery logs, BMS firmware, and user data to prevent hacking.
- Provides resilience against classical and quantum cyber threats.

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Classical AI/ML for Initial Anomaly Detection

- AI models trained on historical EV battery failure incidents.
- Identifies early warning signs of thermal runaway.
- Uses probabilistic models and deep learning for failure prediction.

Deep Learning for Fire Risk Estimation

- Neural Networks classify battery safety levels and generate alerts.
- Implements explainable AI (XAI) to interpret failure causes.

Classical Optimisation Algorithms for Battery Management

- Uses Reinforcement Learning & Heuristic Search to optimize battery efficiency.
- Enhances battery longevity and optimal energy usage.

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Quantum Machine Learning (QML) for Battery Health Prediction

- Uses Variational Quantum Circuits (VQC) for complex pattern recognition.
- Enhances AI's ability to process non-linear battery degradation patterns.

Quantum Neural Networks (QNNs) for Thermal Runaway Risk Assessment

- Quantum-enhanced deep learning models predict potential failures.
- Simulates high-dimensional battery behaviour for precise anomaly detection.

Quantum Approximate Optimisation Algorithm (QAOA) for Energy Management

- Optimises battery charging, discharging, and thermal management.
- Uses quantum annealing techniques for highly efficient decision-making.

Quantum Annealing for Battery Safety Optimisation

- Uses D-Wave's quantum annealers for efficient battery performance tuning.
- Applies quantum-enhanced combinatorial optimisation for fire prevention strategies.

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EV Battery Data Collection & Monitoring Layer

(Real-Time Execution & Sensor Data Processing)

Real-time Sensor Data Acquisition

- Captures data from EV battery sensors (temperature, voltage, current, SOC, SOH).
- Uses IoT & Edge Computing at the Battery Management System (BMS) for real-time processing.
- Implements self-healing AI models that adapt to sensor noise and environmental variations.

Edge Computing at BMS

- Low-latency, real-time analysis to detect early battery anomalies.
- Integrates AI-driven edge computing for preemptive failure response.

Secure Data Transmission:

- Utilises Quantum Cryptography (QKD) for secure communication between EV and cloud servers.
- Ensures tamper-proof data logging for compliance and traceability.

1. Battery Temperature Monitoring System

Goal: Read temperature data, analyse trends, and detect overheating.

Concepts: File handling, NumPy, Pandas, Matplotlib

Tasks:

- Read a CSV file containing battery temperature data
- Calculate average, max, and min temperatures
- Plot a temperature trend graph using Matplotlib
- Detect overheating conditions (e.g., alert if temp > 60°C)

Outcome: Basic battery monitoring using Python

3. State of Charge (SOC) Estimation

Goal: Estimate battery SOC using voltage and current data.

Concepts: Numerical computing, Basic Machine Learning

Tasks:

- Load historical battery data (Voltage, Current, SOC)
- Train a simple regression model to predict SOC
- Validate results using test data
- Display real-time SOC values for a given input

Outcome: SOC estimation using Python | 984561518

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2. Battery Voltage & Current Analysis

Goal: Analyse voltage & current data to detect anomalies..

Concepts: Pandas, Data Visualisation, Time-Series Analysis

Tasks:

- Load battery voltage & current datasets
- Identify voltage drops and current spikes
- Plot Voltage vs. Time & Current vs. Time
- Set a rule: Alert if voltage drops below a threshold

Outcome: Detect battery performance issues

4. EV Battery Health Prediction

Goal: Use AI to predict battery degradation over time.

Concepts: Machine Learning, Data Science

Tasks:

- Load battery charge-discharge cycle data
- Identify patterns in battery degradation
- Train an ML model (Scikit-learn) to predict Remaining Useful Life
- Visualise predictions with graphs

Outcome: AI-based battery health prediction

5. Intrusion Detection in Battery Management System

Goal : Detect anomalous activities in an EV Battery Management System using Python. (Hacking attempts, data tampering, or unauthorised access)

Concepts Used:

- Log Analysis & Data Forensics
- Anomaly Detection (Machine Learning)
- Cybersecurity Threat Detection

Project Overview

The Battery Management System (BMS) logs critical parameters:

- Voltage, Current, Temperature
- State of Charge (SOC), State of Health (SOH)
- Communication logs (CAN messages)

Potential Cyber Threats:

- **Spoofing Attack:** Fake voltage readings injected
- **Man-in-the-Middle Attack:** SOC data modified
- **Malware in BMS:** Unauthorised data manipulation

Expected Outcomes

- Build a Battery Intrusion Detection System (IDS)
- Detect cyber attacks on BMS data
- Train an ML model to differentiate between normal and attack conditions
- Secure BMS communication with encryption (Advanced)

STEP 1 : Collect Battery Data Logs (or Use Sample Data)

- Use a CSV file containing battery logs with timestamps
- Add a column for intrusion detection labels (Normal / Attack)

STEP 2 : Analyse Normal vs. Anomalous Data

- Load the dataset using Pandas
- Visualise voltage/current variations using Matplotlib
- Identify unexpected spikes, drops, or inconsistent SOC values

STEP 3 : Implement an Anomaly Detection Model

- Use Scikit-Learn to train an ML model for intrusion detection
- Algorithms: Isolation Forest, Random Forest, or Logistic Regression
- Train model on normal vs. attack data samples
- Detect real-time anomalies from live battery logs

STEP 4 : Real-Time Intrusion Detection Simulation

- Simulate incoming battery data (live stream using Python)
- Detect unauthorised activities and trigger alerts
- Implement logging system to save security breach attempts

STEP 5 : Secure Battery Data with Encryption

- Use AES Encryption (Python pycryptodome module)
- Encrypt critical BMS data before transmission | Ensure only authorised systems can decrypt it

EV & Automotive Companies

EV & Automotive Software Companies

apple.com/in/ios/carplay/	Overview	DODGE	东风风行	DS AUTOMOBILES	FERRARI	MCLAREN	Mercedes-Benz	MINI	MITSUBISHI MOTORS

The CarPlay Lineup

With over 800 models to choose from, it's easier than ever to find a vehicle that works with CarPlay.²

[See all models that work with CarPlay >](#)

Apple - CarPlay

<https://www.apple.com/careers/in/>



Tesla - EV & Solar Panels

<https://www.tesla.com/>



BYD - Ultra-safe Blade Battery

<https://www.byd.com/en-hk/car/m6>



The screenshot shows the Mercedes-Benz Developer Portal interface. On the left, there is a sidebar titled "Filter" with a "RESET" button. Under "Usecase", "Vehicle Status" and "Repair & Maintenance" are selected, indicated by blue checkmarks. The main content area displays several service cards:

- Electric Vehicle Status 2.0**: Get remote access to all relevant charging data of a vehicle.
- Electric Vehicle Status 3.0**: Remotely control your customers charging.
- Parking Monitoring**: Get anonymized data on the real-time parking behaviour from the Mercedes-Benz vehicle fleet to improve your own applications.
- Pay As You Drive 2.0**: Get actual odometer information and geo position to offer distance & usage based insurance services.
- Remote Diagnostic Support**: Get Mercedes-Benz diagnostic vehicle data and functions for your own application.
- Remote Maintenance Support**: Get Mercedes-Benz maintenance-relevant vehicle data for your own application.

At the bottom, there is contact information: +91 9845561518 | carsoftwaresystems@gmail.com | carsoftwaresystems.com.

waymo - Autonomous Vehicle

<https://waymo.com/>



EV Jobs & Career Opportunities

EV Jobs & Career Opportunities

Explore the latest job openings and career opportunities in

- Electric Vehicles & Battery Technology,
- AI & ML and Telematics,
- Automotive Cybersecurity,
- Renewable energy,
- Quantum Computing,
- Software-Defined Vehicles.

We offer training, mock interviews, resume shortlisting, & career guidance to help EV engineers land the right opportunities.

We connect you to top EV job listings and provide expert support for your career growth.

EV.Engineer - Career Opportunities

EV Software Engineer

Electric Drivetrain Engineer

Test & Validation Engineer

EV Battery Engineer (BMS)

Vehicle Diagnostics Engineer

Control Systems Engineer

AI / ML & Quantum AI

Thermal Management Engineer

Simulation & Modeling Engineer

Automotive Cybersecurity

EV Systems Engineer

Vehicle Integration Engineer

Telematics Engineer

Power Electronics Engineer

Functional Safety Engineer

Renewable Energy Engineer

Embedded Systems Engineer

[... Many More]

EV.Engineer - Career Opportunities

EV Software Engineer

EV Battery Engineer (BMS)

AI / ML & Quantum AI

Automotive Cybersecurity

Telematics Engineer

Renewable Energy Engineer

Electric Drivetrain Engineer

Vehicle Diagnostics Engineer

Thermal Management Engineer

EV Systems Engineer

Power Electronics Engineer

Embedded Systems Engineer

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Control Systems Engineer

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Vehicle Integration Engineer

Functional Safety Engineer

[... Many More]

Engineering Colleges

CS, AI&ML, IS

E&E, E&C,

Mech & Automobile

Freshers

EV Jobs & Career Opportunities



EV.Engineer

EV Battery Research

EV Trainings & Mock Interviews

EV Career Guidance

Internship

EV Company

EV Startup

Hiring Manager

HR (Internal & External)

Company Career Site

Job Portals | Hubs

Internship

EV Jobs

Resume Optimisation, LinkedIn & Networking, Interview questions & Answers
Interview Preparation - (Before, During, After), Personal Branding

Resume Template - Fresher

- **Introduction**
- **Skillset / Domain**
- **Internship / Projects**
- **Company / Experience**
- **Education**
- **Additional Information**
 - **Key Accomplishments**
 - **Licenses / Certifications**
 - **Recommendation**

Full Name

City | email@gmail.com | Cell Number | LinkedIn URL | Website

Place your career objective here. Explain what you are passionate about and how the subjects you have taken in college / university align with your career goals.

*Put one great recommendation here from your college professors or Dean of the Institute.
Recommendations are very important and can serve as a major differentiator from your competition.*

SKILLS

Mention any skills you have acquired while in college. These could be technical skills and soft skills by virtue of being a member of clubs, groups and teams.

INTERNSHIPS / PROJECTS (If Any)

COMPANY A

CITY, COUNTRY

Designation

Mmm YYYY to Date

- Mention the scope of work done with achievements / output if any. Recruiters want to know what you achieved, rather than what you did.

EDUCATION

POSTGRADUATE DEGREE

CITY, COUNTRY

Name of University

Mmm YYYY to Mmm YYYY

Grade / Marks /CGPA

UNDERGRADUATE DEGREE

CITY, COUNTRY

Name of University

Mmm YYYY to Mmm YYYY

Grade / Marks /CGPA

ADDITIONAL INFORMATION

- Mention all key and relevant certifications here.
- Mention hobbies in some detail
- Do not mention that references will be available on request.

Personal Branding - https:// CAR Software Systems (.com)

EV.Engineer

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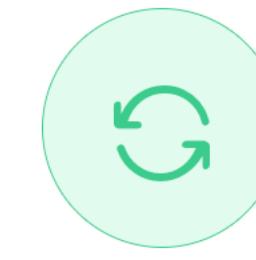
AI-Powered EV Battery Fire Prevention System

"To revolutionise EV Battery safety with AI-powered predictive technology, ensuring a fire-free, secure, and sustainable electric mobility future."



Solutions for EV Battery System

- Battery management app
- Mini Projects (Python)
- Business Plan Doc



Mobile App Development

- iOS app development
- Android app development
- Web app development



Security & Architectural Design

- AWS Solutions
- ULM & Design Patterns
- Automotive Cybersecurity



Embedded Systems

- Embedded System programming
- Arduino programming
- Firmware programming



Proof of Concept (POC)

- Analysis and Idea Validation
- Technical Feasibility
- User Testing and Feedback Collection



Full Stack Development

- Front-End (Client-Side) development
- Back-End (Server-Side) development
- DevOPS and Deployment

[BATTERY SAFETY](#) [AI & ML](#) [CYBERSECURITY](#) [QUANTUM AI](#) [LEADERSHIP](#)

EV Jobs & Career Opportunities

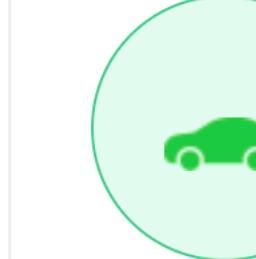
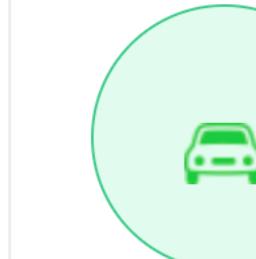
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Electric Vehicle Jobs and Career Opportunities

We provide links to company career pages, job portals, and LinkedIn to help you find the right role.

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Personalised coaching to get your dream job

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Electric Vehicle (EV) Training Programs

Electric Vehicle Engineering | Telematics Engineering | Software Defined Vehicles | EV Battery and Charging Management



Telematics Engineering

Telematics is the technology that deals with computerised information transmission generally used for sending and receiving data

- in vehicles,
- between vehicles or
- between a vehicle and a third party device.

VIDEO TUTORIALS

[iT telematics.com](https://telematics.com) 25 March, 2025



CAR Software Systems

For the automotive service providers, who would like to make their customers' life simpler, CAR Software Systems provides solutions to diagnose car's health and notify when something goes wrong, that helps customers keep track of information about their CAR.

DOWNLOAD

[CAR Software Systems](#) 30 Nov, 2025



Electric Vehicle Engineering

This course offers an in-depth exploration of electric vehicles (EVs), guiding students from basic concepts to advanced design and development. It covers the evolution of EVs, including hybrids, plug-in hybrids, and battery electric vehicles (BEVs).

LEARN MORE

[CAR Software Systems](#) 30 April, 2025

Certified EV Engineers Network

EV.Engineer

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Electric Vehicle Engineers Network

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EV Engineer

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Quality Engineer
EV Engineer

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in T G

in T f

in W f G

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Mech & Automobile

Freshers

Q&A



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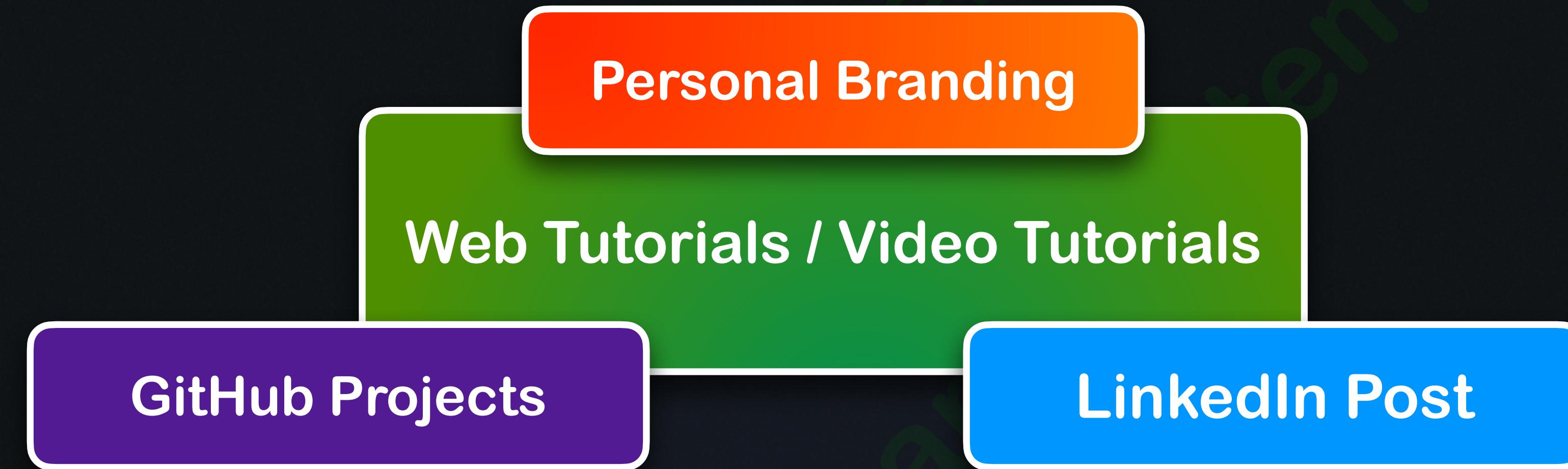
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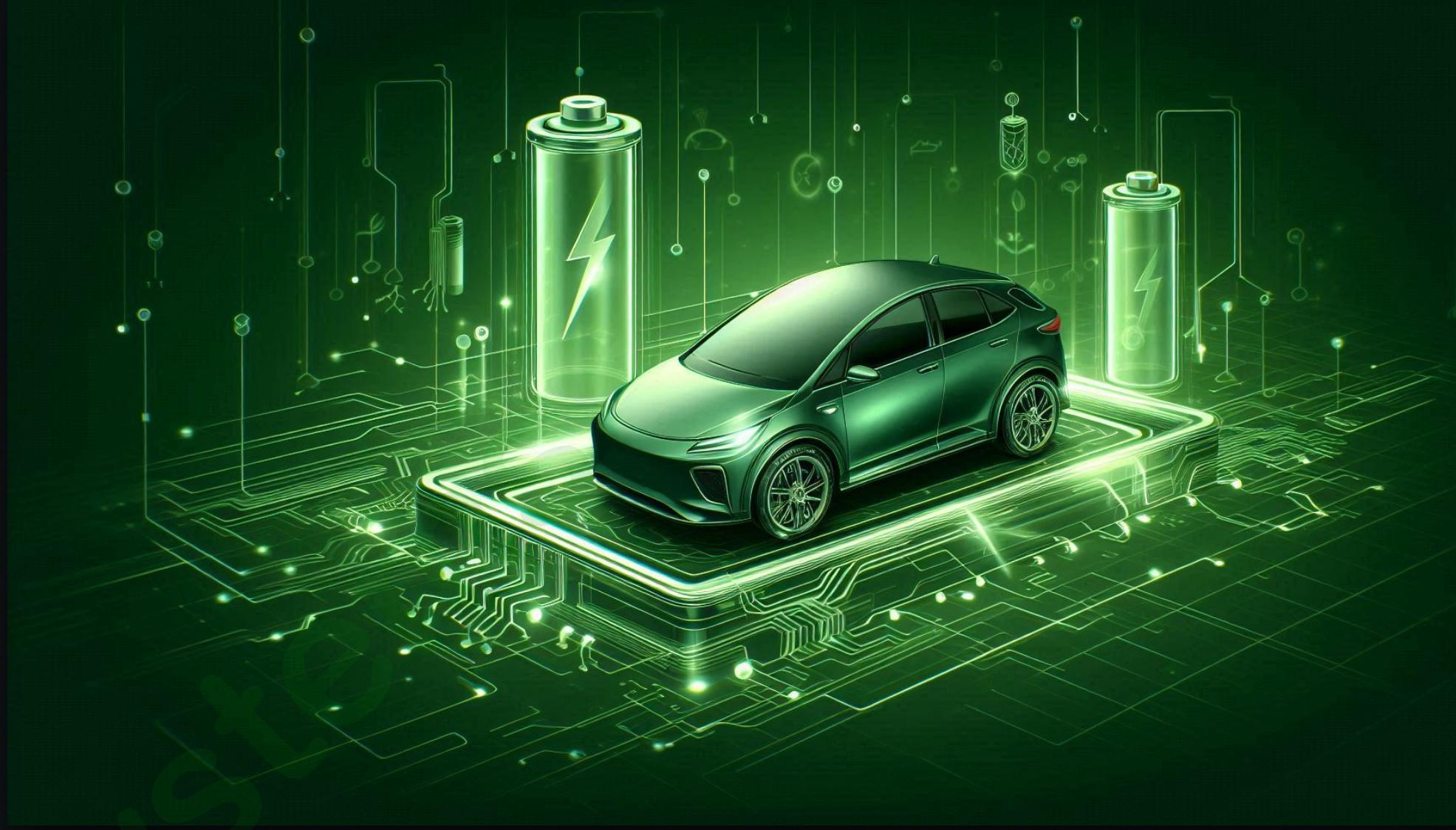
EV.Engineer - Workshop



<https://github.com/CAR SOFTWARE SYSTEMS/EV.Student/>

Thank you

EV.Engineer
CAR Software Systems



Sudarshana Karkala

Co-founder - EV.Engineer, CAR Software Systems
Advisor @ iTelematics Software Private Limited