PROBLEM STATEMENT

Automotive Industry

General Motors (GM)

General Motors is a leader in the automotive manufacturing industry, constantly seeking to optimise production, reduce costs, and improve operational efficiency. Predictive maintenance using deep learning fits well here, as it can minimise equipment downtime, anticipate machine failures, and reduce maintenance costs.

Industry: Automotive Manufacturing
Company: General Motors
Company Overview:
  - Focus Areas: Supply Chain Management, Predictive Maintenance, and Customer Experience
  - Vision: Enhance vehicle safety, streamline manufacturing, and optimise after-sales services.

Competitors:
  - Competitor 1: Tesla (focus on autonomous driving, energy efficiency)
  - Competitor 2: Ford (focus on AI-powered supply chain, smart manufacturing)

References:
  - [AutoMakers Inc. Official Website](https://www.gm.com)
  - [Deloitte - AI Trends in Automotive](https://www2.deloitte.com/ai-gm)
  - [McKinsey - AI in Automotive Manufacturing](https://www.mckinsey.com/ai-gm)

USE CASES

Proposed Use Cases for General Motors.

Use Case 1: AI for Predictive Maintenance
  - Description: Implement Deep learning algorithms to predict vehicle component failures, reducing downtime and repair costs.
  - Benefits: Improved vehicle reliability, reduced warranty claims, enhanced customer satisfaction.
  - Industry Insight: Predictive maintenance is projected to reduce downtime by up to 30% in automotive sectors.
  - References: [McKinsey AI in Manufacturing] (https://www.mckinsey.com/capabilities/operations/our-insights/prediction-at-scale-how-industry-can-get-more-value-out-of-maintenance)

Use Case 2: GenAI-Powered Customer Support Chatbot
  - Description: Develop a conversational AI chatbot to assist customers with common inquiries like maintenance schedules, feature troubleshooting, and recall updates.
  - Benefits: 24/7 customer support, reduced workload for support teams, improved customer experience.
  - References: [Deloitte - AI in Customer Support] (https://www.deloitte.com/global/en/alliances/sap/about/sap-customer-experience.html)

Use Case 3: Supply Chain Optimization with AI
  - Description: Use AI to forecast demand and optimise inventory levels, addressing supply chain disruptions and ensuring timely delivery.
  - Benefits: Enhanced inventory management, cost savings, improved supply chain visibility.
  - References: [Throughput.world - AI for Supply Chain Management] (https://throughput.world/blog/ai-in-supply-chain-and-logistics/)

Use Case: Predictive Maintenance for Manufacturing Equipment

Objective:

Leverage deep learning to predict potential equipment failures in GM's manufacturing plants, allowing for proactive maintenance and minimise downtime. The goal is to increase efficiency and reduce unplanned maintenance costs by forecasting when critical machinery might require service.

Data Requirements:

- **Machine Sensor Data**: Time-series data from sensors (e.g., vibration, temperature, pressure) on manufacturing equipment.
- **Maintenance Logs**: Historical data on repairs, replacements, and failure events.
- **Operating Conditions**: Information on operational factors (e.g., workload, environmental conditions) that can affect equipment longevity.

Dataset Link : https://www.kaggle.com/datasets/hiimanshuagarwal/predictive-maintenance-dataset

Approach:

1. **Data Collection & Preprocessing**: Gather machine sensor data, correlate it with historical maintenance logs, and process it to remove noise.
2. **Feature Engineering**: Extract features from the sensor data, such as trends, averages, and anomalies.
3. **Model Development**: Use deep learning models, like Long Short-Term Memory (LSTM) networks, to predict the time-to-failure for equipment.
4. **Model Evaluation**: Test on historical data to refine prediction accuracy, ensuring high reliability.

Expected Outcomes:

- **Reduced Downtime**: By predicting equipment failures, maintenance can be scheduled more effectively, reducing unscheduled downtime by up to 30%.
- **Cost Savings**: GM could save on replacement parts and labour, as timely maintenance prevents costly breakdowns.
- **Increased Operational Efficiency**: Improved maintenance scheduling leads to smoother production processes and higher output consistency.