Inventory Optimization for a Car Dealership

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Problem Statement:

Cars are an integral part of modern life, serving as the primary mode of transportation for millions and forming a cornerstone of the global economy. The automotive retail sector, in particular, presents numerous opportunities for sales and business growth. However, pricing vehicles in this competitive market involves navigating various influencing factors. These range from macroeconomic indicators and consumer preferences to more granular elements like vehicle condition and market saturation. Understanding and optimizing inventory based on these variables is crucial for dealerships to maximize profitability and maintain competitive advantage. The objective of this project is to leverage data analytics to optimize the inventory of a car dealership, ensuring that the right mix and quantity of vehicles are available to meet consumer demand efficiently.

The 2023 car prices dataset provides a comprehensive look at various vehicle characteristics and their associated costs. By delving into this data, we can uncover patterns in car pricing influenced by factors such as mileage, model year, and brand reputation. This analysis will enable us to optimize the inventory of a car dealership, ensuring the selection of vehicles that represent both good value and high marketability, ultimately aiding in more strategic investment decisions and boosting sales potential

Possible Impact of Your Analysis:

The analysis of the cars dataset could have a number of positive impacts, including:

- Inventory Optimization: Analyzing the dataset helps identify which cars are likely to retain their value over time, enabling the dealership to selectively stock vehicles that are less prone to price depreciation. This strategic selection prevents future losses and maximizes investment returns.

- Price Influence Analysis: Understanding the factors that influence car prices, such as mileage, brand reputation, and model year, empowers the dealership to adjust pricing strategies effectively. This knowledge ensures competitive pricing and attracts a broader customer base.
- Market Trends Identification: By examining trends in car pricing and features across different segments, the dealership can anticipate market shifts and adapt inventory to meet emerging consumer demands. This proactive approach enhances market responsiveness and operational agility.

Dataset(s):

- The 2023 car prices dataset encompasses detailed information on various vehicles available in the market. The data includes a range of variables that provide insights into the automotive industry, such as:
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- ID: A unique identifier for each car listing.
- Price: The listed sale price of the vehicle.
- Levy: The tax levied on the vehicle, if applicable.
- Manufacturer: The brand or company that manufactured the vehicle.
- Model: The specific model of the vehicle.
- Prod. year: The year the vehicle was produced.
- Category: The type of vehicle (e.g., Sedan, SUV, Hatchback).
- Leather interior: Indicates whether the vehicle has a leather interior.
- Fuel type: The type of fuel the vehicle uses (e.g., Diesel, Petrol, Hybrid).
- Engine volume: The size of the vehicle's engine.
- Mileage: The total miles the vehicle has been driven.
- Cylinders: The number of cylinders in the vehicle’s engine.
- Gear box type: The type of transmission in the vehicle.
- Drive wheels: The drivetrain of the vehicle (e.g., Front, Rear, All-wheel drive).
- Doors: The number of doors on the vehicle.
- Wheel: The configuration of the steering wheel (e.g., Left wheel, Right-hand drive).
- Color: The color of the vehicle.
- Airbags: The number of airbags in the vehicle.

Source:https://www.kaggle.com/datasets/sidharth178/car-prices-dataset

• Methods

- Exploring data visually (Tableau): Create exploratory visualizations to identify key patterns and trends in the dataset.

- Querying and filtering data (SQL): Perform targeted queries to refine and group data based on key variables like brand, mileage, and price.
- Handling missing data (Python): Use Python to clean and address any missing data, filling gaps or removing rows where necessary.
- Statistical analysis (Python): Calculate detailed statistics and correlations using Python's libraries (`pandas`, `numpy`) for deeper insights.
- Final visualizations (Python): Create advanced visualizations (e.g., scatter plots, heatmaps) to complement Tableau's results.
- Creating a Datafolio: Compile all steps, findings, and visualizations into a cohesive portfolio document.
- Developing the Final Report: Summarize key findings, insights, and actionable recommendations.
- Reviewing and proofreading: Ensure all deliverables are accurate, clear, and consistent before submission.

Dashboard

- Interactive dashboard (Tableau): The dashboard will provide an interactive overview of key vehicle metrics, such as brand distribution, price ranges, and mileage, allowing the dealership to filter and explore data dynamically.

Milestones

- Load data into Tableau: Load the dataset into Tableau and create initial visualizations to explore key patterns.
- Run SQL queries: Use SQL to filter and group the data by relevant metrics such as vehicle brand, model year, and price.
- Transform the dataset into a Pandas DataFrame: Convert the SQL results into a Pandas DataFrame for further analysis.
- Use Pandas functions to explore the dataset: Examine rows, columns, and values within the DataFrame to identify key variables.
- Identify and handle null values: Address missing data by either removing rows/columns or filling in gaps using the mean, median, or a pre-defined value.
- Check and convert data types: Ensure all data types are correct and convert them if needed (e.g., convert production year to datetime).
- Calculate statistics: Use Python to calculate summary statistics (mean, median, correlations) on the key variables like price and mileage.
- Create visualizations in Python: Develop detailed visualizations (scatter plots, heatmaps) to explore relationships between variables.
- Build an interactive dashboard in Tableau: Design the final dashboard to display interactive visualizations of the key metrics, allowing dynamic data filtering.

- Design a data portfolio: Compile all steps, visualizations, and insights into a structured data portfolio for presentation.
- Document all steps in a detailed final report: Write the final report summarizing the problem, methodology, key findings, and actionable insights.

• Timeline

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• Week	• Tasks
• Week 1	• Data Sourcing & Data Curation
• Week 2	• Exploratory Data Analysis
• Week 3	• Dashboard & Datafolio & Final Report