



LOVELY
PROFESSIONAL
UNIVERSITY

Classic Cars Data Visualization & Analysis

REQUIREMENTS SPECIFICATION

VERSION 1.0

Developed By

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1. EXECUTIVE SUMMARY

This project is a comprehensive exploration of the classic car market, offering in-depth analysis and visual representations to assist classic car enthusiasts, collectors, and industry professionals in making informed decisions. The aim is to provide valuable insights into the world of classic cars, facilitating a deeper understanding of market trends and dynamics.

Our analysis covers a wide spectrum of classic car-related aspects, including historical trends, market values, make and model distributions, regional preferences, and key features such as mileage, manufacturing years, and restoration status. By examining these factors, we offer a holistic perspective on the classic car landscape.

The central focus of this project is predictive analysis, where historical data and critical indicators are utilized to forecast future market performance. This predictive approach enables stakeholders to make strategic decisions when buying or selling classic cars, ensuring they are well-informed about potential investment opportunities.

Throughout this study, we employ advanced data analysis techniques and present our findings through compelling graphs, figures, and visualizations. These visual representations enhance the accessibility of our insights, allowing stakeholders to grasp complex market dynamics briefly.

In conclusion, this project serves as a valuable resource for classic car enthusiasts and industry players alike. It not only supports enthusiasts in their passion for classic cars but also empowers professionals to make well-founded decisions in the dynamic and captivating world of classic automobiles.

1.1 PROJECT OVERVIEW

PROJECT DESCRIPTION

This project is a comprehensive exploration of the classic car market, with a primary focus on data analysis and visualization. It aims to provide valuable insights into various aspects of the classic car industry, including historical trends, market values, make and model distributions, regional preferences, and predictive analysis for future market performance.

OBJECTIVES

- 1. DATA COLLECTION:** - Gather and curate a diverse dataset of classic car information, including make, model, year of manufacture, mileage, historical prices, and restoration status.
- 2. DATA ANALYSIS:** - Utilize advanced data analysis techniques to uncover trends, patterns, and correlations within the classic car dataset. This analysis will provide a deeper understanding of the classic car market.
- 3. DATA VISUALIZATION:** - Create informative and visually appealing graphs, charts, and figures to represent the insights gained from the data analysis. Visualizations will be a key tool for conveying complex information.
- 4. MARKET TRENDS:** - Identify historical market trends, such as price fluctuations, popular classic car models, and shifts in collector preferences.
- 5. PREDICTIVE ANALYSIS:** - Develop predictive models to forecast future market performance based on historical data and key indicators. These predictions will assist buyers and sellers in making informed decisions.
- 6. REGIONAL INSIGHTS:** - Analyze regional variations in classic car popularity and market dynamics, providing valuable information for buyers and sellers in different geographic areas.

DELIVERABLES

1. A curated dataset of classic car information.
2. Comprehensive data analysis reports, including insights into market trends, make and model distributions, and more.
3. Visual representations of data findings, including graphs, charts, and figures.
4. Predictive models for future market performance.
5. Regional insights into classic car preferences and trends.
6. Executive summary and project documentation.

AUDIENCE

- Classic car enthusiasts and collectors seeking insights into the market.
- Classic car sellers and dealers looking for data-driven pricing and sales strategies.
- Industry professionals and analysts interested in understanding market dynamics.
- Anyone with a curiosity for classic cars and their historical significance.

EXPECTED OUTCOMES

- Enhanced understanding of the classic car market.
- Informed decision-making for classic car enthusiasts and industry professionals.
- Accessible data visualizations for easy comprehension.
- Insights into future market trends and performance.

1.2 PURPOSE AND SCOPE OF THIS SPECIFICATION

PURPOSE OF THIS SPECIFICATION

The purpose of this specification document is to clearly define the objectives, requirements, and boundaries of the Classic Cars Data Visualization and Analysis project. It serves as a guide for all stakeholders involved in the project, including project managers, data analysts, and other team members. The primary purposes are:

1. **CLARIFY PROJECT GOALS:** To outline the specific goals and objectives of the project, ensuring that all team members and stakeholders have a shared understanding of what is to be achieved.
2. **DEFINE PROJECT SCOPE:** To establish the boundaries of the project by specifying what is included and what is excluded from the project's scope.
3. **SET REQUIREMENTS:** To detail the data collection, analysis, visualization, and reporting requirements necessary to achieve the project's objectives.
4. **PROVIDE A BASIS FOR PLANNING:** To serve as a foundation for project planning, including resource allocation, timeline development, and budget estimation.
5. **ENSURE ACCOUNTABILITY:** To assign responsibilities to team members and stakeholders, promoting accountability for project deliverables.

1.3 SCOPE OF THIS SPECIFICATION

The scope of this specification encompasses the following aspects of the Classic Cars Data Visualization and Analysis project:

1. **DATA COLLECTION:** This project will involve gathering data related to classic cars, including information on make, model, year of manufacture, mileage, historical prices, and restoration status. Data sources will be identified and accessed.
2. **DATA ANALYSIS:** Advanced data analysis techniques will be applied to the collected dataset to identify trends, patterns, correlations, and insights within the classic car market.
3. **DATA VISUALIZATION:** The project will create visually appealing and informative graphs, charts, and figures to represent the findings from the data analysis. Visualization tools and techniques will be employed.
4. **MARKET TRENDS:** The project will identify historical market trends, such as price fluctuations, popular classic car models, and shifts in collector preferences, based on the analyzed data.
5. **PREDICTIVE ANALYSIS:** Predictive models will be developed to forecast future market performance. These models will be based on historical data and key indicators, providing valuable insights for decision-making.
6. **REGIONAL INSIGHTS:** The project will analyze regional variations in classic car popularity and market dynamics, offering insights into buyer and seller behavior in different geographic areas.
7. **AUDIENCE:** The project is intended for classic car enthusiasts, collectors, sellers, industry professionals, and analysts interested in the classic car market.
8. **PROJECT TIMELINE:** The project timeline will be defined during the project planning phase, specifying milestones and deadlines for each phase of the project.
9. **BUDGET:** A detailed budget plan will be developed to cover data collection, analysis tools, visualization software, project management costs, and other project-related expenses.
10. **Expected Outcomes:** The project aims to enhance understanding, support informed decision-making, provide accessible data visualizations, and offer insights into future market trends within the classic car market.

2. PRODUCT | SERVICE DESCRIPTION

OVERVIEW:

The Classic Cars Data Visualization and Analysis service is a comprehensive offering designed to provide valuable insights and information to classic car enthusiasts, collectors, sellers, and industry professionals. Leveraging advanced data analysis and visualization techniques, this service aims to enhance understanding, support informed decision-making, and offer predictive insights into the dynamic world of classic automobiles.

KEY FEATURES:

- 1. DATA COLLECTION:** Our service collects and curates' extensive data related to classic cars, including details on make, model, year of manufacture, mileage, historical prices, and restoration status. We access diverse data sources to ensure comprehensive coverage.
- 2. DATA ANALYSIS:** Our team of data analysts and data scientists employs advanced analytical methods to uncover trends, patterns, and correlations within the classic car market. This analysis provides a deeper understanding of market dynamics.
- 3. DATA VISUALIZATION:** We create visually engaging and informative graphs, charts, and figures to represent the insights gained from data analysis. Our visualizations make complex data easy to comprehend and interpret.
- 4. MARKET TRENDS:** We identify historical market trends, such as price fluctuations, popular classic car models, and shifts in collector preferences. This information is valuable for buyers, sellers, and enthusiasts seeking to understand market dynamics.
- 5. PREDICTIVE ANALYSIS:** Our service develops predictive models based on historical data and key indicators. These models forecast future market performance, assisting stakeholders in making informed decisions about classic car investments.
- 6. REGIONAL INSIGHTS:** We analyze regional variations in classic car popularity and market behavior, providing insights into buyer and seller behavior in different geographic areas.

AUDIENCE:

Classic Car Enthusiasts: Individuals passionate about classic cars seeking insights into market trends and valuation.

- **COLLECTORS:** Collectors looking to make informed decisions about their classic car collections and investments.
- **SELLERS AND DEALERS:** Classic car sellers and dealers interested in pricing strategies and market analysis.
- **INDUSTRY PROFESSIONALS:** Professionals in the classic car industry, including appraisers, insurers, and restoration specialists.
- **ANALYSTS:** Market analysts and researchers seeking data-driven insights into the classic car market.

BENEFITS:

- **INFORMED DECISION-MAKING:** Access to data-driven insights for making informed decisions about buying, selling, or collecting classic cars.
- **COMPREHENSIVE MARKET UNDERSTANDING:** Deeper insights into market trends, regional variations, and future market performance.
- **VISUAL DATA REPRESENTATION:** Complex data presented in visually compelling formats for easy comprehension.
- **PREDICTIVE INSIGHTS:** Forecasting models for anticipating future market dynamics and potential investment opportunities.
- **HISTORICAL DATA:** Access to historical data that aids in assessing the value and significance of classic cars.

AVAILABILITY:

The Classic Cars Data Visualization and Analysis service is available online, providing users with easy access to our data-driven insights and visualizations. Users can access our reports, visualizations, and predictive models through our web platform.

PRICING:

Pricing for our service is available upon request and may vary based on the specific needs and usage requirements of our clients. We offer flexible pricing plans to accommodate both individual classic car enthusiasts and industry professionals.

2.1 USER CHARACTERISTICS

Understanding the characteristics and profiles of potential users is crucial for designing and tailoring the Classic Cars Data Visualization and Analysis service to meet their specific needs. Here are some key user characteristics:

1. CLASSIC CAR ENTHUSIASTS:

- **DEMOGRAPHICS:** Varied age groups, predominantly male but increasingly diverse.
- **MOTIVATION:** Passion for classic cars, seeking historical information, market trends, and valuation insights.
- **USAGE:** Regularly engage with the service to stay informed about the classic car market and make informed purchasing decisions.

2. COLLECTORS:

- **DEMOGRAPHICS:** Diverse age groups, affluent individuals, and hobbyists.
- **MOTIVATION:** Building and maintaining classic car collections, seeking data on rarity, value, and historical significance.
- **USAGE:** Frequent and detailed analysis of data, especially when considering new acquisitions.

3. SELLERS AND DEALERS:

- **DEMOGRAPHICS:** Business professionals, including classic car dealers, auction houses, and brokers.
- **MOTIVATION:** Pricing strategies, inventory management, and market analysis to optimize sales.
- **USAGE:** Regularly access market trend reports and valuation data to guide pricing and sales decisions.

4. INDUSTRY PROFESSIONALS:

- **DEMOGRAPHICS:** Appraisers, insurers, restoration specialists, and consultants.
- **MOTIVATION:** Accurate valuation, risk assessment, and restoration insights for client services.
- **USAGE:** Access historical data and market trend reports for professional assessments.

5. ANALYSTS AND RESEARCHERS:

- **DEMOGRAPHICS:** Professionals in market analysis and research roles.
- **MOTIVATION:** Researching market trends, contributing to academic or industry publications.
- **USAGE:** Extensive data access, analytical tools, and historical data for research purposes.

6. GENERAL PUBLIC:

- **DEMOGRAPHICS:** Varied, including individuals with a general interest in classic cars.
- **MOTIVATION:** Seeking educational information about classic cars, including their history, significance, and cultural impact.
- **USAGE:** Occasional access to educational resources and basic market information.

2.2 ASSUMPTIONS

In any project, it's important to identify and document assumptions that may impact the project's planning, execution, and outcomes. Here are some assumptions that could apply to the Classic Cars Data Visualization and Analysis project:

1. **DATA AVAILABILITY:** The assumption that sufficient and relevant data on classic cars, including historical prices and details, is accessible from a variety of sources.
2. **DATA QUALITY:** Assuming that the collected data is accurate, reliable, and representative of the classic car market.
3. **DATA PRIVACY AND LEGAL COMPLIANCE:** If all data used in the project is obtained and used in compliance with data privacy regulations and legal requirements.
4. **TECHNOLOGICAL INFRASTRUCTURE:** Assuming that the required hardware and software infrastructure for data analysis and visualization will be available and reliable throughout the project.
5. **TEAM EXPERTISE:** If the project team possesses the necessary skills, knowledge, and expertise in data analysis, predictive modeling, and data visualization.
6. **BUDGET AND FUNDING:** If the project receives adequate funding and resources to cover data acquisition costs, analysis tools, and other project expenses.
7. **TIMELY DATA UPDATES:** Data sources will provide timely updates, allowing the project to maintain current market insights.
8. **USER ENGAGEMENT:** If users engage with the service regularly and find value in the insights provided.
9. **PREDICTIVE MODEL ACCURACY:** predictive models will yield accurate forecasts based on historical data and key indicators.
10. **MARKET STABILITY:** Assuming that market conditions and external factors affecting the classic car market will remain relatively stable during the project's timeline.
11. **USER ADOPTION:** If users will adopt the service and find it useful for their classic car-related needs.
12. **SCALABILITY:** If the project's infrastructure can scale to accommodate increased data volume and user demand if the service becomes highly popular.
13. **SECURITY:** Assuming that appropriate security measures are in place to protect user data and prevent unauthorized access.
14. **USER TRAINING:** If users may require training or resources to effectively utilize the data analysis and visualization tools.
15. **STAKEHOLDER COLLABORATION:** If stakeholders, such as classic car industry professionals, will collaborate and provide input for the project's success.

2.3 CONSTRAINTS

Constraints are factors that may limit or affect the execution and scope of the Classic Cars Data Visualization and Analysis project. It's important to identify these constraints to proactively address them and manage expectations. Here are some potential constraints:

1. **DATA AVAILABILITY:** The availability of comprehensive and up-to-date data on classic cars may be limited, and access to certain data sources could be restricted.
2. **DATA QUALITY:** The accuracy and reliability of data from various sources may vary, leading to potential data quality issues that need to be addressed.
3. **DATA PRIVACY:** Compliance with data privacy regulations, such as GDPR or CCPA, may impose constraints on how user data is collected, stored, and used.
4. **BUDGET:** Budget constraints may limit the resources available for data acquisition, analysis tools, and project management.
5. **TIMEFRAME:** A limited timeframe for the project may restrict the depth of data analysis and the number of predictive models that can be developed.
6. **TECHNOLOGICAL INFRASTRUCTURE:** Constraints related to the availability and scalability of hardware and software resources for data analysis and visualization may impact the project's capabilities.
7. **EXPERTISE:** Availability of skilled data analysts, data scientists, and data visualization experts may be limited, affecting the complexity and depth of analysis.
8. **LEGAL AND ETHICAL CONSIDERATIONS:** Constraints related to legal and ethical considerations, such as copyright restrictions on data sources or ethical considerations in data analysis, need to be adhered to.
9. **MARKET VOLATILITY:** External factors, economic conditions, and market volatility may affect the accuracy of predictive models and market trend analysis.
10. **USER TRAINING:** Constraints related to user familiarity with data analysis and visualization tools may require additional training resources.
11. **STAKEHOLDER COLLABORATION:** Limited collaboration and engagement from classic car industry stakeholders may restrict access to valuable industry insights.
12. **SECURITY:** Constraints related to data security and the prevention of data breaches need to be addressed to protect user information.
13. **SCALABILITY:** The service's ability to scale and handle increased data volume or user demand may be constrained by technological limitations.
14. **REGULATORY CHANGES:** Changes in data privacy regulations or other legal requirements during the project may necessitate adjustments to data handling practices.
15. **GEOGRAPHIC CONSTRAINTS:** Geographic constraints may affect the availability of data for specific regions or countries, potentially limiting the scope of analysis.
16. **RESOURCE AVAILABILITY:** Availability of human resources and expertise may be constrained, affecting the project's capacity to meet all objectives.

DEPENDENCIES

Dependencies in a project refer to the relationships between tasks, activities, or components that rely on one another for successful completion. Identifying and managing dependencies is crucial for ensuring that the Classic Cars Data Visualization and Analysis project progresses smoothly. Here are potential dependencies to consider:

1. DATA ACQUISITION DEPENDENCIES:

Data Sources: The project depends on the availability and accessibility of data sources. Delays or changes in data sources can impact data collection.

2. DATA PREPROCESSING DEPENDENCIES:

Data Cleaning: Data cleaning and preparation tasks must be completed before analysis. Data quality issues can delay analysis.

3. TECHNOLOGY DEPENDENCIES:

Software and Tools: The project relies on specific data analysis, visualization, and predictive modeling tools. Changes or updates to these tools can affect the project.

4. EXPERTISE DEPENDENCIES:

Data Analysts: The availability of skilled data analysts and data scientists is crucial for data analysis. The project depends on their expertise.

5. USER ENGAGEMENT DEPENDENCIES:

User Feedback: User feedback and input are essential for refining the service. The project depends on user engagement and feedback.

6. BUDGET DEPENDENCIES:

Funding: Adequate budget and funding are necessary for data acquisition, software licenses, and project management. Budget constraints can limit project capabilities.

7. TIMELINE DEPENDENCIES:

Project Schedule: Dependencies exist between various project phases. Delays in one phase can impact subsequent phases, affecting the project timeline.

8. LEGAL AND COMPLIANCE DEPENDENCIES:

Data Privacy Regulations: Compliance with data privacy regulations is critical. Changes in regulations can impact data handling practices.

9. STAKEHOLDER ENGAGEMENT DEPENDENCIES:

Collaboration: Collaboration with classic car industry stakeholders is important for obtaining industry insights. The project depends on stakeholder engagement.

10. MARKET CONDITIONS DEPENDENCIES:

Market Stability: The accuracy of predictive models and market trend analysis depends on stable market conditions. Market volatility can affect predictions.

11. SCALABILITY DEPENDENCIES:

User Growth: As the user base grows, the project may depend on the ability to scale infrastructure and accommodate increased data volume.

12. REGULATORY DEPENDENCIES:

Regulatory Changes: Changes in regulations during the project may necessitate adjustments in data handling and reporting practices.

3. REQUIREMENTS

Requirements for the Classic Cars Data Visualization and Analysis project outline what needs to be achieved to fulfill the project's objectives. These requirements encompass various aspects, including data, analysis, visualization, and user experience. Here are some key requirements:

1. DATA REQUIREMENTS:

- **DATA COLLECTION:** Acquire comprehensive data on classic cars, including make, model, year of manufacture, mileage, historical prices, and restoration status, from diverse and reliable sources.
- **DATA QUALITY:** Ensure data accuracy, completeness, and reliability through data validation and cleaning processes.
- **DATA PRIVACY:** Comply with data privacy regulations, obtain necessary permissions, and protect user data.
- **DATA UPDATES:** Regularly update the dataset to maintain its relevance and accuracy.

2. ANALYSIS REQUIREMENTS:

- **DATA ANALYSIS:** Apply advanced data analysis techniques to uncover trends, patterns, correlations, and insights within the classic car market.
- **PREDICTIVE MODELING:** Develop predictive models based on historical data and key indicators to forecast future market performance.
- **REGIONAL ANALYSIS:** Provide insights into regional variations in classic car preferences and market dynamics.
- **MARKET TRENDS:** Identify and report on historical market trends, including price fluctuations, popular classic car models, and shifts in collector preferences.

3. VISUALIZATION REQUIREMENTS:

- **DATA VISUALIZATION:** Create visually appealing and informative graphs, charts, and figures to represent data findings.
- **USER-FRIENDLY INTERFACE:** Design an intuitive and user-friendly interface that allows users to interact with and explore data visualizations easily.
- **CUSTOMIZATION:** Offer customization options for users to tailor data visualizations to their specific interests and needs.

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4. USER EXPERIENCE REQUIREMENTS:

- **USER ENGAGEMENT:** Promote user engagement through features like interactive dashboards and regular updates.
- **FEEDBACK MECHANISM:** Implement a feedback mechanism to gather user input and suggestions for service improvement.
- **USER TRAINING:** Provide resources and tutorials for users to effectively utilize data analysis and visualization tools.

5. TECHNICAL REQUIREMENTS:

- **INFRASTRUCTURE:** Ensure the availability of the necessary hardware and software infrastructure for data analysis and visualization.
- **SCALABILITY:** Design the service to accommodate growth in data volume and user demand.
- **SECURITY:** Implement robust security measures to protect user data and prevent unauthorized access.

6. STAKEHOLDER COLLABORATION REQUIREMENTS:

- **INDUSTRY COLLABORATION:** Collaborate with classic car industry stakeholders to access industry insights and expertise.
- **USER COLLABORATION:** Foster collaboration with users for user-centric service improvements.

7. REPORTING REQUIREMENTS:

- **DOCUMENTATION:** Provide comprehensive project documentation, including an executive summary, reports, and user guides.
- **REGULAR REPORTING:** Share regular reports on market trends and insights with users.

8. USER SUPPORT REQUIREMENTS:

- **CUSTOMER SUPPORT:** Offer customer support to address user inquiries, issues, and feedback.
- **TRAINING RESOURCES:** Provide training resources and tutorials to help users maximize the service's capabilities.

3.1 FUNCTIONAL REQUIREMENTS

Requirement no.	Requirement name	Requirement description
1	Comprehensive Data Acquisition	Collect comprehensive data on classic cars from diverse sources
2	Data Quality Assurance	Perform data validation and cleaning processes to ensure data accuracy, completeness, and reliability. Conduct regular data quality checks.
3	Data Privacy Compliance	Comply with data privacy regulations, obtain necessary permissions, and securely store and protect user data from unauthorized access.
4	Advanced Data Analysis	Employ advanced data analysis techniques to uncover trends, patterns, correlations, and insights within the classic car market.
5	Predictive Model	Develop predictive models based on historical data and key indicators to forecast future market performance.
6	Visual Representation	visually appealing graphs, charts, and figures to represent data findings and make them accessible through the interface.
7	Intuitive User Interface	Provide an intuitive and user-friendly interface for users to explore data visualizations, customize views, and access information.
8	User Engagement Features	Promote user engagement through interactive features like dashboards, notifications, and regular updates on market trends and insights.
9	User Feedback Collection	Implement a feedback mechanism for users to provide input, suggestions, and feedback to improve the service continually.
10	Training Resources Availability	Provide training resources, including tutorials, guides, and documentation, to assist users in effectively utilizing data analysis and visualization tools.
11	Data Security Implementation	Implement robust security measures to protect user data, ensure data integrity, and prevent unauthorized access or breaches.
12	Comprehensive Reporting	Generate comprehensive reports on market trends, historical data, and predictive insights for user reference and analysis.

NON-FUNCTIONAL REQUIREMENTS:

Non-functional requirements describe the qualities or attributes that are important for the Classic Cars Data Visualization and Analysis project but do not pertain to specific functionality. These requirements focus on performance, usability, security, and other aspects that contribute to the overall quality of the service. Here are some non-functional requirements for the project:

1. PERFORMANCE:

- **RESPONSE TIME:** The system should respond to user interactions with data visualizations within two seconds to ensure a seamless user experience.
- **SCALABILITY:** The service should be scalable to handle an increased number of users and data volume without significant performance degradation.
- **DATA PROCESSING SPEED:** Data analysis and predictive modeling should be performed efficiently to provide timely insights to users.

2. USABILITY:

- **USER INTERFACE CONSISTENCY:** The user interface should maintain consistency in design and layout to enhance user navigation and usability.
- **ACCESSIBILITY:** The service should be accessible to users with disabilities, complying with accessibility standards such as WCAG.
- **CROSS-PLATFORM COMPATIBILITY:** The service should be compatible with common web browsers and mobile devices to accommodate users on different platforms.

3. SECURITY:

- **DATA ENCRYPTION:** User data and sensitive information should be encrypted to protect it from unauthorized access or breaches.
- **AUTHENTICATION AND AUTHORIZATION:** Implement robust authentication and authorization mechanisms to ensure that only authorized users can access sensitive data and functionalities.
- **REGULAR SECURITY AUDITS:** Conduct regular security audits and vulnerability assessments to identify and address potential security risks.

4. RELIABILITY:

- **SYSTEM AVAILABILITY:** The service should have high availability, with downtime not exceeding 99.9% per year.
- **DATA BACKUP:** Implement regular data backup procedures to ensure data recovery in case of unexpected data loss.
- **FAULT TOLERANCE:** The system should be designed to continue functioning in the presence of hardware or software failures.

HARDWARE REQUIREMENTS:

1. SERVER INFRASTRUCTURE:

- ❖ High-performance servers with multicore processors to handle data processing and user requests efficiently.
- ❖ Processor: Intel Dual-Core or above
- ❖ Sufficient RAM capacity for data analysis and modeling tasks.
- ❖ RAM: 4 GB or above
- ❖ Large storage capacity to store historical data and user information securely.
- ❖ Redundant hardware components for fault tolerance and high availability.

2. STORAGE SYSTEMS:

- ❖ Reliable and scalable storage systems for storing and retrieving large datasets.
- ❖ Fast and redundant storage for quick access to frequently used data

3. NETWORK INFRASTRUCTURE

- ❖ High-speed internet connection to ensure seamless data transfer and user interactions.
- ❖ Load balancing mechanisms to distribute user requests evenly across server clusters.

4. BACKUP AND DISASTER RECOVERY:

- ❖ Disaster recovery infrastructure to ensure business continuity in case of system failures.
- ❖ Regularly updated backup systems to protect against data loss.

5. SECURITY HARDWARE:

- ❖ Firewalls, intrusion detection systems, and other security appliances to protect against cyber threats.
- ❖ Secure sockets layer (SSL) certificates for encrypting data in transit.

6. MONITORING AND LOGGING:

- ❖ Monitoring tools and hardware sensors to track system performance and health.
- ❖ Logging servers to capture and store system logs for auditing and troubleshooting.

SOFTWARE REQUIREMENTS:

1. OPERATING SYSTEM:

- Linux-based or Windows server operating system, chosen based on the project's technical requirements and expertise of the team.

2. WEB SERVER:

- A web server software like Apache HTTP Server, Nginx, or Microsoft IIS to serve web applications and content.

3. DATABASE MANAGEMENT SYSTEM:

- A relational database management system (RDBMS) such as PostgreSQL, MySQL, or Microsoft SQL Server for data storage and retrieval.

4. DATA ANALYSIS AND MODELING TOOLS:

- Data analysis and modeling software like Python with libraries (e.g., Pandas, NumPy, SciPy), R, or specialized data analysis platforms (e.g., IBM SPSS, SAS).

5. DATA VISUALIZATION TOOLS:

- Data visualization tools and libraries such as Matplotlib, Seaborn, D3.js, or specialized BI tools (e.g., Tableau, Power BI) for creating informative visuals.

6. SECURITY SOFTWARE:

- Security software for monitoring and protecting against cyber threats, including antivirus, firewall, and intrusion detection systems.

7. BACKUP AND RECOVERY SOFTWARE:

- Backup and recovery software to automate data backups and ensure data integrity.

8. DATA PRIVACY COMPLIANCE TOOLS:

- Software tools and practices to ensure compliance with data privacy regulations, including tools for managing user consent and data access permissions.

9. MONITORING AND LOGGING TOOLS:

- Monitoring and logging tools to track system performance, detect issues, and generate logs for auditing.

10. DEVELOPMENT AND TESTING TOOLS:

- Integrated development environments (IDEs), version control systems (e.g., Git), and testing frameworks for software development and quality assurance.

3.2 USER INTERFACE REQUIREMENTS

User Interface (UI) requirements for the Classic Cars Data Visualization and Analysis project outline the design and functionality of the user interface, ensuring that it meets the needs of users and provides an engaging and intuitive experience. Here are some UI requirements:

1. USER-FRIENDLY INTERFACE:

The user interface should be user-friendly, with an intuitive layout and navigation that allows users to easily access data and features.

2. DASHBOARD:

The system should feature a customizable dashboard where users can view key data visualizations, reports, and insights relevant to their interests.

3. DATA VISUALIZATION:

Provide interactive data visualizations, including graphs, charts, and maps, that allow users to explore and analyze classic car market data.

4. CUSTOMIZATION:

Allow users to customize their dashboard and data visualizations, enabling them to select the data and metrics they want to see.

5. ACCESSIBILITY:

Ensure that the UI is accessible to users with disabilities, complying with accessibility standards such as WCAG.

6. INTERACTIVE ELEMENTS:

Include interactive elements like tooltips, hover effects, and click interactions to enhance user engagement.

7. DATA DRILL-DOWN:

Allow users to drill down into specific data points for more detailed information and analysis.

8. HELP AND DOCUMENTATION:

Include easily accessible help resources, tutorials, and user documentation within the UI to assist users in utilizing the service effectively.

9. DATA EXPORT:

Allow users to export data visualizations, reports, and insights in various formats, such as PDF, CSV, or Excel.

10. BRANDING AND THEMING:

Incorporate branding elements and theming options to allow organizations to customize the UI's appearance.

3.3 PERFORMANCE

3.3.1 CAPACITY

- The system should be capable of handling a large volume of concurrent users, supporting at least [insert expected number] users at peak times.

3.3.2 AVAILABILITY

- The system should aim for high availability, with a target uptime of 99.9% annually, allowing for scheduled maintenance windows.

3.3.3 LATENCY

- User interactions, such as data retrieval and visualization rendering, should have a response time of under two seconds to ensure a responsive user experience.

3.4 MANAGEABILITY|MAINTAINABILITY

- Implement robust monitoring tools and mechanisms to continuously track system performance, detect anomalies, and generate alerts for the operations team.

3.4.1 MONITORING

- Regularly schedule maintenance windows during low-traffic periods for updates, data backups, and system optimization without impacting user experience.

3.4.2 MAINTENANCE

- Establish clear operational procedures and documentation for system administrators to manage, troubleshoot, and scale the infrastructure effectively.

3.4.3 OPERATIONS

- The system should provide APIs or integration points to allow for seamless integration with external data sources or third-party applications that classic car enthusiasts and professionals may use.

3.5 SYSTEM INTERFACE|INTEGRATION

- Implement robust security measures to protect against common web application vulnerabilities, including SQL injection, cross-site scripting (XSS), and cross-site request forgery (CSRF).

3.6 SECURITY

Security is a critical aspect of any software system, ensuring that data and resources are protected from unauthorized access, breaches, and malicious activities. In the context of the Classic Cars Data Visualization and Analysis project, security requirements are crucial to safeguard user data and maintain the integrity of the system.

3.6.1 PROTECTION

Explanation:

Protection in the context of security refers to the measures and mechanisms put in place to safeguard the system from various threats and vulnerabilities. It involves ensuring the confidentiality, integrity, and availability of data and resources.

KEY ASPECTS:

DATA ENCRYPTION: Implement encryption protocols (e.g., SSL/TLS) to secure data transmission between users and the system. Encrypt sensitive data at rest to prevent unauthorized access.

FIREWALLS AND INTRUSION DETECTION: Employ firewalls to monitor and filter network traffic, allowing only authorized connections. Implement intrusion detection systems (IDS) to detect and respond to suspicious activities.

SECURE CODING PRACTICES: Follow secure coding guidelines to prevent common vulnerabilities like SQL injection, cross-site scripting (XSS), and buffer overflows.

REGULAR SECURITY AUDITS: Conduct periodic security audits and vulnerability assessments to identify and mitigate potential weaknesses in the system.

USER DATA PROTECTION: Implement strong user data protection measures, including hashing and salting passwords, to prevent unauthorized access to user accounts.

3.6.2 AUTHORIZATION AND AUTHENTICATION

EXPLANATION:

Authorization and authentication are fundamental components of access control. Authentication verifies the identity of users, while authorization determines the permissions and access levels granted to authenticated users.

KEY ASPECTS:

USER AUTHENTICATION: Implement robust user authentication mechanisms, including username and password authentication, multi-factor authentication (MFA), or single sign-on (SSO) options to ensure that only authorized individuals can access the system.

ACCESS CONTROL: Define access control policies that specify who can access specific system resources and what actions they can perform. Implement role-based access control (RBAC) to manage user permissions effectively.

SESSION MANAGEMENT: Manage user sessions securely, including secure storage of session tokens, session timeouts, and logout functionality.

USER ROLE MANAGEMENT: Enable administrators to assign and manage user roles and permissions. Ensure that each user is granted the appropriate level of access based on their role.

AUDIT TRAILS: Maintain detailed audit logs of user activities and access attempts, including failed login attempts, to facilitate monitoring and investigation.

3.7 DATA MANAGEMENT

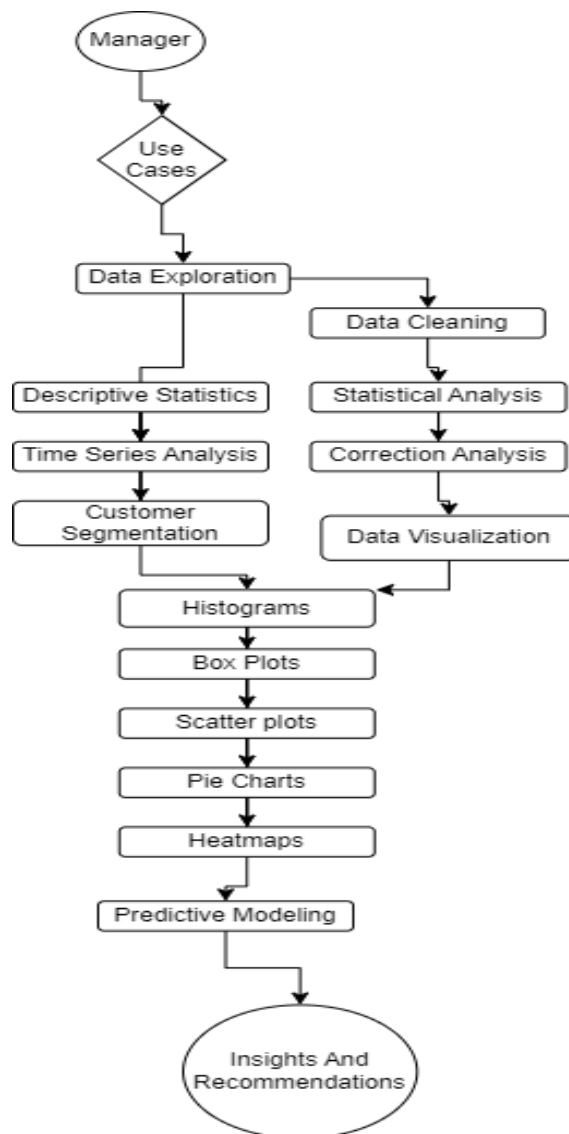
- Implement efficient data storage and retrieval mechanisms to ensure that data can be accessed, searched, and analyzed quickly. Employ data compression and indexing techniques as needed.

3.8 STANDARDS COMPLIANCE

- Ensure compliance with relevant industry standards, including data privacy regulations (e.g., GDPR, CCPA), web accessibility standards (e.g., WCAG), and security standards (e.g., OWASP).

4. USER SCENARIOS|USE CASES

User scenarios or use cases are descriptions of how users interact with a system or application to achieve specific goals or tasks. In the context of the Classic Cars Data Visualization and Analysis project, here are some user scenarios or use cases:



5. Deleted or Deferred Requirements

Sometimes, during the development of a project, certain requirements may need to be deleted or deferred due to various reasons, such as changes in project scope, resource constraints, or shifting priorities. Here are examples of deleted or deferred requirements for the Classic Cars Data Visualization and Analysis project:

DELETED REQUIREMENTS:

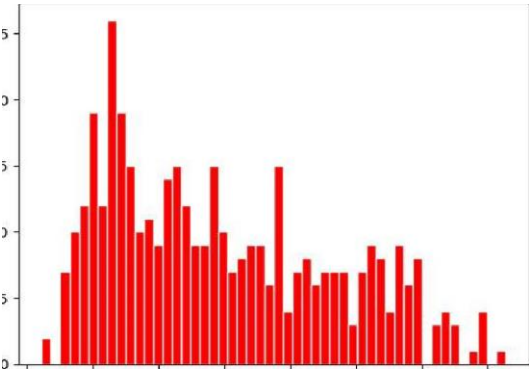
- 1. VIRTUAL REALITY INTEGRATION:** Initially, there was a requirement to integrate virtual reality (VR) technology for an immersive classic car exploration experience. However, due to technical complexities and resource limitations, this requirement has been deleted.
- 2. ADVANCED NATURAL LANGUAGE PROCESSING (NLP):** Originally, there was a plan to implement advanced NLP for sentiment analysis of user comments and reviews related to classic cars. This requirement has been deleted to streamline the project and prioritize core functionality.
- 3. MOBILE APPLICATION:** Initially, there was a requirement to develop a dedicated mobile application for iOS and Android platforms. However, due to budget constraints, the mobile app requirement has been deleted, and the focus is on a responsive web interface.

DEFERRED REQUIREMENTS:

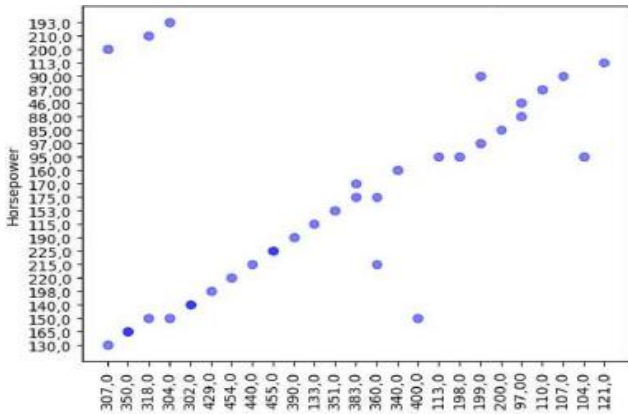
- 1. MACHINE LEARNING RECOMMENDATIONS:** The requirement to implement machine learning-driven personalized recommendations for classic car enthusiasts has been deferred to a later phase of the project. The initial release will focus on basic data analysis and visualization.
- 2. INTEGRATION WITH SOCIAL MEDIA:** The integration with social media platforms to allow users to share their favorite classic cars and insights will be deferred to a future update, as it requires additional development effort.
- 3. MULTI-LANGUAGE SUPPORT:** While the project initially aimed for multi-language support, it has been deferred to a later stage to prioritize core functionalities. The primary language will be English in the initial release.
- 4. ADVANCED USER ANALYTICS:** The implementation of advanced user analytics, including user behavior tracking and advanced reporting, has been deferred to a post-launch phase to ensure timely project delivery.

SNAPSHOTS

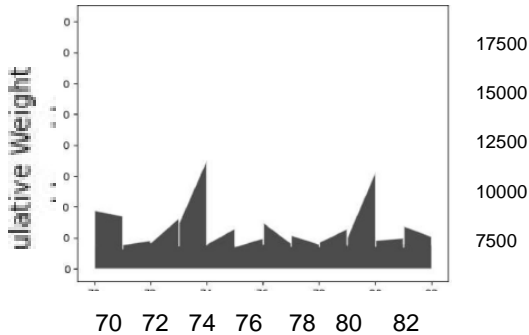
DISTRIBUTION OF CAR WEIGHTS



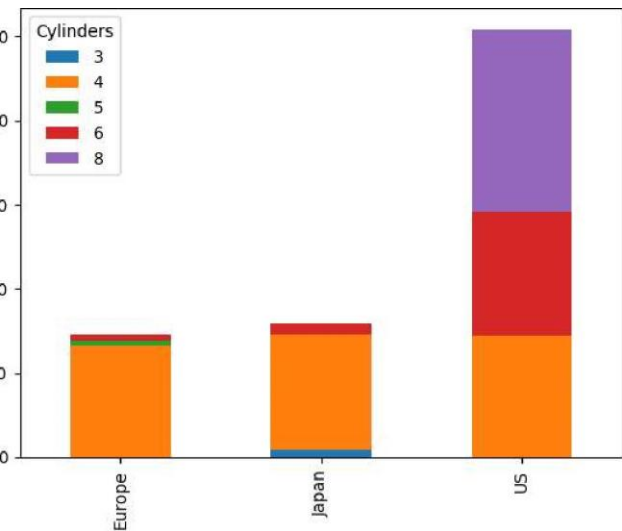
SCATTER PLOT: DISPLACEMENT VS HORSEPOWER



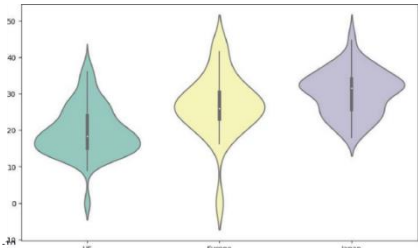
CUMULATIVE WEIGHT OF CARS OVER THE YEARS



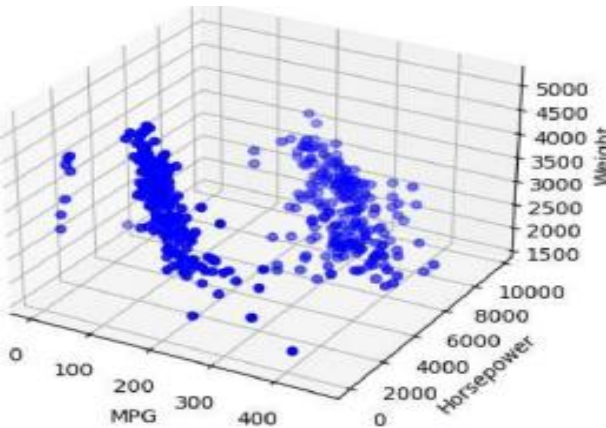
STACKED BAR CHART: CYLINDERS BY CAR ORIGIN



VIOLIN PLOT: MPG BY CAR ORIGIN



3D SCATTER PLOT: MPG VS. HORSEPOWER VS. WEIGHT



RADAR CHART: COMPARISON OF CAR ATTRIBUTES

