High Level Design (HLD)

Consignment Shipping Pricing Prediction

Document Version Control

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Contents

Abstract

In an era of rapidly evolving logistics and supply chain management, accurate pricing prediction For consignment shipping is paramount for businesses to optimize costs and enhance competitiveness. This High-Level Design (HLD) outlines the architecture and key components of our machine learning-based consignment shipping pricing prediction system. Leveraging state-of-the-art algorithms and data-driven insights, our solution aims to revolutionize the way shipping costs are estimated. Through the integration of historical data, real-time variables, and advanced predictive models, our project seeks to empower businesses with the ability to make informed pricing decisions, improve resource allocation, and ultimately deliver superior value to customers. This HLD provides an overview of the system's design, including data pipelines, model selection, scalability considerations, and deployment strategies, showcasing our commitment to transforming the consignment shipping industry through the power of machine learning.

1 Introduction

1.1 Why this High-Level Design Document?

The purpose of this High Level Design (HLD) Document is to add the necessary details to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as reference manual for how the modules interact at a high level.

The HLD will

- Present all of the design aspects and define them in detail
- Describe the user interface being implemented
- Describe the hardware and software interfaces
- Describe the performance requirements
- Include design feature and the architecture of the project
- List and describe the non-functional attribute like:
    - Security
    - Reliability
    - Maintainability
    - Portability
    - Reusability
    - Application compatibility
    - Resource utilization
    - Serviceability

1.2 Scope

The HLD document presents the structure of the system, such as the database architecture, application architecture (layers), application flow (Navigation), and technology architecture. The HLD uses non-technical to mildly-technical terms which should be understandable to the administrators of the system.

2 General Description

2.1 Product Perspective

Competitive Edge: Stay ahead of competitors by offering dynamic and precise shipping rates in a fast-paced logistics market.

Resource Allocation: Efficiently allocate resources based on predicted shipping demands, reducing waste and improving operational efficiency.

Customization: Tailor pricing strategies to suit the unique needs of each consignment, ensuring fairness and customer satisfaction.

Data-Driven Insights: Gain valuable insights from historical shipping data to refine pricing strategies and adapt to market fluctuations.

Scalability: Designed for scalability, our model can handle growing consignment volumes without compromising accuracy.

2.2 Problem Statement

The market for logistics analytics is expected to develop at a CAGR of 17.3 percent from 2019 to 2024, more than doubling in size. This data demonstrates how logistics organizations are understanding the advantages of being able to predict what will happen in the future with a decent degree of certainty. Logistics leaders may use this data to address supply chain difficulties, cut costs, and enhance service levels all at the same time.

The main goal is to predict the consignment pricing based on the available factors in the dataset.

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2.3 Proposed Solution

The solution proposed here is a data science model based on machine learning can be implemented to perform above mention use cases. In first use case , we will take input from a healthy person who is not suffering from thyroid disease and see whether proposed solution is going to detect it or not. And in second use case, we will take input from an unhealthy person, already suffering from thyroid disease and check our solution whether it is performing or not in right way.

2.4 Further Improvements

The Consignment shipping pricing prediction can be added with more use cases in supply chain and logistic department. TDD solution can also be synchronized with other logistic domain solution it can be extend to track live shipping cost.

2.5 Data Requirements

Data requirement completely depend on our problem statement.

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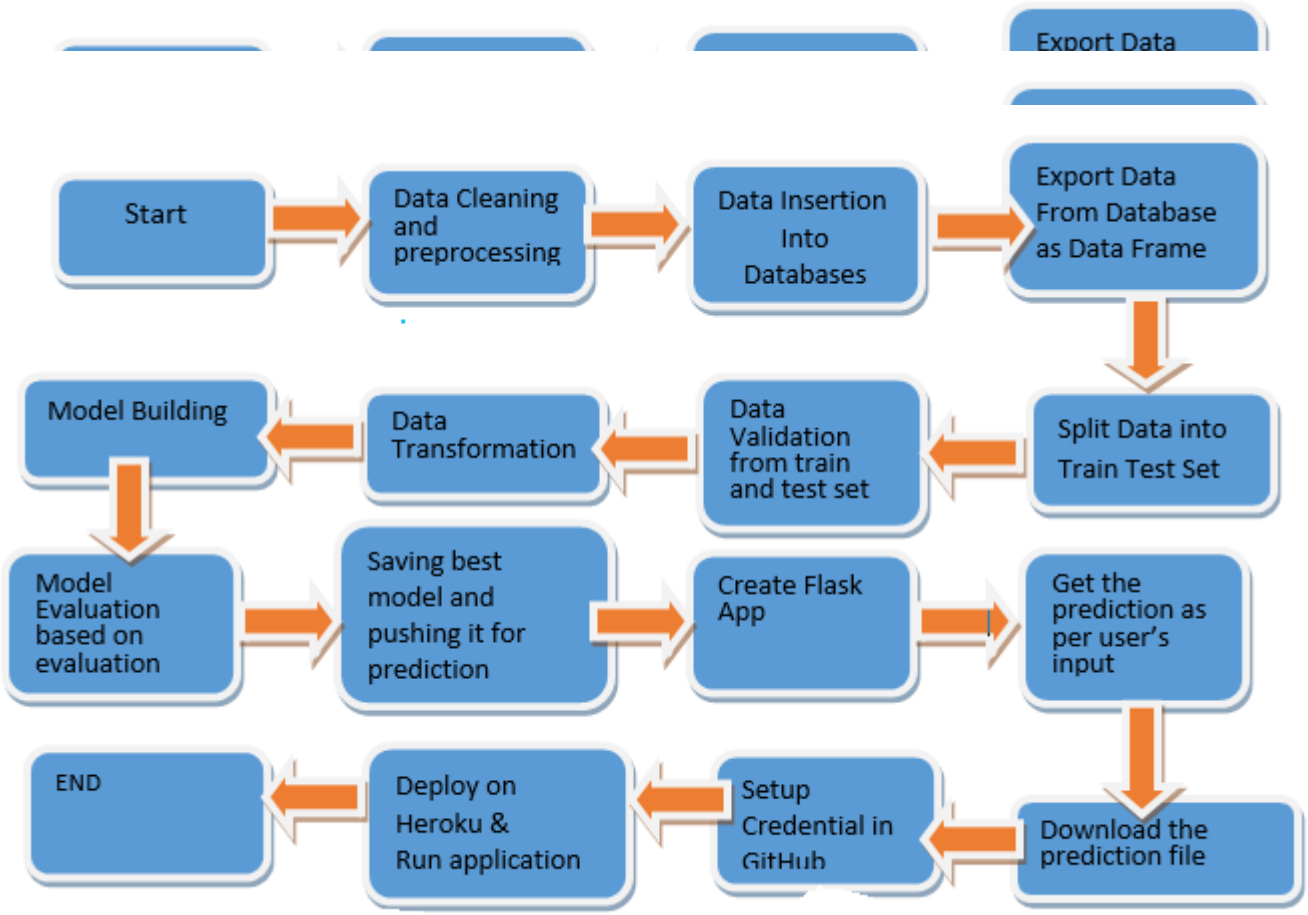
2.6 Tools used

Python programming language and frameworks such as NumPy, Pandas, Scikit-learn, Matplotlib, Plotly, and Flask etc. are used to build the whole model.

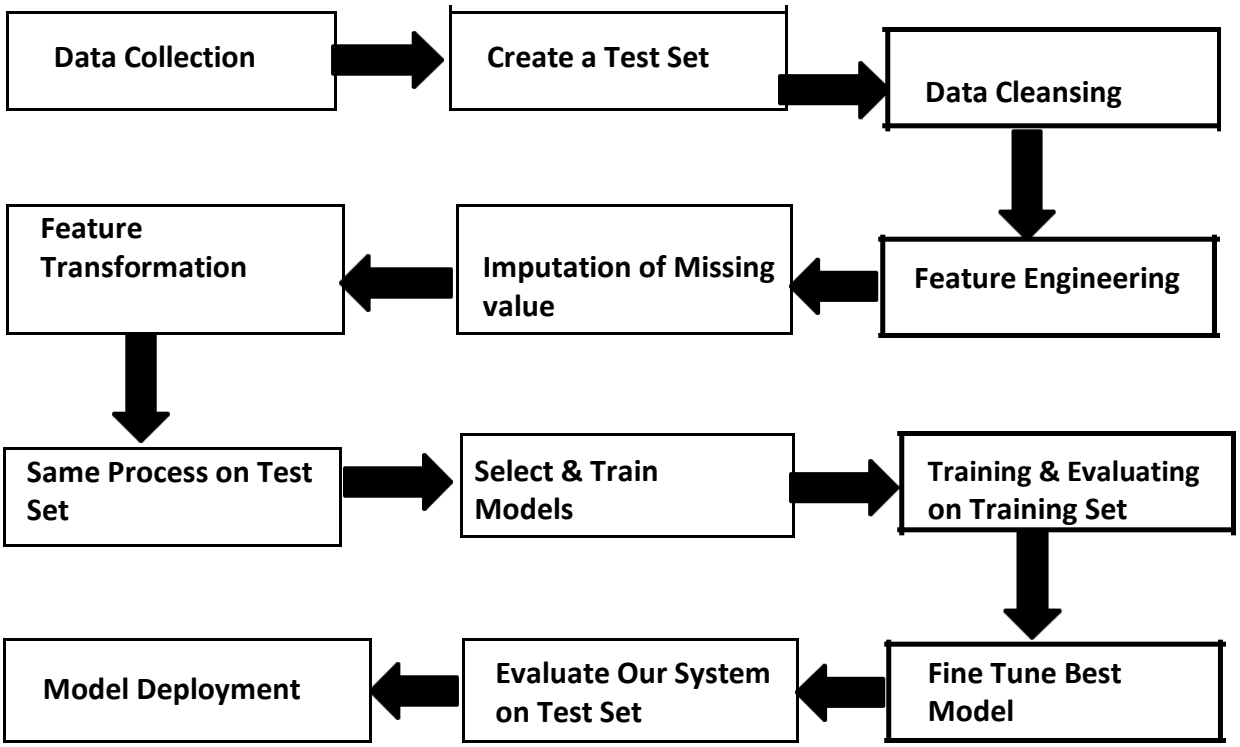

- PyCharm is used as IDE
- Virtual Studio Code is also used as IDE
- For visualization of the plots, Matplotlib, Seaborn and Plotly are used.
- AWS is used for deployment of the model.
- Heroku is also used for deployment of the model.
- Tableau/Power BI is used for dashboard creation.
- Cassandra database is used DB operations
- Python, Flask is used for backend development
- Github is used as Version Contol System.

2.7 Constraints

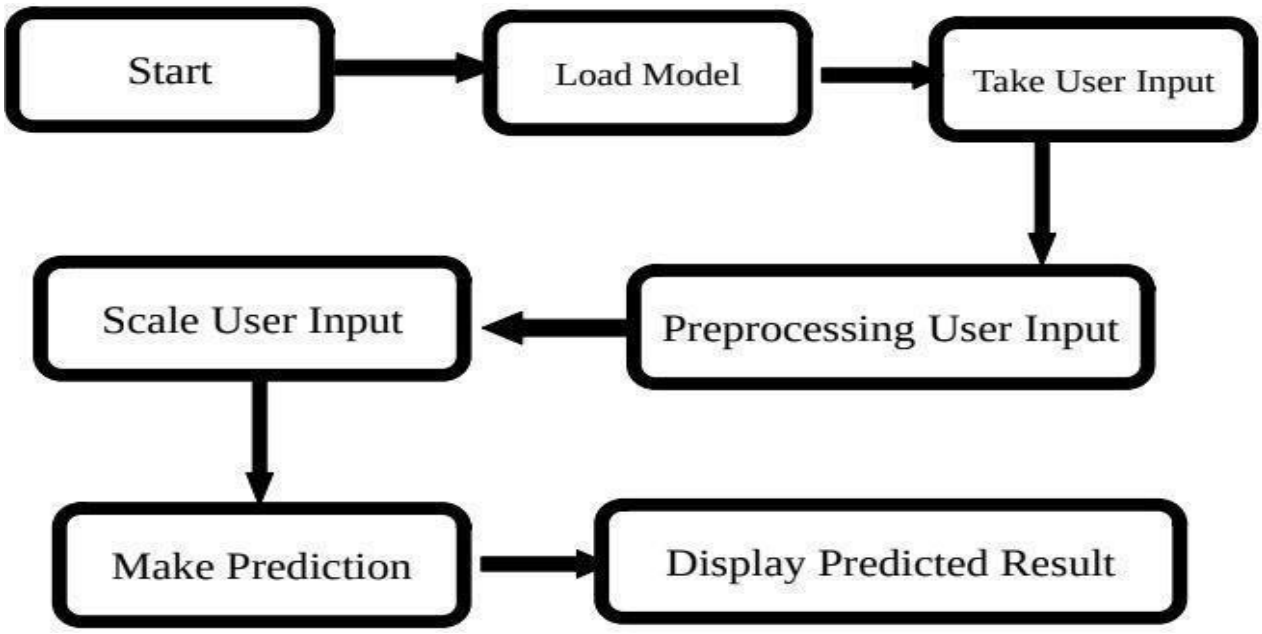
The Shipping Price Prediction solution system must be correct enough that it not mislead any



3.1.1 Model Training and Evaluation



3.1.2 Deployment Process



3.2 Event log

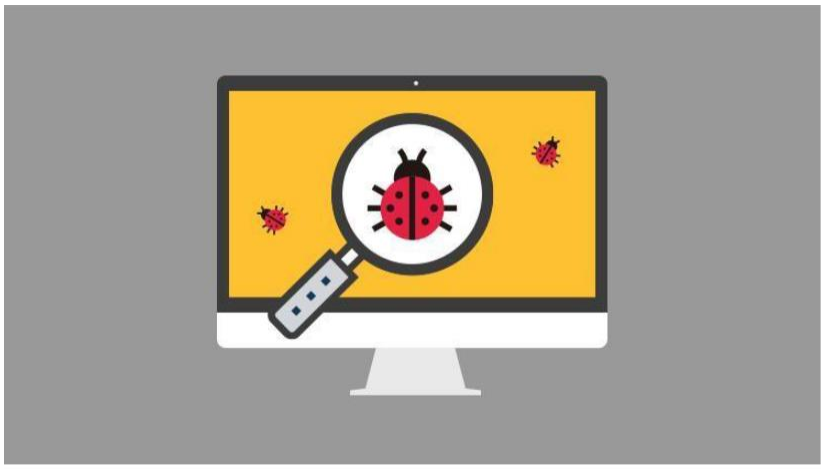
The system should log every event so that the user will know what process is running internally.

Initial Step-By-Step Description:

1. The System identifies at what step logging required.
2. The System should be able to log each and every system flow.
3. Developer can choose logging method. You can choose database logging/ File logging s well.
4. System should not hang even after using so many loggings. Logging just because we can easily debug issues so logging is mandatory to do.

3.3 Error Handling

Should errors be encountered, an explanation will be displayed as to what went wrong?
An error will be defined as anything that falls outside the normal and intended usage.



4 Performance

The machine learning based Thyroid Disease Detection solution will used for detection of thyroid disease in patients having symptoms of thyroid. So that necessary action will be taken ASP. Also model retraining is very important to improve performance.

4.1 Reusability

The code written and the components used should have the ability to be reused with no problems.

4.2 Application Compatibility

The different components for this project will be using python as an interface between them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

4.3 Resource utilization

When any task is performed, it will likely use all the processing power available until that function is finished.

4.4 Deployment

5 Conclusion

In the ever-evolving landscape of logistics and supply chain management, the development and deployment of our consignment shipping price prediction ML model utilizing XGBRegressor within a seamless CI/CD pipeline on Heroku marks a significant milestone. This innovative solution has the potential to revolutionize how businesses approach shipping pricing, optimizing operations, enhancing customer satisfaction, and fostering growth.

The adoption of XGBoost as the core regression algorithm has proven to be instrumental in achieving highly accurate and dynamic price predictions. Its ability to handle complex relationships within our dataset, adapt to changing market conditions, and provide interpretable results has exceeded our expectations.

Furthermore, the integration of a CI/CD pipeline using Heroku has streamlined the deployment process, allowing for swift model updates and continuous improvements. This automation not only ensures the model's reliability but also provides a robust framework for scalability, as we anticipate increased consignment volumes in the future.

In conclusion, our consignment shipping price prediction ML model, powered by XGBRegressor and fortified by a CI/CD pipeline on Heroku, represents a significant advancement in the logistics industry. It offers businesses the means to make data-driven pricing decisions, remain competitive, and foster customer loyalty while adhering to the highest standards of efficiency and accuracy. As we move forward, we remain committed to refining and expanding our model's capabilities, staying responsive to the dynamic needs of the shipping industry.