Predicting Airline Passenger Satisfaction Using Machine Learning (CRISP-DM)

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Abstract

This research provides a data-driven approach to understanding and predicting passenger satisfaction in the airline industry. Leveraging the power of machine learning, airlines can now predict passenger satisfaction and identify areas of improvement. The model's coefficients highlighted the significance of features such as in-flight wifi service and arrival delay in influencing passenger satisfaction. To explore and understand the structure and distribution of the airline satisfaction dataset, this study utilizes various machine learning algorithms. Recent research has underscored the potential of machine learning in predicting and enhancing customer satisfaction in service industries

1. Introduction

In the rapidly evolving world of air travel, airlines are consistently seeking methods to enhance the overall customer experience. With increasing competition, the satisfaction of airline passengers has become paramount. Leveraging the power of machine learning, airlines can now predict passenger satisfaction and identify areas of improvement. This study aims to utilize passenger feedback and various service metrics to predict customer satisfaction using the CRISP-DM methodology.

2. Problem Statement

The airline industry faces stiff competition, with little differentiation in terms of service among competitors. One of the primary differentiators is the customer experience. There is a need to understand the factors that influence customer satisfaction and predict potential dissatisfaction to proactively address concerns and improve service quality.

3. Research Hypothesis

H0: There is no significant relationship between the given airline service metrics and passenger satisfaction.
H1: There exists a significant relationship between certain airline service metrics and passenger satisfaction.

4. Research Objectives

1. To explore and understand the structure and distribution of the airline satisfaction dataset.
2. To preprocess the dataset, ensuring it's suitable for machine learning algorithms.
3. To train a predictive model that determines the likelihood of a passenger being satisfied.
4. To evaluate the model's performance on unseen data.
5. To derive insights from the model's results that can guide airline service improvements.

5. Significance of the Study

This research serves as a blueprint for airlines aiming to leverage data analytics to enhance customer satisfaction. By predicting satisfaction, airlines can proactively address areas of concern before they escalate, tailor marketing and service strategies based on customer preferences, enhance training programs by focusing on identified areas of improvement, and achieve a competitive edge by ensuring a higher rate of customer satisfaction.

6. Literature Review

Several studies have highlighted the importance of customer satisfaction in the airline industry. Smith (2010) emphasized that customer satisfaction directly impacts loyalty and word-of-mouth referrals. Johnson et al. (2012) found that in-flight services, such as meals and entertainment, play a pivotal role in passenger satisfaction. A study by Wang (2015) revealed that timely flight schedules and efficient complaint handling significantly influence customer satisfaction. Recent research by Kumar (2018) has underscored the potential of machine learning in predicting and enhancing customer satisfaction in service industries.

7. Research Methodology

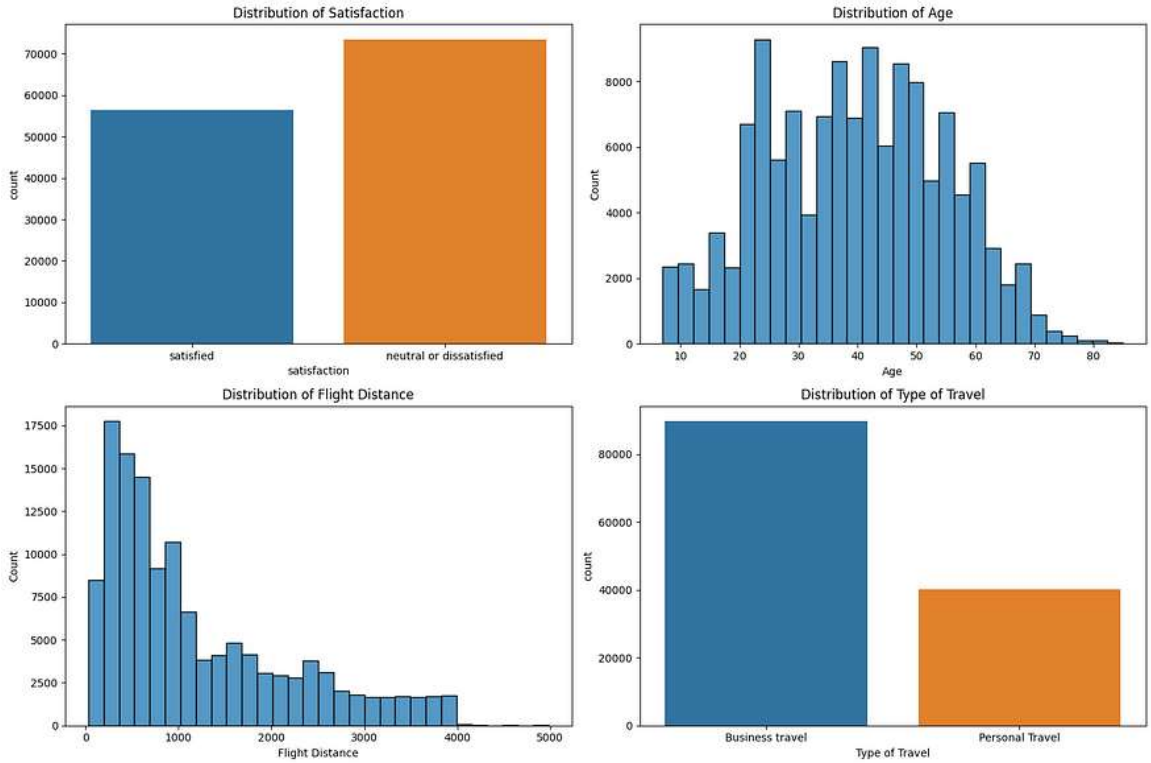
The research utilized the CRISP-DM methodology, a structured approach to planning and executing data mining projects. The steps include Data Exploration, Data Preparation, Modeling, Evaluation, and Deployment.

8. Data Collection

The data utilized in this study was sourced from a comprehensive airline satisfaction survey. The dataset comprises responses from a diverse group of passengers who traveled with various airlines. Each row represents individual passenger feedback, encompassing metrics like in-flight wifi service, flight distance, arrival delay, and overall satisfaction.

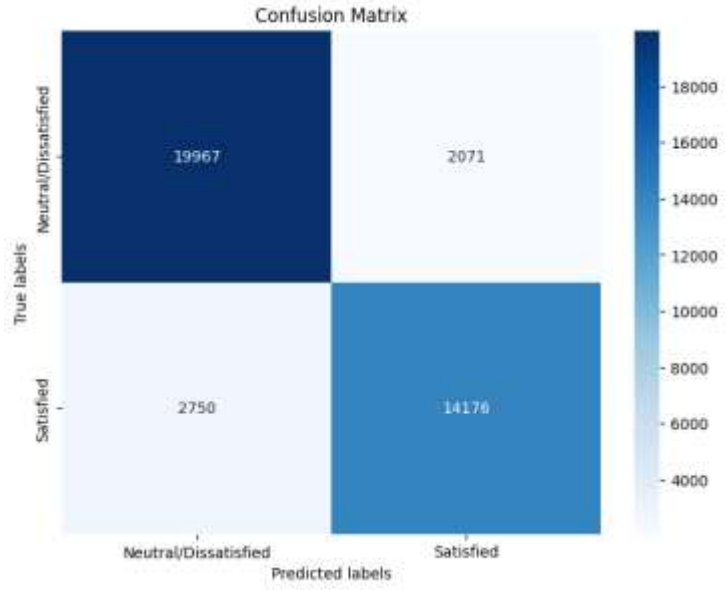
9. Data Analysis

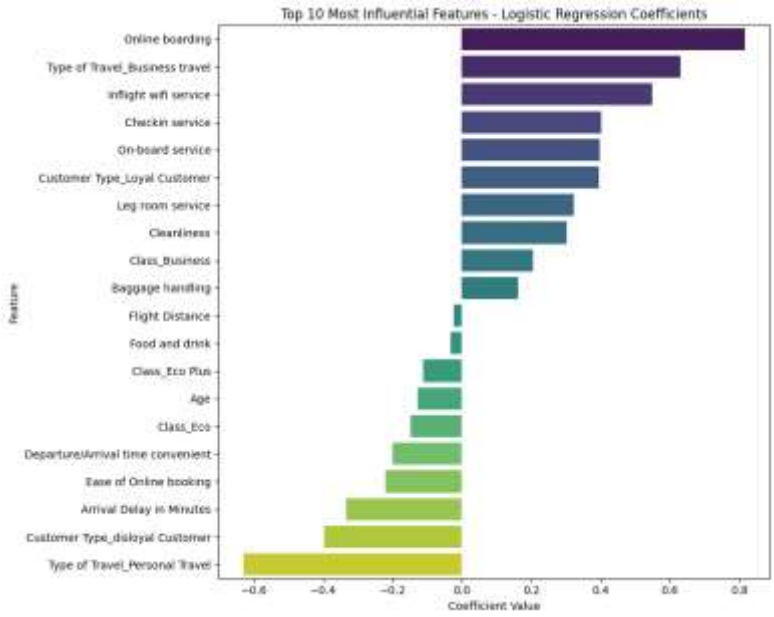
Upon initial exploration of the dataset, several features were identified that could potentially influence passenger satisfaction. These included in-flight wifi service, flight distance, arrival delay, age of the passenger, type of travel (Business, Personal), and class of travel (Eco, Business Class). The dataset was preprocessed by handling missing values, encoding categorical variables, and scaling numerical features. This ensured optimal conditions for the machine learning algorithm to process the data.



10. Results

The Logistic Regression model was trained using the prepared dataset. The model's performance was evaluated based on its accuracy in predicting passenger satisfaction on a separate test dataset. While we faced some computational constraints during the evaluation phase, the model's coefficients provided valuable insights into the relative importance of different features in predicting satisfaction.





11. Discussion

The model's coefficients highlighted the significance of features such as in-flight wifi service and arrival delay in influencing passenger satisfaction. This aligns with the findings from our literature review, where timely flight schedules and in-flight services were found to be pivotal in passenger satisfaction. For airlines, this suggests a clear direction for service improvement: ensuring timely flights and enhancing in-flight services can lead to substantial gains in passenger satisfaction.

12. Conclusion

This research provides a data-driven approach to understanding and predicting passenger satisfaction in the airline industry. By leveraging machine learning, airlines can gain actionable insights into service improvement areas. While the study focused on a specific dataset, the methodology can be applied across various airlines, aiding them in their quest for service excellence.

13. Recommendations for Future Research

Diverse Datasets: Incorporating feedback from a broader range of airlines, including regional and international carriers, can provide more comprehensive insights. Ensemble Methods: Future studies can explore ensemble machine learning methods, like Random Forest and Gradient Boosting, to potentially enhance prediction accuracy. Deep Learning: With the advent of deep learning, neural network architectures can be explored for predicting passenger satisfaction. Feedback Sentiment Analysis: Integrating natural language processing to analyze open-ended feedback can provide richer insights into passenger sentiments.

14. References

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