Hotel Reservation Cancellation Rate Prediction

Under the Guidance of

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Outline

- The 'Hotel Reservation Cancellation Prediction' project aims to predict the possible reservations that are going to be cancelled by the customers by analyzing various features and variables associated with the reservation

- Leveraging the Decision Tree algorithm, it analyzes reservation data to forecast cancellations accurately.

Introduction

- The "Hotel Reservation Cancellation Prediction" project aims to tackle the escalating challenge of cancellations in the hospitality industry.

- Leveraging the predictive power of the Decision Tree algorithm, this initiative analyzes extensive historical reservation data, encompassing booking details, customer information, and cancellation status.

- Through meticulous data preprocessing, exploratory analysis, and model selection, the project strives to empower hotels in proactively managing inventory and optimizing revenue strategies.

Objectives

- The goal of the project is to utilize sophisticated machine learning methodologies, particularly the Decision Tree algorithm, for precise prediction of hotel reservation cancellations.

- Through an in-depth examination of various features and factors linked to hotel bookings, encompassing alterations in plans and scheduling conflicts facilitated by online reservation channels, the project endeavors to forecast cancellations with accuracy.

- This foresight enables hotel management to proactively handle inventory, refine revenue strategies, and elevate guest satisfaction within the dynamic hospitality environment.

Literature Survey

| Paper referred	Author	Date	Key takeaways
Advances In Hospitality and Tourism Research	Antalya, ANTALYA, Turkiye,	2016	This study/paper aims to reach the core objective of hospitality order cancellation prediction (HOCP), that is, to identify potential cancellers from many customer bases, thereby enhancing the effectiveness of customer retention campaigns.
Big Data in Hotel Revenue Management: Exploring Cancellation Drivers to Gain Insights Into Booking Cancellation Behavior	N. Antonio, Ana de Almeida, Luís Nunes	2017	By leveraging predictive models for booking cancellations, hotels can enhance the accuracy of their demand forecasts, mitigate cancellations, and optimize revenue through strategic adjustments in cancellation policies and overbooking strategies.
Using machine learning and big data for efficient forecasting of hotel booking cancellations	Agustín J. Sánchez-Medina, Eleazar C.-Sánchez	2018	Utilizing machine learning methodologies and big data analysis can effectively predict hotel booking cancellations, resulting in a significant reduction in cancellation rates by as much as 98%
Identifying critical hotel cancellations using artificial intelligence	E. C. Sánchez, Agustín J. Sánchez-Medina, Mónica Pellejero	2020	Utilizing AI techniques leveraging Personal Name Records (PNR), we've devised a method to accurately forecast hotel cancellations occurring seven days in advance.

Proposed System

- Phase 1- We collect data for the Hotel Reservation and Cancellation Prediction project, focusing on booking dates, room types, guest info, cancellations, and prices from online platforms.
- Phase 2- Deals with data cleaning, handling missing values or outliers to ensure a clean dataset.
- Phase 3- Involves training the model using the Decision Tree algorithm on a split dataset.
- Phase 4- We test the trained model on a separate dataset and integrate it into a user interface for demonstration.

System Design
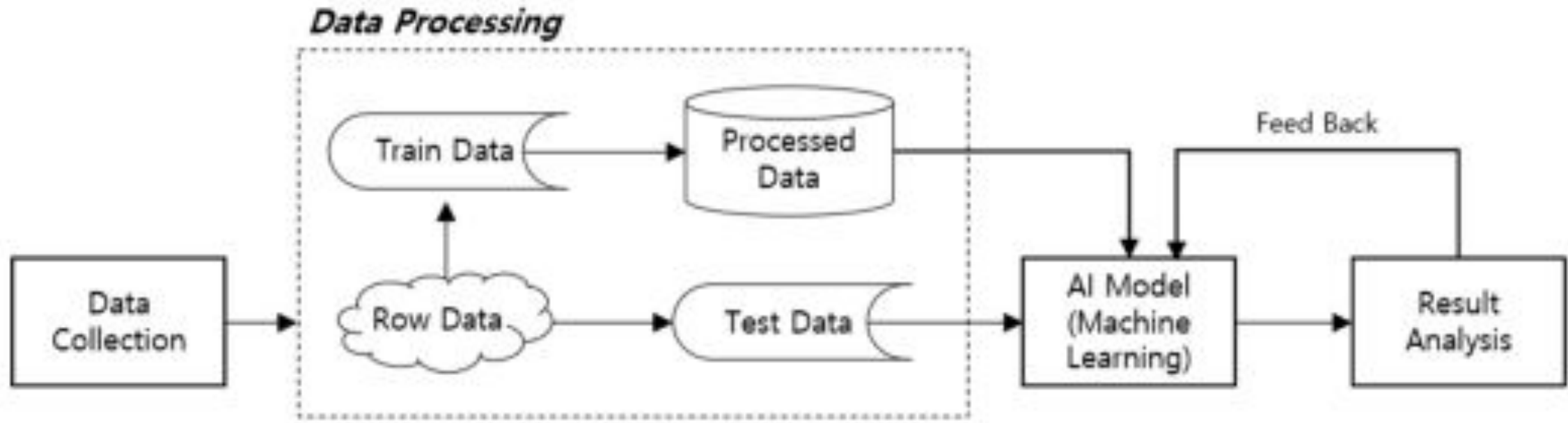
System Design

Given below is the architecture diagram.
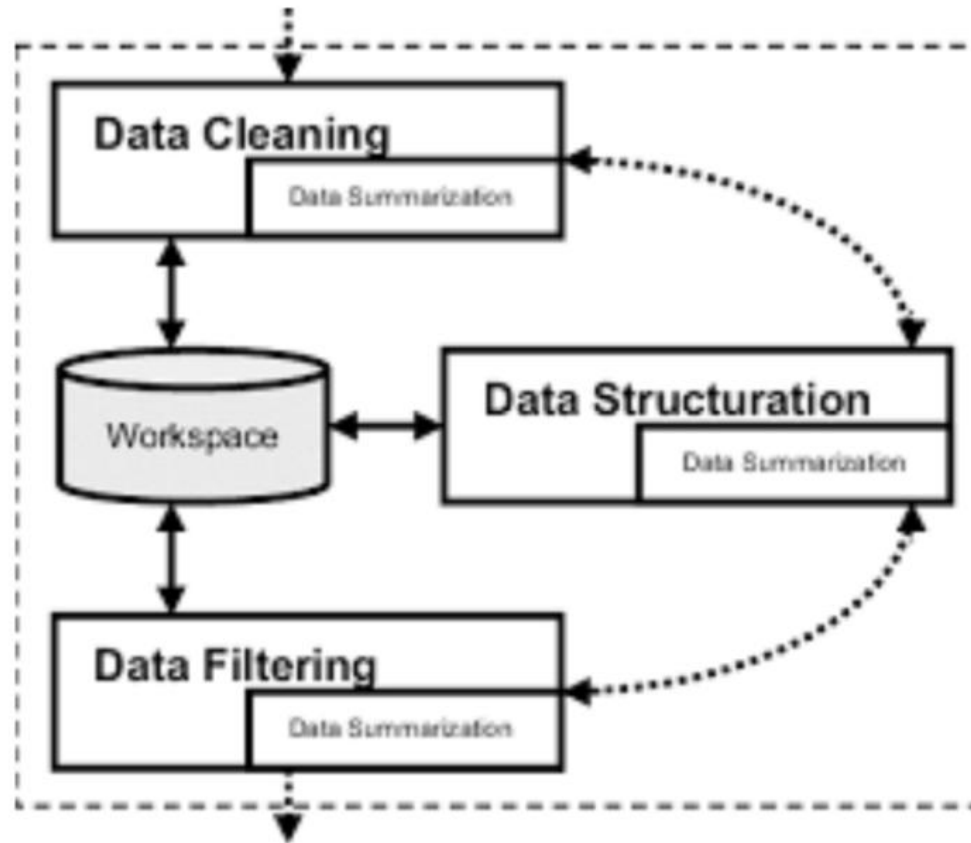
Implementation


```python
from sklearn.tree import DecisionTreeClassifier

#decision tree classifier Object
dtree = DecisionTreeClassifier()
```

Hyperparameter Tuning using GridSearchCV

```python
from sklearn.model_selection import GridSearchCV

#grid search parameters
grid_param = {
    'max_depth': [2,4,6,8],
    'min_samples_leaf': [2,4,6,8],
    'min_samples_split': [2,4,6,8],
    'criterion': ['gini', 'entropy'],
    'random_state': [0,42]
}

#grid search object
grid_search = GridSearchCV(estimator=dtree, param_grid=grid_param, cv=5, n_jobs=-1, scoring='accuracy')

#fitting the grid search object to the training data
grid_search.fit(X_train, y_train)

#best parameters
print(grid_search.best_params_)
```

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Confusion Matrix - Decision Tree
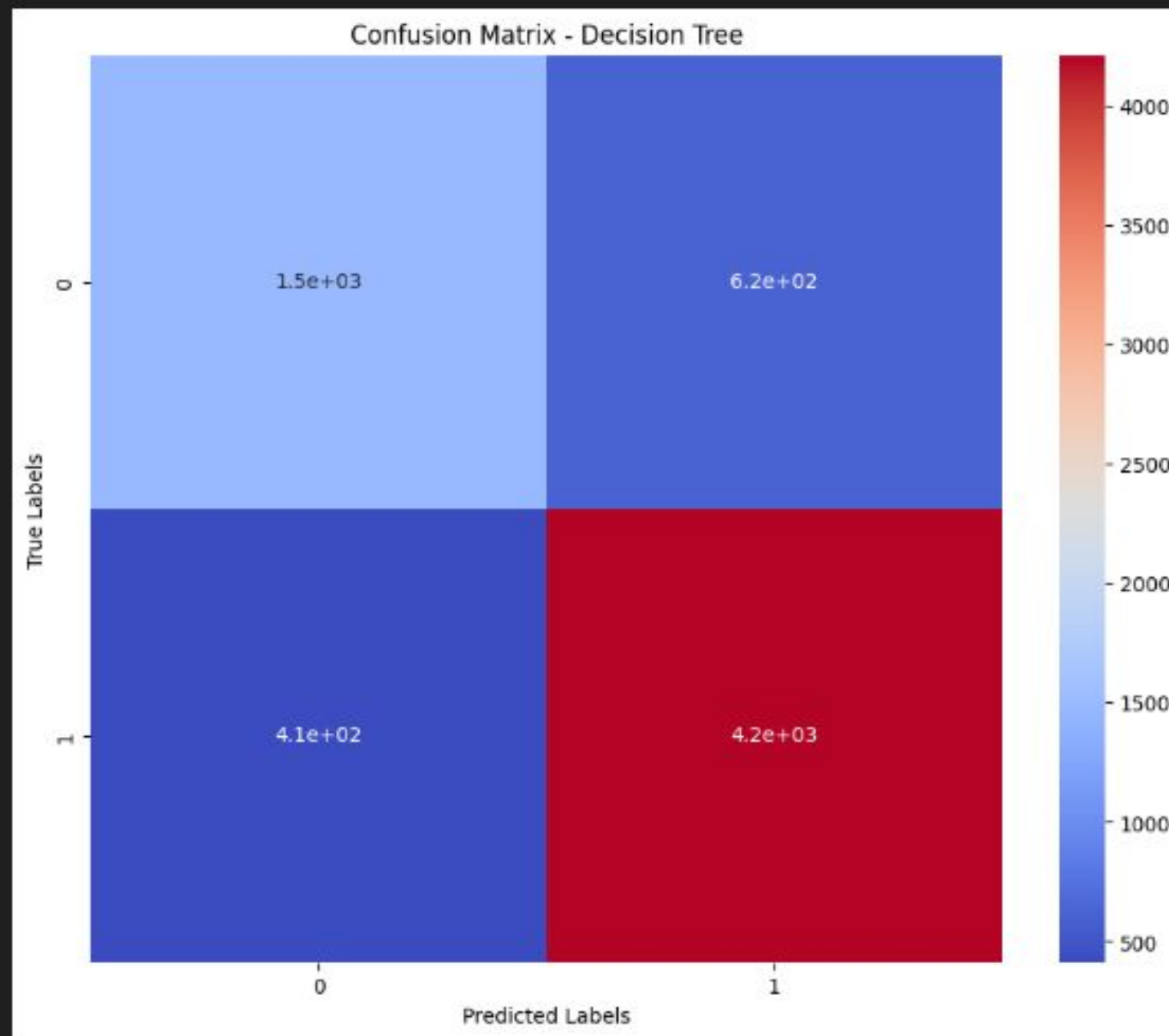
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Results


```
Model Metrics

from sklearn.metrics import accuracy_score, mean_absolute_error, mean_squared_error

#decision tree
print('Decision Tree')
print('Accuracy Score: ', accuracy_score(y_test, d_pred))
print('Mean Absolute Error: ', mean_absolute_error(y_test, d_pred))
print('Mean Squared Error: ', mean_squared_error(y_test, d_pred))

print('\n')
```
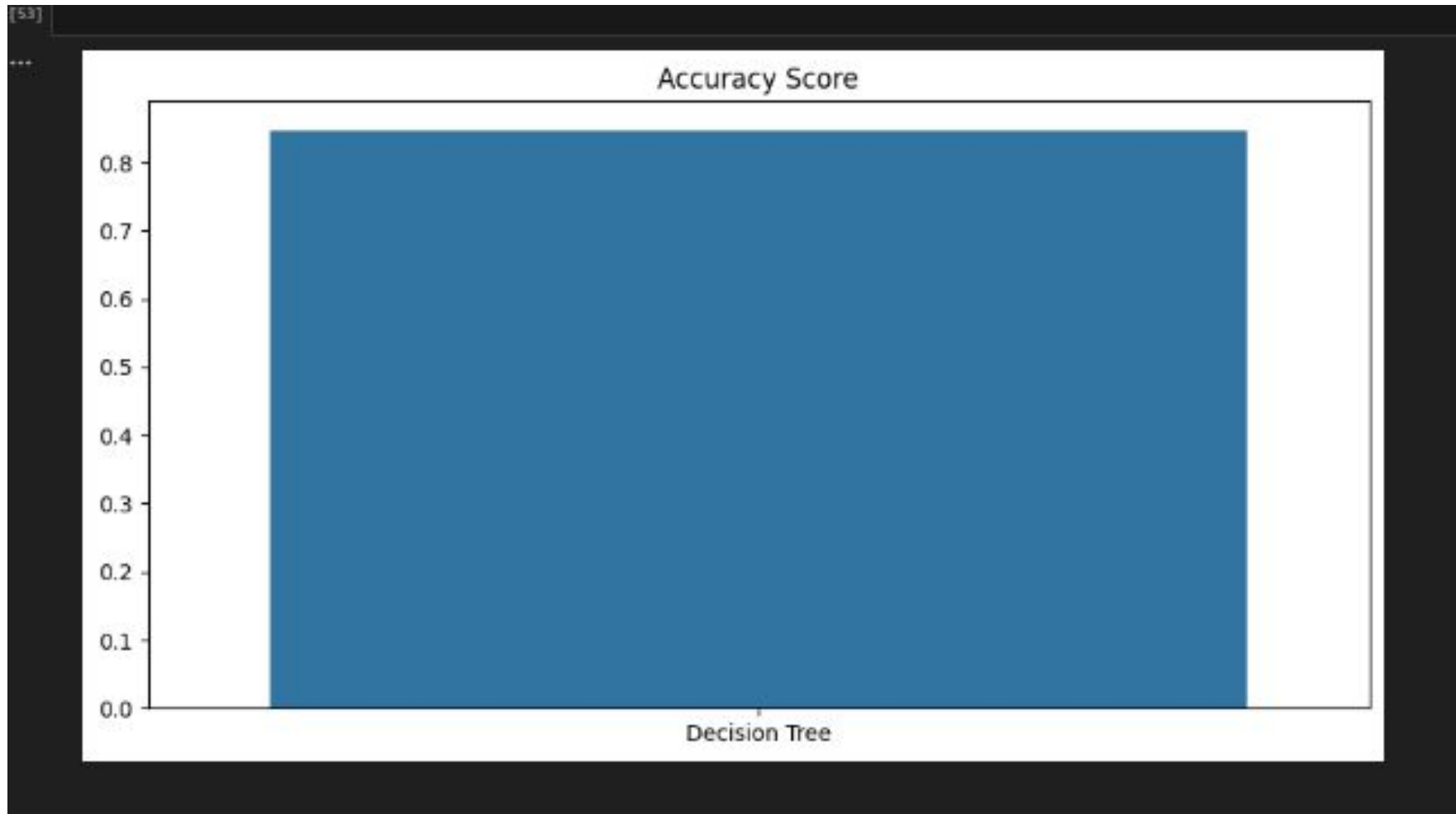
```
Decision Tree
Accuracy Score:  0.8472862453531599
Mean Absolute Error:  0.15271375464684014
Mean Squared Error:  0.15271375464684014
```

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Results

Conclusion

The market segment of the reservation also had an impact on the reservation cancellation. The reservations made through online platforms had the highest number of cancellations. This highlights the hotel's reputation and presence on online platforms. The hotel should try to improve its reputation on online platforms to reduce the reservation cancellation.

Coming to the classification models, we have used the Decision Tree Classifier, for predicting the reservation cancellation. The Decision Tree Classifier has an accuracy of 85%.

Thank You