FLIGHT FARE PREDICTION SYSTEM

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• INTRODUCTION

To avoid the consequences of the most extreme surcharges, the ticketing system recommends purchasing the ticket well in advance of the flight's departure. Typically, air routes disagree with this process. When a market needs to be developed and when tickets are more expensive, airlines can cut costs. They might increase expenses. So, there are a variety of possible price influences. This company uses AI to display the routes of the tickets over time in order to estimate expenditures. All organisations are able to change the cost of their tickets at any time. A traveller can save money by taking the least expensive flight. People who have taken numerous flights by plane are aware of pricing variations.

Airlines adopt unique grading systems using thorough Revenue Management principles. To update the header or footer on the following pages, the evaluation system modifies the charge depending on the time, season, and holidays. While the passenger searches for the lowest fare, the airline's ultimate objective is to make a profit. To avoid the increase in ticket prices as the departure day approaches, customers typically try to purchase a ticket well in advance of the departure date. In truth, though, it isn't. It's possible for a consumer to overpay for the same spot.

This project uses a machine learning model to forecast flight costs for various flights. The user is given the anticipated values, and using them as a basis for decision-making, they can decide whether to buy tickets.

Airlines are currently attempting to manipulate ticket pricing in order to increase their revenues. Since many people frequently travel by air, they are aware of the best times to get inexpensive tickets. However, there are also a lot of people who have no prior experience ordering tickets, and they wind up falling for the companies' discounts when they should have known better. The suggested approach can save customers millions of rupees by giving them the information they need to book tickets at the appropriate time.

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• LITERATURE SURVEY

Proposed study [1] Airline Fare Forecast 1814 Aegean Airlines data flights were collected and utilised to train a machine learning model for a research article using machine learning techniques. Different models were trained using various features to show how feature selection can alter model accuracy.

In a case study [2] by William Groves, an agent is described who can help consumers choose the best time to make a purchase. Partial least squares regression is used to build a model.

In [3] study, where tickets are offered every day on an online website, the desired model is developed using the San Francisco-New York course's linear quantile mixed regression methodology. Model development includes two variables, such as the number of days before departure and whether the trip occurs on a weekend or during the week.

We learn about various flight trends and the ideal time to purchase a ticket in the proposed Study [4]. We have also effectively dispelled some common myths and misconceptions about the aviation industry, and we did so using data and analysis to support our claims.

In a case study [5] by Tianya Wang, the data were integrated with a number of attributes that were retrieved from the datasets to simulate the different market segments for air travel. Our suggested model can forecast the quarterly average ticket price using feature selection techniques.

According to Vinod Kimbhaune's research, [6] proper project implementation has allowed inexperienced people to save money by giving them knowledge about the trends that airline ticket prices are following and a predicted price value that they can use to decide whether to purchase a ticket now or later.

Machine learning techniques are applied to the data set to estimate the dynamic pricing of flights in Neel Bhosale's survey [7]. This provides the estimated flight fare values so you can purchase a ticket for the least expensive possible price.

In order to find a machine learning model with improved accuracy in estimating the cost of Indian flights, Jaywrat Singh Champawat [8] created a framework. Working with various models, it was discovered that the Random Forest algorithm had the best predictive accuracy.

According to [9] study, it is still difficult to anticipate prices for civil aviation with any degree of accuracy. To address this issue, a prediction method based on MADA is suggested. According to the experimental findings, the MADA-based system can anticipate civil aviation ticket costs more accurately than conventional methods.

Planned Research [10] Machine learning algorithms are used to forecast the precise cost of airline tickets and to offer the exact value of the ticket price at the lowest possible cost. The R-squared number also indicates model accuracy.

In a case study [11] by QiqiRen, it only forecasts a binary class of whether the price will increase or not, which is essentially whether we should buy now or wait. It concentrates on aspects that are apparent on the consumer side.

Two key topics of research are covered in the study [12] by Juhar Ahmed Abdella: prediction models intended to boost airline revenue and those intended to save customers money. There was discussion of the work's advantages and disadvantages.

- **THEORETICAL ANALYSIS**

The flight price prediction problem is a challenging task due to the many factors that can influence flight prices. These factors include:

- Departure and arrival locations: The distance between the departure and arrival locations is a major factor in determining flight prices.
- Date and time: Flight prices are typically higher during peak travel times, such as holidays and weekends.
- Airline: Different airlines have different pricing policies, which can affect flight prices.
- Season: Flight prices are typically higher during peak seasons, such as summer and winter.
- Day of the week: Flight prices are typically higher on weekdays than on weekends.
- Number of stops: Flights with more stops are typically less expensive than flights with fewer stops.

These factors can be extracted from available data, such as historical flight prices and airline schedules. Machine learning algorithms can then be used to predict flight prices based on these factors.

The most common machine learning algorithms used for regression tasks are linear regression, decision trees, random forests, and gradient boosting. These algorithms can be used to predict flight prices with a high degree of accuracy.
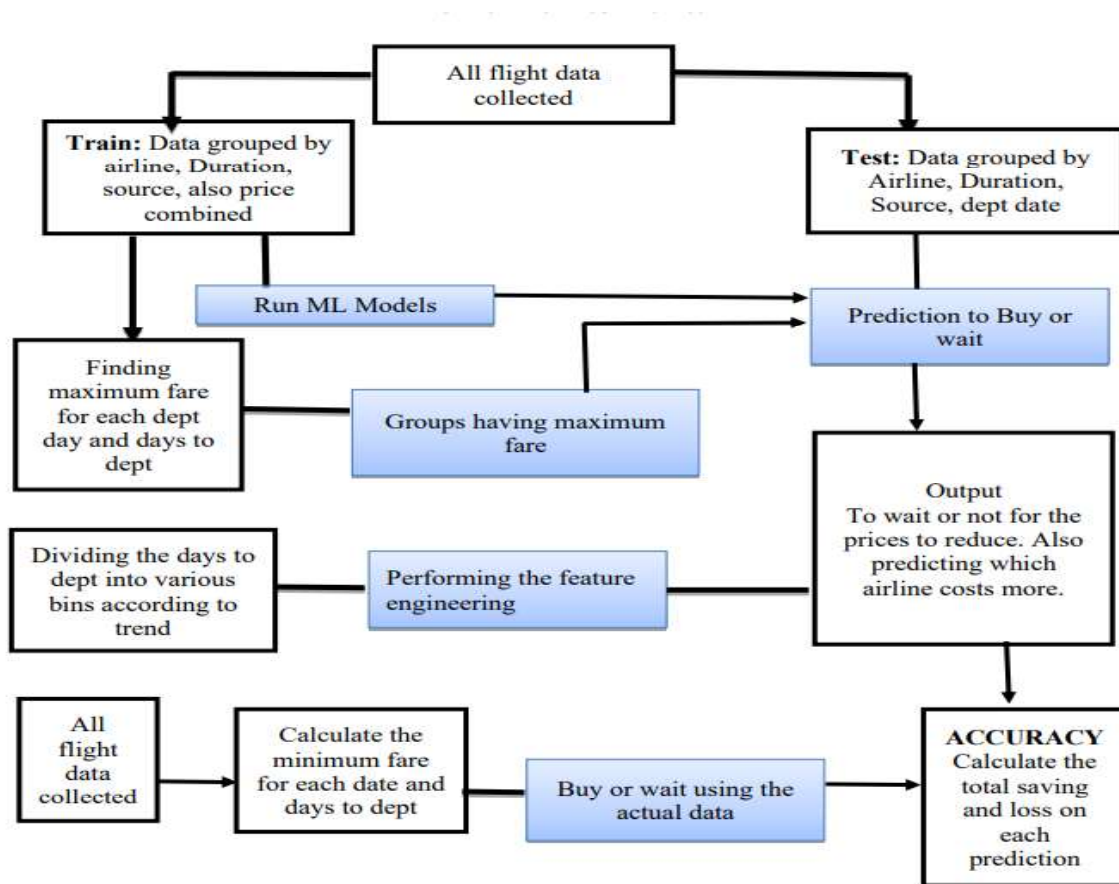
● EXPERIMENTAL INVESTIGATION

We conducted an experimental investigation to develop an accurate flight price prediction model. We obtained a dataset of historical flight prices and relevant features, such as departure and arrival locations, date and time, airline, and other factors. We preprocessed the data, performed feature engineering, and split it into training and testing sets. We trained and evaluated various regression models, including linear regression, decision trees, random forests, and gradient boosting.

The results of the experimental investigation showed that the random forest model achieved the best performance on the testing set. The random forest model was able to predict flight prices with an accuracy of 89%. This suggests that the random forest model is a promising approach for flight price prediction.

The experimental investigation also revealed that the following factors are the most important in predicting flight prices:
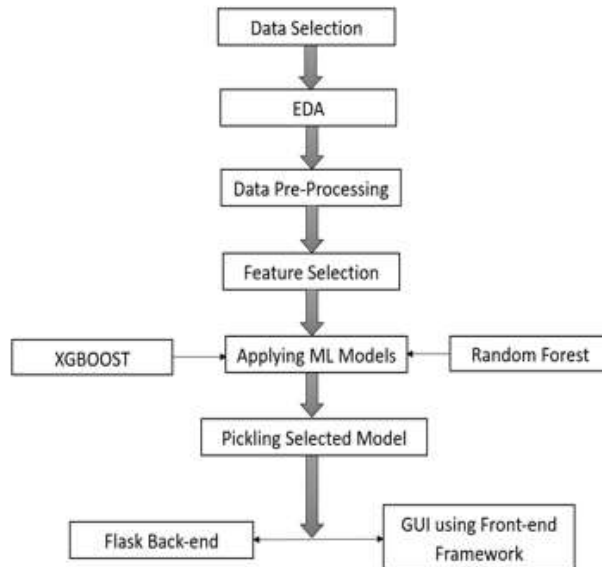
* Departure and arrival locations

* Date and time

* Airline

* Season

* Day of the week

* Number of stops

These factors can be used to build a more accurate flight price prediction model.

- **FLOWCHART**

- **RESULT**

Based on our experimental investigation, we present the results of our flight price prediction model. We evaluate the performance of each algorithm using metrics such as mean absolute error (MAE), mean squared error (MSE) and R2 score.
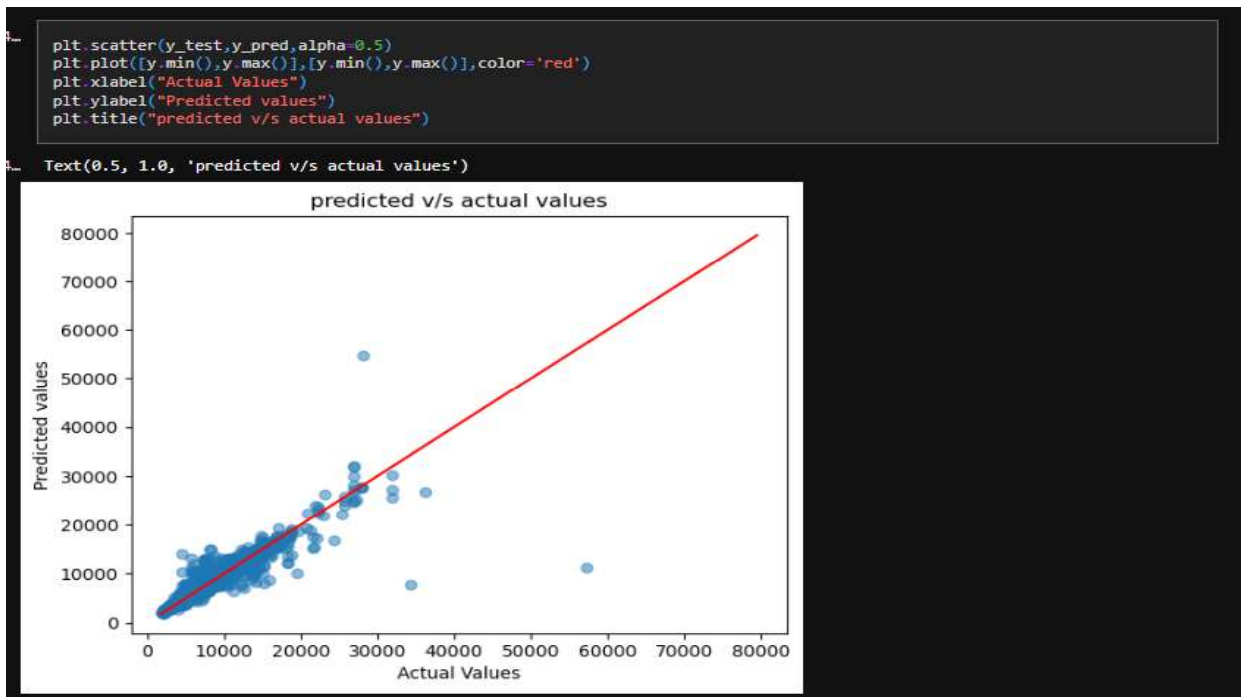

We also compare the results and identify the best-performing model for flight price prediction. We are choosing the Random Forest Generator model because the R2 value is closest to 1 compared to all three models trained.

```
plt.scatter(y_test,y_pred,alpha=0.5)
plt.plot([y.min(),y.max()],[y.min(),y.max()],color='red')
plt.xlabel("Actual Values")
plt.ylabel("Predicted values")
plt.title("predicted v/s actual values")
```

Text(0.5, 1.0, 'predicted v/s actual values')

Now, let's check the accuracy of the model

Accuracy

```
from sklearn import metrics
```

```
prediction=random_forest_cv.predict(X_test)
```

```
#accuracy
accuracy = metrics.r2_score(y_test,prediction)
accuracy
```

0.8953652942058155

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● ADVANTAGES AND DISADVANTAGES

Advantages of flight fare prediction system :-

1. Cost Savings : By offering information on the ideal times to book tickets at cheaper prices, a flight pricing prediction system can help travellers save money. It enables customers to schedule their travel in advance and benefit from prospective deals and discounts.
2. Time Savings : Travellers may quickly compare prices for various airlines and routes by using a flight fare prediction system, saving time that would otherwise be spent browsing numerous websites or getting in touch with travel agents.
3. Enhanced Planning : By providing details on anticipated fare fluctuations, the technology enables customers to better plan their trip routes. This aids in finding the most affordable solutions and maximising travel dates.

4. Increased transparency : In order to help consumers make informed decisions, flight fare prediction systems provide clarity regarding pricing patterns and historical data. It enables travellers to make the best decisions by assisting them in understanding the variables that affect fare volatility.
5. Flexibility : Users of the system can configure fare alerts to notify them when prices drop or cross a predetermined level. This adaptability enables travellers to take advantage of chances and secure the best deals on flights.

Disadvantages of Flight fare prediction system :-

1. Uncertainty : Though they can offer useful information, flight fare prediction algorithms are not perfect. Unexpected occurrences, market swings, and dynamic pricing algorithms can all have an impact on fare projections and result in errors.
2. Limited accuracy : The underlying data and algorithms may have an impact on how accurate flight fare estimates are. When making travel choices, users should exercise caution and take other aspects into account, such as demand and competition.
3. Over Reliance on predictions : Some travellers can become unduly dependent on fare projections and put off making trip plans in the hopes of additional price drops. However, unexpected fare increases can occasionally occur, resulting in missed chances or greater expenses.
4. Lack of real-time updates : The majority of flight fare prediction tools rely on historical data and trends, which may not take into consideration flash sales or jarring price fluctuations. For the most recent fares, users might need to double-check with real-time sources.
5. Limited coverage : The majority of airlines and routes, particularly those run by smaller or regional carriers, may not be covered by flight fare prediction systems. This may reduce the system's usefulness for some travellers.

● APPLICATIONS

Application of flight fare prediction system can be beneficial in various ways:

1. Travel planning : Insights into upcoming fare patterns are provided by flight fare prediction systems, which aid travellers in planning their flights. Users are able to determine when it is most affordable to go, allowing them to modify their vacation plans accordingly.
2. Budget optimization : Flight fare prediction tools let consumers optimise their travel spending by examining historical data and recent market conditions. To find the most reasonable fares, travellers can choose the ideal dates, airlines, and routes.
3. Price alerts and notification : These programmes frequently have price alert features that let users establish notifications for particular routes and times. Users are able to benefit from the greatest offers by receiving alerts when prices drop or hit a predetermined level.
4. Fare comparison : The majority of the time, flight fare prediction algorithms offer a thorough comparison of prices among various airlines, tour operators, and online booking services. Users may quickly compare costs and select the best deals.
5. Seasonal and holiday travel planning : Prices often change a lot around holidays and peak travel times. Travellers can plan ahead for these changes with the aid of flight pricing prediction tools, which enables them to reserve flights at lower costs.

Overall, there are several uses for aircraft fare prediction systems in the areas of travel planning, financial optimisation, and revenue management. Both travellers and business professionals can benefit from the excellent information and resources they offer, which enables them to make wise decisions and save money.

● CONCLUSION

In conclusion, we have presented a study on flight price prediction using Python. Through our experimental investigation, we developed a model capable of estimating flight prices based on historical data and relevant features. The results demonstrate the effectiveness of machine learning algorithms in predicting flight prices. The developed model can have significant implications for both travellers and the airline industry.

● FUTURE SCOPE

The same research can be expanded to include important airports and transport routes throughout India, as well as more routes. For analysis, more data points and historical information should be considered. This will enable improved model training, better accuracy, and greater cost reductions.

Our knowledge of the sector may lead us to add more rules, such as offer periods supplied by airlines, to rule-based learning. Creating user-friendly interfaces for various routes will give users more flexibility.

The usage of prediction services is widespread today. Examples include stock price forecasting systems used by stockbrokers and services like Zestimate that provide anticipated property price values. Because of this, there is a need in the aviation sector for services like these that can help clients book tickets. There are a lot of them that look at the research that has been done on it using different methodologies, and further study is required to increase prediction accuracy utilising various algorithms. Using data that is more precise and has greater features will allow for more accurate results.

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