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## Flight-Fare Prediction With Flask Deployment

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### ABSTRACT

Recently the connectivity for air routes has increased immensely. A maximum population opts for easy ways to travel a shorter distance from one location to another possible. The only way to this is by air route that is, travelling by flight. Therefore air travel has become predominant part of the modern way of life. Predicting the flight fare prices helps travelers to book the tickets for the cheapest price possible, thereby an important and challenging task. Flight ticket prices vary from time to time, fluctuate as a result of various factors such as final destination, flight schedule, the duration that is taken to reach the destination, as well as numerous occasions and events like festive seasons, different seasons in a year like summers, rainy season and winters, celebrations and vacations. Travelers try to book flight tickets way ahead of their departure day. The reason may be to make early reservations for confirmation of booking. However, there's a potential that flight fares may decrease in future. This way the travelers might end up spending beyond what individuals are required to. Considering such various challenging situations and difficulties faced by travelers, strategies are deployed to foresee flight prices in an affordable range. Several methods based on ML are used to accomplish, are utilized which involve algorithms like supervised Random Forest Algorithm which is more accurate comparatively.

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Keywords: Machine learning, flight, prices, Random Forest, supervised algorithm.

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### 1. Introduction

As we all people know holidays often call for vacations, so there will be a need for awareness about flights farewell in advance to finalize the budget and can keep aside money. With the massive growth of the internet and social media, travelers may now easily check the prices and availability of all airlines in the world. All consumers can purchase their chosen tickets online via official airline or through agent websites, When they're content about a Flight Fare. There were in fact numerous models for forecasting created to foretell the airfare before departure in order to assist clients in purchasing the least-priced flights. Therefore, this essay will offer significant knowledge on the ML deployed Forecast of Jet Fares Systems which make use of RF regression to produce a reliable and accurate system for producing flight fares. Depending on the available historical flight data and employing a variety of ML algorithms, the project will contribute to the travel industry by providing important intuitions to both travelers and agencies by improving the overall travel experience by deploying the system on flask framework. This deployment jet-fare prognosis model using Flask brings the capability of ML to travellers, empowering individuals to decide certain matters concerning their aviation expenses. The Flask web application is designed to take user inputs, such as departure and arrival cities, travel dates, and airline preferences which are then passed to the flight fare prediction model, which by pre processing the data, applying the learned algorithms, and generating an predicted fare price. The predicted fare is then displayed to the user through the web interface.

2. Methodology

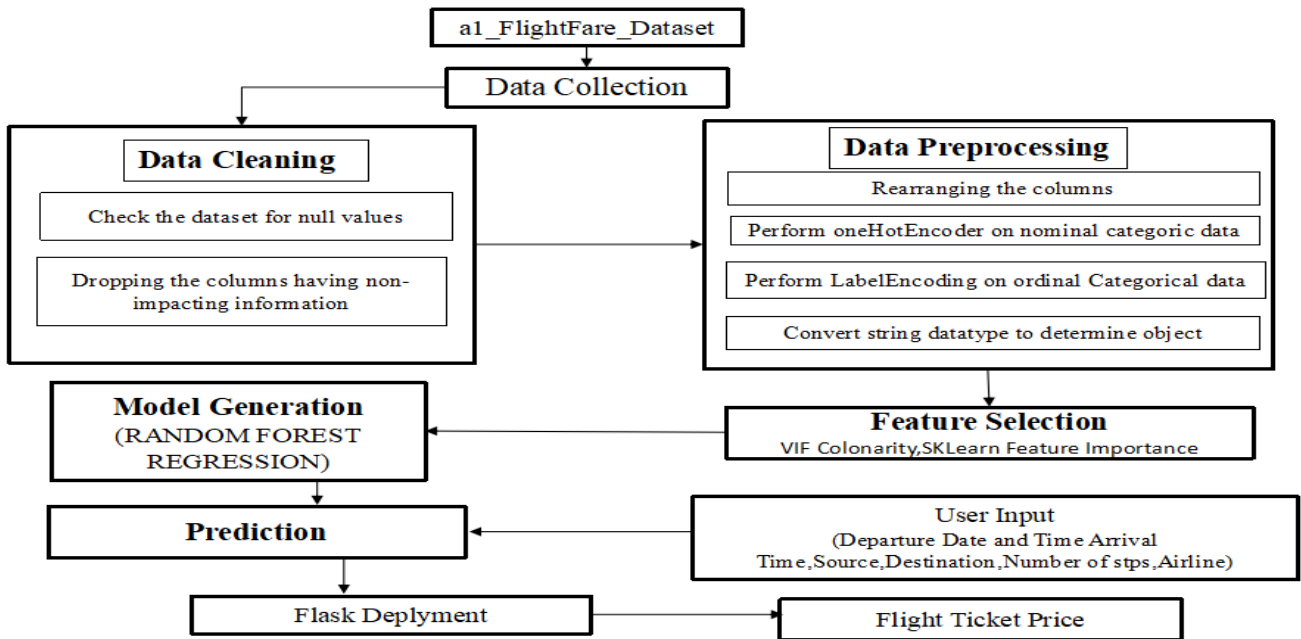


Fig.2: Proposed Architecture Design

2.1 DataCollection

Select a data source: select a data source from many available websites and APIs that provide flight price information.

Set up a database: Create a database to store the flight price prediction data as it becomes available. A widely used option is SQL, and the process of building a SQL database is covered in numerous instructional videos.

Set up a Flask application: Create a Flask application to connect to the database and display the flight price data to users. Flask is a lightweight web framework that is easy to use and perfect for small projects.

Collect and store data: For collecting and storing the data use the API which you select in data source to collect flight price data at regular intervals and store it in the previously created database. You can use Python to write scripts and set up a scheduler to automate this process.

Instruct a machine learning model: Provided the repository contains ample information, you can utilize it to instruct a model for ML to predict flight prices. Multiple ML algorithms exist to select between, including linear regression, decision trees, and neural networks. A Python library such as Scikit-learn to create and train your model can be utilized.

Deploy the app: Finally, launch a Flask application that includes a ML module. A hosting service like flask to host your app is utilized, alternative is to deploy it on your own server.

This steps can aid to collect flight price data, train a machine learning model, and deploy a Flask app to predict flight prices.

2.2 CleaningandPreparingofData

Import the necessary libraries such as Pandas, NumPy, Matplotlib, Scikit-learn, Flask, etc. Firstly, Load the dataset that contains the required information about flight prices and features such as source, destination, date, arrival time, departure\_time, duration, airline, etc. Then, Explore the dataset and check for any missing or null values. If values are mislaid then ha mislaid or empty values by inputting the values depending upon mode, mean or median of the particular characteristics. Then split the dataset into training settings for ML evaluation, model deployment. Select the suitable algorithm for ML and instruct the model. Check the perfection of module testing set. If the accuracy of the model is satisfactory, deploy the machine learning model using Flask. Develop a web application using Flask and connect utilising it, the developed ML model. Finally, test the web application to ensure that it remains running

smoothly and predicting the flight prices accurately.

## 2.3 Methodologies of ML

RF- ML Algorithm is used for creating a model for flight fare prediction. There are Multiple Assessing metrics employed for this model. These are mentioned as follows:

RMSE, MSE, MAE, Normalised RMSE.

### 2.3.1 RMSE

RMSE predicts the quality of the predictions. It tells how close are the predicted values from the measured true value. It uses Euclidean distance for this purpose.

Root Mean Squared Error =  $\sqrt{(\sum_{i=1}^n \|Y(i) - Y^{\wedge}(i)\|^2)/n}$

n = No. of data points

Y(i) = i'th measurement

### 2.3.2 MAE

Mean Absolute errors refer relating to the worth of difference between the prediction and the true value of an observation.

Mean Absolute Error =  $(1/N) * \sum |Y_i - X_i|$

$\Sigma$ : Symbol representing summation.

Y<sub>i</sub>: Actual value for i' th observation.

X<sub>i</sub>: Calculated value for i' th observation.

N: Overall count of sightings.

### 2.3.3 MSE

MSE measures quantity of error in models. It calculates the variation in squares within the values seen and predicted values.

Mean Squared Error =  $1/N \sum_{i=1}^n (Y_i - Y^{\wedge})^2$

i = Data Point.

N = The quantity of elements of information.

Y<sub>i</sub> = Value returned by the model.

Y<sup>^</sup> = Actual Value for i.

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## 3. ML Algorithms Used

### 3.1 The RF Algorithm

RF Regression is a well built and powerful ML algorithm that is frequently used for regressor and classifier methods. It is a Numerous decision chains combined in the collaborative learning approach to make fare predictions. In the context of regression, Random Forest Regression can accurately predict continuous numerical values, such as flight fares. The characteristics and features of random forest algorithm are Ensemble Method, Decision Tree Construction, Feature Importance, Handling Non-linearity, Robust to Overfitting, Scalability, Handling Missing Data, Model Interpretability.

Altogether, RF Regressor model is an adaptable and more powerful algorithm for regression. It is possible to handle robustness, non-linear relationships, and feature importance analysis, against overfitting will make it a popular option for a variety of uses, comprising flight fare prediction. Upon completing collective intelligence of several decision chains, RF Regressor will provide reliable and accurate prediction results for uninterrupted numerical values.

3.2 Result analysis of RFAgorithmare

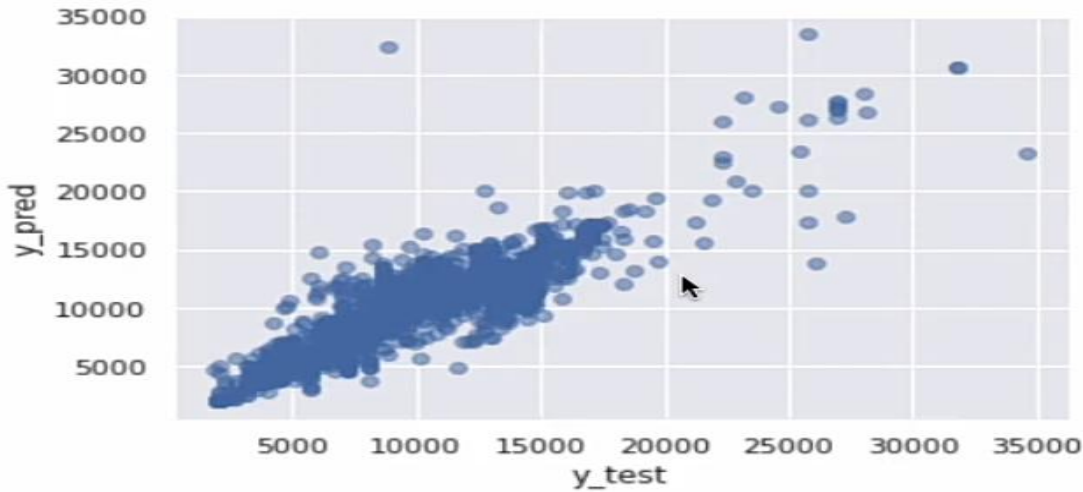


Fig 3.2. Scatter plot b/w actual test prices vs predicted prices

4. Flask Deployment

Flask is a popular web framework for establishing web applications utilize the Python programming language. It was generated by Armin Ronacher in 2010 and is now maintained by the Pallets organization. Flask is highly regarded for its lucidity, flexibility, and lightweight nature, which produce it a popular solution for small to medium-sized web applications. It gives a variation of tools and libraries for constructing web applications, including URL routing, templating, and support for working with databases, between others. Withinthis web pages are providing everything that this app may need in order to run smoothly.

There are 3 parts:-It's providing all the required libraries in the first part, so the model runs smoothly.

- 1) from flask import flask, request, render\_template
- 2) from flask\_core import cross\_origin
- 3) import sklearn
- 4) import pickle
- 5) import pandas as pd

In the second part loading flight fair prediction model.pkl.Defining a query handling mechanism in third part. There is a home page which is basically home.html kept in folder. Once user fills all the travel details and click on predict price on home page then predict route is called upon.

If it has prepared variables in the required form. To the model for prediction then the final model prediction is displayed back onto the same home.html front end page for user's reference.

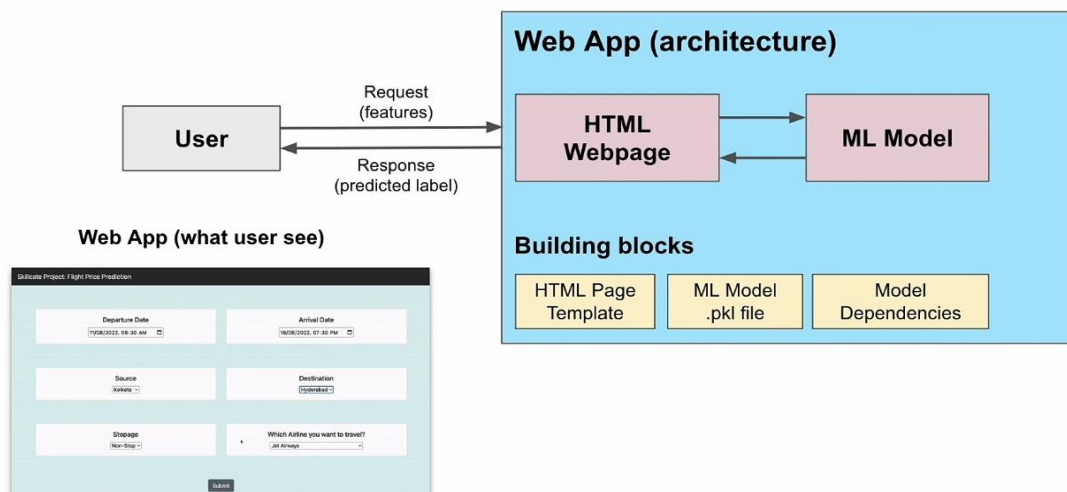


Fig 4.This is how web app works

## 5. Conclusion

In conclusion, flight using ML for forecasting fares and deploying it using Flask can greatly enhance the user experience, increase efficiency, and save time. The machine learning models can leverage historical data, and recent trends to provide accurate predictions, which can be further enhanced by feature engineering and optimization techniques. Flask, but on the contrary side enables the deployment of the model as a web application, allowing users to interact with it easily through a user-friendly interface. The strategy can yield valuable perspectives into the flight ticket pricing system, making travel more accessible and affordable for everyone. Overall, the combination of ML and Flask can bring significant benefits to the aviation industry, saving resources and providing a better experience for users.

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