OPTIMIZING FLIGHT BOOKING THROUGH MACHINE LEARNING PRICE PREDICTION

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Project Flow:

- User interacts with the UI to enter the input.
- Entered input is analysed by the model which is integrated.
- Define Problem / Problem Understanding
  - Specify the business problem
  - Business requirements
  - Literature Survey
  - Social or Business Impact.
- Data Collection & Preparation
  - Collect the dataset
  - Data Preparation
- Exploratory Data Analysis
  - Descriptive statistical
  - Visual Analysis
- Model Building
  - Training the model in multiple algorithms
  - Testing the model
- Performance Testing & Hyperparameter Tuning
  - Testing model with multiple evaluation metrics
  - Comparing model accuracy before & after applying hyperparameter tuning
- Model Deployment
  - Save the best model

- Integrate with Web Framework
- Project Demonstration & Documentation
  - Record explanation Video for project end to end solution
  - Project Documentation-Step by step project development procedur

Optimizing Flight Booking Decisions through Machine Learning Price Predictions People who work frequently travel through flight will have better knowledge on best discount and right time to buy the ticket. For the business purpose many airline companies change prices according to the seasons or time duration. They will increase the price when people travel more. Estimating the highest prices of the airlines data for the route is collected with features such as Duration, Source, Destination, Arrival and Departure. Features are taken from chosen dataset and in the price wherein the airline price ticket costs vary overtime. we have implemented flight price prediction for users by using KNN, decision tree and random forest algorithms. Random Forest shows the best accuracy of 80% for predicting the flight price. also, we have done correlation tests and metrics for the statistical analysis.

Milestone 1: Define Problem / Problem Understanding

Activity 1: Specify the business problem

Activity 2: Business requirements The business requirements for a machine learning model to predict personal loan approval include the ability to accurately predict loan approval based on applicant information, Minimise the number of false positives (approved loans that default) and false negatives (rejected loans that would have been successful). Provide an explanation for the model's decision, to comply with regulations and improve transparency.

Activity 3: Literature Survey (Student Will Write) As the data is increasing daily due to digitization in the banking sector, people want to apply for loans through the internet. Machine Learning (ML), as a typical method for information investigation, has gotten more consideration increasingly. Individuals of various businesses are utilising ML calculations to take care of the issues dependent on their industry information. Banks are facing a significant problem in the approval of the loan. Daily there are so many applications that are challenging to manage by the bank employees, and also the chances of some mistakes are high.Most banks earn profit from the loan, but it is risky to choose deserving customers from the number of applications.There are various algorithms that have been used with varying levels of success. Logistic regression, decision tree, random forest, and neural networks have all been used and have been able to accurately predict loan defaults. Commonly used features in these studies include credit score, income, and employment history, sometimes also other features like age, occupation, and education level.

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier,GradientBoostingClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import f1_score
from sklearn.metrics import classification_report,confusion_matrix
import warnings
import pickle
from scipy import stats
warnings.filterwarnings('ignore')
plt.style.use('fivethirtyeight')
```

Activity 1: Collect the dataset There are many popular open sources for collecting the data. Eg: kaggle.com, UCI repository, etc. In this project we have used .csv data. This data is downloaded from kaggle.com. Please refer to the link given below to download the dataset. As the dataset is downloaded. Let us read and understand the data properly with the help of some visualisation techniques and some analysing techniques. Link: https://www.kaggle.com/code/anshigupta01/flight-price-prediction/data

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 19 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          10683 non-null  object
 1   Source           10683 non-null  object
 2   Destination      10683 non-null  object
 3   Total_Stops      10682 non-null  object
 4   Additional_Info  10683 non-null  object
 5   Price            10683 non-null  int64 
 6   Date             10683 non-null  object
 7   Month            10683 non-null  object
 8   Year             10683 non-null  object
 9   City1            10682 non-null  object
 10  City2            10682 non-null  object
 11  City3            10683 non-null  object
 12  Dep_Time_Hour    10683 non-null  object
 13  Dep_Time_Mins    10683 non-null  object
 14  Arrival_date     10683 non-null  object
 15  Arrival_Time_Hour  10683 non-null  object
 16  Arrival_Time_Mins  10683 non-null  object
 17  Travel_Hours     10683 non-null  object
 18  Travel_Mins      10683 non-null  object
dtypes: int64(1), object(18)
memory usage: 1.5+ MB
```

Activity 2: Visual Analysis

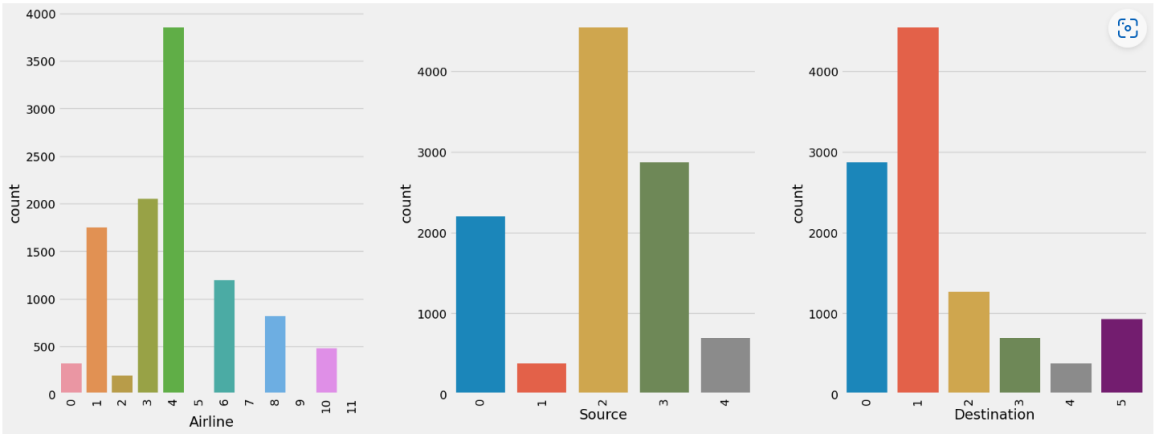
Activity 1: Descriptive statistical

Descriptive analysis is to study the basic features of data with the statistical process. Here pandas has a worthy function called describe. With this describe function we can understand the unique, top and frequent values of categorical features. And we can find mean, std, min, max and percentile values of continuous features.

```
import seaborn as sns
c=1
plt.figure(figsize=(20,45))

for i in categorical:
    plt.subplot(6,3,c)
    sns.countplot(data[i])
    plt.xticks(rotation=90)
    plt.tight_layout(pad=3.0)
    c=c+1

plt.show()
```



Activity 6: Evaluating performance of the model and saving the model

From sklearn, cross_val_score is used to evaluate the score of the model. On the parameters, we have given rfr (model name), x, y, cv (as 3 folds). Our model is performing well. So, we are saving the model by pickle.dump()

```
6]:  import pickle
     pickle.dump(rfr,open('model1.pkl','wb'))
```

Activity 2.2: Build Python code:

```
from flask import Flask,render_template, request
import numpy as np
import pickle

model=pickle.load(open(r"model1.pkl",'rb'))

app = Flask(__name__,template_folder="../templates")

@app.route('/')
@app.route('/home')
def home():
    return render_template("home.html")
@app.route("/predict")
def predict1():
    return render_template("predict.html")


@app.route("/pred",methods=['POST','GET'])
def predict():
    if request.method=='POST':
        x=[[x for x in request.form.values()]]
        print(x)

        x=np.array(x)
        print(x.shape)

        print(x)
        pred= model.rfr(x)
        return pred
    return render_template('submit.html')
```