SOURCE CODE:

JUPYTER NOTEBOOK

```
%matplotlib inline

#Visualization Libraries

import matplotlib.pyplot as plt

import seaborn as sns

#Data processing Libraries

import numpy as np

import pandas as pd

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import LabelEncoder

from math import sqrt

#from sklearn.feature_selection import VarianceThreshold

import warnings

#Machine model Algorithm module

from sklearn.ensemble import RandomForestClassifier

from xgboost import XGBClassifier

#from sklearn.tree import plot_tree,DecisionTreeRegressor

import catboost as cb

import joblib

#Performance metrics

from sklearn.metrics import
mean_squared_error,confusion_matrix,roc_auc_score,RocCurveDisplay,auc,roc_curve,Co
nfusionMatrixDisplay
```

```
from sklearn.metrics import
precision_recall_fscore_support,plot_confusion_matrix,log_loss,accuracy_score,f1_score

#IMPORTING THE DATASET USING PANDAS LIBRARIES

df = pd.read_csv("weatherAUS.csv")

#DISPLAYS THE FIRST FIVE ROWS OF THE DATA

df.head()

#DISPLAYS THE LAST FIVE ROWS OF THE DATA

df.tail()

#DESCRIPTION OF THE DATA

df.describe()

#INFORMATION OF DATA

df.info()

#SPLITTING OF DATA SEPARATELY INTO DAY,MONTH,YEAR

df['Date'] = pd.to_datetime(df['Date'])

df['year'] = df['Date'].dt.year

df['month'] = df['Date'].dt.month

df['day'] = df['Date'].dt.day

df.drop(['Date'], axis = 1,inplace=True)

df.head()

#DIMENSION OF THE DATASET

df.shape

#DESCRIPTION OF THE DATASET AFTER SPLIITING THE DATE

df.describe()

#CONVERTING THE FEATURES OF 'RainTomorrow' AND 'RainToday'INTO CATEGORICAL
DATA
```

```
LE=LabelEncoder()

df['RainTomorrow']=LE.fit_transform(df['RainTomorrow'])

df['RainToday']=LE.fit_transform(df['RainToday'])

df['RainTomorrow']

#VISUALIZING THE IMBALANCE DATA

import matplotlib.pyplot as plt

#fig = plt.figure(figsize = (20,5))

ax=df['RainTomorrow'].value_counts(normalize = True).plot(kind='bar', color=
['RED','navy'], alpha = 0.9, rot=0)

plt.title('RainTomorrow Indicator No(0) and Yes(1) in the Imbalanced Dataset')

for p in ax.patches:

   ax.annotate(str(round(p.get_height(),2)), (p.get_x() * 1.01 , p.get_height() * 1.01))

plt.show()

#BALANCING THE IMBALANCED DATA AND VISUALIZING IT

from sklearn.utils import resample

no = df[df['RainTomorrow'] == 0]

yes = df[df['RainTomorrow'] == 1]

yes_oversampled = resample(yes, replace=True, n_samples=len(no), random_state=42)

df_1 = pd.concat([no, yes_oversampled])

#fig = plt.figure(figsize = (20,5))

ax=df_1.RainTomorrow.value_counts(normalize = True).plot(kind='bar', color=
['RED','navy'], alpha = 0.9, rot=0)

plt.title('RainTomorrow Indicator No(0) and Yes(1) after Oversampling (Balanced
Dataset)')

for p in ax.patches:
```

```
    ax.annotate(str(round(p.get_height(),2)), (p.get_x() * 1.01 , p.get_height() * 1.01))

plt.show()

# MISSING DATA PATTERN IN TRAINING DATA

import seaborn as sns

plt.figure(figsize = (20,5))

sns.heatmap(df_1.isnull(), cbar=False, cmap='PuBu')

plt.show()

#COLLECTING THE OBJECT DATATYPE OF THE FEATURES IN THE DATASET

lb=[i for i in df_1.columns if(df_1[i].dtype=='object')]

lb

df_1['Location'].mode()[0]

# IMPUTE cATEGORICAL VARIABLE WITH MODE

df_1['Location'] = df_1['Location'].fillna(df_1['Location'].mode()[0])

df_1['WindGustDir'] = df_1['WindGustDir'].fillna(df_1['WindGustDir'].mode()[0])

df_1['WindDir9am'] = df_1['WindDir9am'].fillna(df_1['WindDir9am'].mode()[0])

df_1['WindDir3pm'] = df_1['WindDir3pm'].fillna(df_1['WindDir3pm'].mode()[0])

# CONVERTING THE OBJECT TYPE FEATURES INTO CATEGORIAL DATA USING LABEL
ENCODING

from sklearn.preprocessing import LabelEncoder

lencoders = {}

for col in lb:

    lencoders[col] = LabelEncoder()

    df_1[col] = lencoders[col].fit_transform(df_1[col])

# FILLING THE NULL VALUES WITH MEAN VALUES
```

```
import warnings

warnings.filterwarnings("ignore")

# Multiple Imputation by Chained Equations

from sklearn.experimental import enable_iterative_imputer

from sklearn.impute import IterativeImputer

df = df_1.copy(deep=True)

mice_imputer = IterativeImputer()

df.iloc[:, :] = mice_imputer.fit_transform(df_1)

plt.figure(figsize=(27,15))

plt.title("Correlation Among Features")

sns.heatmap(df.corr(),linewidths=1,annot=True)

plt.show()

df.drop(['RISK_MM','Location','year'],axis=1,inplace=True,)

plt.figure(figsize=(25,10))

plt.title("Correlation Among Features")

sns.heatmap(df.corr(),linewidths=1,annot=True)

plt.show()

y = df['RainTomorrow']

x = df.loc[:, df.columns != 'RainTomorrow']

# Split into test and train

from sklearn.model_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, shuffle=True)

dfx=pd.DataFrame()

dfx=pd.concat([x_test,y_test],axis=1)
```

```
dfx.head()

model_rf=
RandomForestClassifier(max_depth=16,min_samples_leaf=1,min_samples_split=2,n_esti
mators=100)

model_rf.fit(x_train, y_train)

ypreds_rf=model_rf.predict(x_test)

ypreds_rf

model_rf.score(x_test,y_test)

f2=f1_score(y_test,model_rf.predict(x_test))

lgls=log_loss(y_test, model_rf.predict_proba(x_test))

acc=accuracy_score(y_test, model_rf.predict(x_test))

rac=roc_auc_score(y_test, model_rf.predict(x_test))

f2,lgls,rac,acc

fpr, tpr, thresholds = roc_curve(y_test, ypreds_rf)

roc_auc = auc(fpr, tpr)

display =RocCurveDisplay(fpr=fpr, tpr=tpr, roc_auc=roc_auc,

                         estimator_name='Randomforest')

display.plot(color='r')

plt.plot(list(np.arange(0,2,0.1)),list(np.arange(0,2,0.1)),color='k')

plt.title('ROC curve')

plt.xlim([0,1])

plt.ylim([0,1])

plt.show()

plt.show()

#Kfold
```

```
from sklearn.model_selection import StratifiedKFold

folds=StratifiedKFold(n_splits=5)

scores=[]

for i,j in folds.split(x,y):

   X_train, X_test, Y_train, Y_test=x.iloc[i],x.iloc[j],y.iloc[i],y.iloc[j]

   model1 =
RandomForestClassifier(max_depth=16,min_samples_leaf=1,min_samples_split=2,n_esti
mators=100)

   model1.fit(X_train, Y_train)

   scores.append(model1.score(X_test,Y_test))

print(np.mean(scores))

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y_test,model_rf.predict(x_t
est)),display_labels=['yes','no'])

disp.plot()

plt.show()

joblib.dump(model_rf,"RainPredictModelRF.sav")

warnings.filterwarnings("ignore")

model_xgb =XGBClassifier(n_estimators= 500,max_depth= 16)

model_xgb.fit(x_train, y_train)

ypreds_xgb=model_xgb.predict(x_test)

ypreds_xgb

model_xgb.score(x_test,y_test)

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y_test,model_xgb.predict(x_
test)),display_labels=['yes','no'])

disp.plot()
```

```
plt.show()

fpr, tpr, thresholds = roc_curve(y_test, ypreds_xgb)

roc_auc = auc(fpr, tpr)

display =RocCurveDisplay(fpr=fpr, tpr=tpr, roc_auc=roc_auc,

                         estimator_name='Randomforest')

display.plot(color='r')

plt.plot(list(np.arange(0,2,0.1)),list(np.arange(0,2,0.1)),color='k')

plt.title('ROC curve')

plt.xlim([0,1])

plt.ylim([0,1])

plt.show()

plt.show()

joblib.dump(model_xgb,"RainPredictModelXGB.sav")

#Kfold

from sklearn.model_selection import StratifiedKFold

folds=StratifiedKFold(n_splits=5)

scores=[]

for i,j in folds.split(x,y):

   X_train, X_test, Y_train, Y_test=x.iloc[i],x.iloc[j],y.iloc[i],y.iloc[j]

   model1 =XGBClassifier(n_estimators= 500,max_depth= 16)

   model1.fit(X_train, Y_train)

   scores.append(model1.score(X_test,Y_test))

print(np.mean(scores))

model_cb = cb.CatBoostClassifier(iterations= 50,max_depth=16)
```

```
model_cb.fit(x_train, y_train)

ypreds_cb=model_cb.predict(x_test)

ypreds_cb

model_cb.score(x_test,y_test)

f2=f1_score(y_test,model_cb.predict(x_test))

lgls=log_loss(y_test, model_cb.predict_proba(x_test))

acc=accuracy_score(y_test, model_cb.predict(x_test))

rac=roc_auc_score(y_test, model_cb.predict(x_test))

f2,lgls,rac,acc

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y_test,model_cb.predict(x_t
est)),display_labels=['yes','no'])

disp.plot()

plt.show()

joblib.dump(model_cb,"RainPredictModelCB.sav")

fpr, tpr, thresholds = roc_curve(y_test, ypreds_cb)

roc_auc = auc(fpr, tpr)

display =RocCurveDisplay(fpr=fpr, tpr=tpr, roc_auc=roc_auc,

estimator_name='Randomforest')

display.plot(color='r')

plt.plot(list(np.arange(0,2,0.1)),list(np.arange(0,2,0.1)),color='k')

plt.title('ROC curve')

plt.xlim([0,1])

plt.ylim([0,1])

plt.show()
```

```
plt.show()

#Kfold

from sklearn.model_selection import StratifiedKFold

folds=StratifiedKFold(n_splits=5)

scores=[]

for i,j in folds.split(x,y):

   X_train, X_test, Y_train, Y_test=x.iloc[i],x.iloc[j],y.iloc[i],y.iloc[j]

   model1 =cb.CatBoostClassifier(iterations= 50,max_depth=16)

   model1.fit(X_train, Y_train)

   scores.append(model1.score(X_test,Y_test))

print(np.mean(scores))
```

MODEL DEPLOYMENT

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import LabelEncoder

#Performance metrics

from sklearn.metrics import
mean_squared_error,confusion_matrix,roc_auc_score,RocCurveDisplay,auc,roc_curve,Co
nfusionMatrixDisplay

from sklearn.metrics import
precision_recall_fscore_support,plot_confusion_matrix,log_loss,accuracy_score,f1_score

import joblib

df = pd.read_csv("rainDS.csv")
```

```
df=df.drop(labels=['Unnamed: 0'],axis=1)

df.head()

y = df['RainTomorrow']

x = df.loc[:, df.columns != 'RainTomorrow']

rf_model = joblib.load("RainPredictModelRF.sav")

ypreds=rf_model.predict(x)

ypreds

plt.scatter(range(len(y)),y,c='r')

plt.scatter(range(len(ypreds)),ypreds,c='b')




plt.xlim(140,180)

plt.show()

rf_model.score(x,y)

f2=f1_score(y,rf_model.predict(x))

lgls=log_loss(y, rf_model.predict_proba(x))

acc_rf=accuracy_score(y, rf_model.predict(x))

rac=roc_auc_score(y, rf_model.predict(x))

f2,lgls,rac,acc_rf

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y,rf_model.predict(x)),displa
y_labels=['yes','no'])

disp.plot()

plt.show()

xgb_model = joblib.load("RainPredictModelXGB.sav")
```

```
xgb_model.predict(x)

xgb_model.score(x,y)

f2=f1_score(y,xgb_model.predict(x))

lgls=log_loss(y, xgb_model.predict_proba(x))

acc_xgb=accuracy_score(y, xgb_model.predict(x))

rac=roc_auc_score(y, xgb_model.predict(x))

f2,lgls,rac,acc_xgb

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y,xgb_model.predict(x)),disp
lay_labels=['yes','no'])

disp.plot()

plt.show()

cb_model = joblib.load("RainPredictModelCB.sav")

cb_model.predict(x)

cb_model.score(x,y)

f2=f1_score(y,cb_model.predict(x))

lgls=log_loss(y, cb_model.predict_proba(x))

acc_cb=accuracy_score(y, cb_model.predict(x))

rac=roc_auc_score(y, cb_model.predict(x))

f2,lgls,rac,acc_cb

disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y,cb_model.predict(x)),displ
ay_labels=['yes','no'])

disp.plot()

plt.show()

def Ensemble_Model(x,model1,model2,model3):
```

```
    pred=[]
    l1=model1.predict(x)
    l2=model2.predict(x)
    l3=model3.predict(x)
    for i in range(len(l1)):
        pred.append(max([l1[i],l2[i],l3[i]], key = [l1[i],l2[i],l3[i]].count))
    pred=np.array(pred)
    return pred
f2=f1_score(y,Ensemble_Model(x,rf_model,xgb_model,cb_model))
lgls=log_loss(y, Ensemble_Model(x,rf_model,xgb_model,cb_model))
acc_en=accuracy_score(y, Ensemble_Model(x,rf_model,xgb_model,cb_model))
rac=roc_auc_score(y, Ensemble_Model(x,rf_model,xgb_model,cb_model))
f2,lgls,rac,acc_en
disp =
ConfusionMatrixDisplay(confusion_matrix=confusion_matrix(y,Ensemble_Model(x,rf_mo
del,xgb_model,cb_model)),display_labels=['yes','no'])
disp.plot()
plt.show()
import seaborn as sns
l=[acc_rf,acc_xgb,acc_cb,acc_en]
l=[i*100 for i in l]
n=['Random Forest','XGBoost','Catboost','Ensemble Model']
plt.figure(figsize=(8,5))
plt.bar(n,l,color=sns.color_palette("crest"))
for i in range(4):
```

```
    plt.text(i,l[i]//2,round(l[i],2),ha='center',Bbox = dict(facecolor = 'white', alpha =1))



plt.show()
```

INDEX.HTML

```
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>House price prediction</title>
    <style>
        @import
url('https://fonts.googleapis.com/css2?family=Nunito&display=swap');

        * {
            font-family: 'Nunito', sans-serif;
            padding: 0;
            margin: 0;
            box-sizing: border-box;
        }

        .main {
            height: 100vh;
            width: 100vw;
            background-image:
url("https://images.pexels.com/photos/3394939/pexels-photo-
3394939.jpeg?auto=compress&cs=tinysrgb&w=1260&h=750&dpr=1");
            background-size: 100%;
            background-repeat: no-repeat;
        }

        .main .nav {
            color: white;
            background: rgb(46, 174, 191);
            padding: .6rem;
        }

        .main .outer {
            display: flex;
            height: 70vh;
```

```
        justify-content: center;
        align-items: center;
    }

    .main .outer form .group {
        display: flex;
        justify-content: space-between;
        color: white;
        font-size: large;
    }
    .main .outer form{
        width: 40vw;
    }
    .main .outer form .center{
        width: 50vw;
        display: flex;
        justify-content: center;
    }
    .main .outer form .center-btn{
        display: flex;
        justify-content: center;
    }
    .main .outer form .center-btn input[type="submit"]{
        color: white;
        background-color: rgb(46, 174, 191);
        padding: .5rem;
        font-size: large;
        border-radius: 10px;
        border: none;
        margin-top: 50px;
        font-weight: bold;
    }
    .main .outer form .center-btn input[type="submit"]:hover{
        background-color: blue;
    }
    .main .center{
        width: 100vw;
        display: flex;
        justify-content: center;
    }
    .main .center p{
        background-color: rgb(46, 174, 191);
        color:white;
        padding: 1rem;
        border-radius: 10px;

        font-size: large;
    }
```

```
    </style>
</head>

<body>
    <section class="main">
        <div class="nav">
            <h1 style="text-align: center;">PREDICTION OF RAINFALL</h1>
        </div>
        <div class="outer">
            <form action="/predict" method="POST">
               <center style="margin-top: 70px;"><h2><b></h2></b></center>
                <div class="group group-1">
                    <div class="inner">
                        <label><b>
                            MinTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MinTemp" id="MinTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            MaxTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MaxTemp" id="MaxTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            Rainfall
                        </b>
                        </label><br>
                        <input type="text" name="Rainfall" id="Rainfall"
required>
                        <br>
                    </div>
                </div>
                <div class="group group-2">
                    <div class="inner">
                        <label><b>Evaporation</b></label>
                        <br>
                        <input type="text" name="Evaporation"
id="Evaporation" required>

                    </div>
```

```
                    <div class="inner">
                        <label><b>Sunshine</b></label>
                        <br>
                        <input type="text" name="Sunshine" id="Sunshine"
required>

                    </div>
                    <div class="inner">
                        <label><b>WindGustDir</b></label>
                        <br>
                        <input type="text" name="WindGustDir"
id="WindGustDir" required>
                    </div>
                </div>
                <div class="group group-3">
                    <div class="inner">
                        <label><b>WindGustSpeed</b></label>
                        <br>
                        <input type="text" name="WindGustSpeed"
id="WindGustSpeed" required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir9am</b></label>
                        <br>
                        <input type="text" name="WindDir9am" id="WindDir9am"
required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir3pm</b></label>
                        <br>
                        <input type="text" name="WindDir3pm" id="WindDir3pm"
required>
                    </div>

                </div>
                <div class="group group-4">
                <div class="inner">
                    <label><b>WindSpeed9am</b></label>
                    <br>
                    <input type="text" name="WindSpeed9am" id="WindSpeed9am"
required>
                </div>
                <div class="inner">
                    <label><b>WindSpeed3pm</b></label>
                    <br>
                    <input type="text" name="WindSpeed3pm" id="WindSpeed3pm"
required>
                </div>
```

```
                <div class="inner">
                    <label><b>Humidity9am</b></label>
                    <br>
                    <input type="text" name="Humidity9am" id="Humidity9am"
required>
                </div>
            </div>
            <div class="group group-5">
                <div class="inner">
                    <label><b>Humidity3pm</b></label>
                    <br>
                    <input type="text" name="Humidity3pm" id="Humidity3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure9am</b></label>
                    <br>
                    <input type="text" name="Pressure9am" id="Pressure9am"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure3pm</b></label>
                    <br>
                    <input type="text" name="Pressure3pm" id="Pressure3pm"
required>
                </div>
            </div>
            <div class="group group-6">
                <div class="inner">
                    <label><b>Cloud9am</b></label>
                    <br>
                    <input type="text" name="Cloud9am" id="Cloud9am"
required>
                </div>
                <div class="inner">
                    <label><b>Cloud3pm</b></label>
                    <br>
                    <input type="text" name="Cloud3pm" id="Cloud3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Temp9am</b></label>
                    <br>
                    <input type="text" name="Temp9am" id="Temp9am" required>
                </div>
            </div>
            <div class="group group-7">
                <div class="inner">
```

```
                    <label><b>Temp3pm</b></label>
                    <br>
                    <input type="text" name="Temp3pm" id="Temp3pm" required>
                </div>
                <div class="inner">
                    <label><b>RainToday</b></label>
                    <br>
                    <input type="text" name="RainToday" id="RainToday"
required>
                </div>
                <div class="inner">
                    <label><b>month</b></label>
                    <br>
                    <input type="text" name="month" id="month" required>
                </div>
            </div>
            <div class="group group-8">
                <div class="inner">
                    <label><b>day</b></label>
                    <br>
                    <input type="text" name="day" id="day" required>
                </div>
            </div>
            <div class="center-btn">
                <input type="submit" value="Predict">

        </div>


    </form><!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>House price prediction</title>
    <style>
        @import
url('https://fonts.googleapis.com/css2?family=Nunito&display=swap');

        * {
            font-family: 'Nunito', sans-serif;
            padding: 0;
            margin: 0;
            box-sizing: border-box;
        }
```

```
        .main {
            height: 100vh;
            width: 100vw;
            background-image:
url("https://images.pexels.com/photos/3394939/pexels-photo-
3394939.jpeg?auto=compress&cs=tinysrgb&w=1260&h=750&dpr=1");
            background-size: 100%;
            background-repeat: no-repeat;
        }

        .main .nav {
            color: white;
            background: rgb(46, 174, 191);
            padding: .6rem;
        }

        .main .outer {
            display: flex;
            height: 70vh;
            justify-content: center;
            align-items: center;
        }

        .main .outer form .group {
            display: flex;
            justify-content: space-between;
            color: white;
            font-size: large;
        }
        .main .outer form{
            width: 40vw;
        }
        .main .outer form .center{
            width: 50vw;
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn{
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn input[type="submit"]{
            color: white;
            background-color: rgb(46, 174, 191);
            padding: .5rem;
            font-size: large;
            border-radius: 10px;
            border: none;
```

```
            margin-top: 50px;
            font-weight: bold;
        }
        .main .outer form .center-btn input[type="submit"]:hover{
            background-color: blue;
        }
        .main .center{
            width: 100vw;
            display: flex;
            justify-content: center;
        }
        .main .center p{
            background-color: rgb(46, 174, 191);
            color:white;
            padding: 1rem;
            border-radius: 10px;

            font-size: large;
        }
    </style>
</head>

<body>
    <section class="main">
        <div class="nav">
            <h1 style="text-align: center;">PREDICTION OF RAINFALL</h1>
        </div>
        <div class="outer">
            <form action="/predict" method="POST">
               <center style="margin-top: 70px;"><h2><b></h2></b></center>
                <div class="group group-1">
                    <div class="inner">
                        <label><b>
                            MinTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MinTemp" id="MinTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            MaxTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MaxTemp" id="MaxTemp"
required>
```

```
                    </div>
                    <div class="inner">
                        <label><b>
                            Rainfall
                        </b>
                        </label><br>
                        <input type="text" name="Rainfall" id="Rainfall"
required>
                        <br>
                    </div>
                </div>
                <div class="group group-2">
                    <div class="inner">
                        <label><b>Evaporation</b></label>
                        <br>
                        <input type="text" name="Evaporation"
id="Evaporation" required>

                    </div>
                    <di<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>House price prediction</title>
    <style>
        @import
url('https://fonts.googleapis.com/css2?family=Nunito&display=swap');

        * {
            font-family: 'Nunito', sans-serif;
            padding: 0;
            margin: 0;
            box-sizing: border-box;
        }

        .main {
            height: 100vh;
            width: 100vw;
            background-image:
url("https://images.pexels.com/photos/3394939/pexels-photo-
3394939.jpeg?auto=compress&cs=tinysrgb&w=1260&h=750&dpr=1");
            background-size: 100%;
            background-repeat: no-repeat;
        }
```

```
        .main .nav {
            color: white;
            background: rgb(46, 174, 191);
            padding: .6rem;
        }

        .main .outer {
            display: flex;
            height: 70vh;
            justify-content: center;
            align-items: center;
        }

        .main .outer form .group {
            display: flex;
            justify-content: space-between;
            color: white;
            font-size: large;
        }
        .main .outer form{
            width: 40vw;
        }
        .main .outer form .center{
            width: 50vw;
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn{
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn input[type="submit"]{
            color: white;
            background-color: rgb(46, 174, 191);
            padding: .5rem;
            font-size: large;
            border-radius: 10px;
            border: none;
            margin-top: 50px;
            font-weight: bold;
        }
        .main .outer form .center-btn input[type="submit"]:hover{
            background-color: blue;
        }
        .main .center{
            width: 100vw;
            display: flex;
            justify-content: center;
```

```
        }
        .main .center p{
            background-color: rgb(46, 174, 191);
            color:white;
            padding: 1rem;
            border-radius: 10px;

            font-size: large;
        }
    </style>
</head>

<body>
    <section class="main">
        <div class="nav">
            <h1 style="text-align: center;">PREDICTION OF RAINFALL</h1>
        </div>
        <div class="outer">
            <form action="/predict" method="POST">
               <center style="margin-top: 70px;"><h2><b></h2></b></center>
                <div class="group group-1">
                    <div class="inner">
                        <label><b>
                            MinTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MinTemp" id="MinTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            MaxTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MaxTemp" id="MaxTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            Rainfall
                        </b>
                        </label><br>
                        <input type="text" name="Rainfall" id="Rainfall"
required>
                        <br>
                    </div>
```

```
                </div>
                <div class="group group-2">
                    <div class="inner">
                        <label><b>Evaporation</b></label>
                        <br>
                        <input type="text" name="Evaporation"
id="Evaporation" required>

                    </div>
                    <div class="inner">
                        <label><b>Sunshine</b></label>
                        <br>
                        <input type="text" name="Sunshine" id="Sunshine"
required>

                    </div>
                    <div class="inner">
                        <label><b>WindGustDir</b></label>
                        <br>
                        <input type="text" name="WindGustDir"
id="WindGustDir" required>
                    </div>
                </div>
                <div class="group group-3">
                    <div class="inner">
                        <label><b>WindGustSpeed</b></label>
                        <br>
                        <input type="text" name="WindGustSpeed"
id="WindGustSpeed" required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir9am</b></label>
                        <br>
                        <input type="text" name="WindDir9am" id="WindDir9am"
required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir3pm</b></label>
                        <br>
                        <input type="text" name="WindDir3pm" id="WindDir3pm"
required>
                    </div>

                </div>
                <div class="group group-4">
                <div class="inner">
                    <label><b>WindSpeed9am</b></label>
                    <br>
```

```
                    <input type="text" name="WindSpeed9am" id="WindSpeed9am"
required>
                </div>
                <div class="inner">
                    <label><b>WindSpeed3pm</b></label>
                    <br>
                    <input type="text" name="WindSpeed3pm" id="WindSpeed3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Humidity9am</b></label>
                    <br>
                    <input type="text" name="Humidity9am" id="Humidity9am"
required>
                </div>
            </div>
            <div class="group group-5">
                <div class="inner">
                    <label><b>Humidity3pm</b></label>
                    <br>
                    <input type="text" name="Humidity3pm" id="Humidity3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure9am</b></label>
                    <br>
                    <input type="text" name="Pressure9am" id="Pressure9am"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure3pm</b></label>
                    <br>
                    <input type="text" name="Pressure3pm" id="Pressure3pm"
required>
                </div>
            </div>
            <div class="group group-6">
                <div class="inner">
                    <label><b>Cloud9am</b></label>
                    <br>
                    <input type="text" name="Cloud9am" id="Cloud9am"
required>
                </div>
                <div class="inner">
                    <label><b>Cloud3pm</b></label>
                    <br>
                    <input type="text" name="Cloud3pm" id="Cloud3pm"
required>
```

```
                </div>
                <div class="inner">
                    <label><b>Temp9am</b></label>
                    <br>
                    <input type="text" name="Temp9am" id="Temp9am" required>
                </div>
            </div>
            <div class="group group-7">
                <div class="inner">
                    <label><b>Temp3pm</b></label>
                    <br>
                    <input type="text" name="Temp3pm" id="Temp3pm" required>
                </div>
                <div class="inner">
                    <label><b>RainToday</b></label>
                    <br>
                    <input type="text" name="RainToday" id="RainToday"
required>
                </div>
                <div class="inner">
                    <label><b>month</b></label>
                    <br>
                    <input type="text" name="month" id="month" required>
                </div>
            </div>
            <div class="group group-8">
                <div class="inner">
                    <label><b>day</b></label>
                    <br>
                    <input type="text" name="day" id="day" required>
                </div>
            </div>
            <div class="center-btn">
                <input type="submit" value="Predict">

        </div>


    </form>
        </div>
       <div class="center" style="margin-top: 60px;">
            <p><b>ENSEMBLE MODEL PREDICTION :{{z}}</b></p>
    </div>
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
```

```
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>House price prediction</title>
    <style>
        @import
url('https://fonts.googleapis.com/css2?family=Nunito&display=swap');

        * {
            font-family: 'Nunito', sans-serif;
            padding: 0;
            margin: 0;
            box-sizing: border-box;
        }

        .main {
            height: 100vh;
            width: 100vw;
            background-image:
url("https://images.pexels.com/photos/3394939/pexels-photo-
3394939.jpeg?auto=compress&cs=tinysrgb&w=1260&h=750&dpr=1");
            background-size: 100%;
            background-repeat: no-repeat;
        }

        .main .nav {
            color: white;
            background: rgb(46, 174, 191);
            padding: .6rem;
        }

        .main .outer {
            display: flex;
            height: 70vh;
            justify-content: center;
            align-items: center;
        }

        .main .outer form .group {
            display: flex;
            justify-content: space-between;
            color: white;
            font-size: large;
        }
        .main .outer form{
            width: 40vw;
        }
        .main .outer form .center{
            width: 50vw;
```

```
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn{
            display: flex;
            justify-content: center;
        }
        .main .outer form .center-btn input[type="submit"]{
            color: white;
            background-color: rgb(46, 174, 191);
            padding: .5rem;
            font-size: large;
            border-radius: 10px;
            border: none;
            margin-top: 50px;
            font-weight: bold;
        }
        .main .outer form .center-btn input[type="submit"]:hover{
            background-color: blue;
        }
        .main .center{
            width: 100vw;
            display: flex;
            justify-content: center;
        }
        .main .center p{
            background-color: rgb(46, 174, 191);
            color:white;
            padding: 1rem;
            border-radius: 10px;

            font-size: large;
        }
    </style>
</head>

<body>
    <section class="main">
        <div class="nav">
            <h1 style="text-align: center;">PREDICTION OF RAINFALL</h1>
        </div>
        <div class="outer">
            <form action="/predict" method="POST">
               <center style="margin-top: 70px;"><h2><b></h2></b></center>
                <div class="group group-1">
                    <div class="inner">
                        <label><b>
                            MinTemp
```

```
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MinTemp" id="MinTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            MaxTemp
                        </b>
                        </label>
                        <br>
                        <input type="text" name="MaxTemp" id="MaxTemp"
required>
                    </div>
                    <div class="inner">
                        <label><b>
                            Rainfall
                        </b>
                        </label><br>
                        <input type="text" name="Rainfall" id="Rainfall"
required>
                        <br>
                    </div>
                </div>
                <div class="group group-2">
                    <div class="inner">
                        <label><b>Evaporation</b></label>
                        <br>
                        <input type="text" name="Evaporation"
id="Evaporation" required>

                    </div>
                    <div class="inner">
                        <label><b>Sunshine</b></label>
                        <br>
                        <input type="text" name="Sunshine" id="Sunshine"
required>

                    </div>
                    <div class="inner">
                        <label><b>WindGustDir</b></label>
                        <br>
                        <input type="text" name="WindGustDir"
id="WindGustDir" required>
                    </div>
                </div>
                <div class="group group-3">
```

```
                    <div class="inner">
                        <label><b>WindGustSpeed</b></label>
                        <br>
                        <input type="text" name="WindGustSpeed"
id="WindGustSpeed" required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir9am</b></label>
                        <br>
                        <input type="text" name="WindDir9am" id="WindDir9am"
required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir3pm</b></label>
                        <br>
                        <input type="text" name="WindDir3pm" id="WindDir3pm"
required>
                    </div>

                </div>
                <div class="group group-4">
                <div class="inner">
                    <label><b>WindSpeed9am</b></label>
                    <br>
                    <input type="text" name="WindSpeed9am" id="WindSpeed9am"
required>
                </div>
                <div class="inner">
                    <label><b>WindSpeed3pm</b></label>
                    <br>
                    <input type="text" name="WindSpeed3pm" id="WindSpeed3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Humidity9am</b></label>
                    <br>
                    <input type="text" name="Humidity9am" id="Humidity9am"
required>
                </div>
            </div>
            <div class="group group-5">
                <div class="inner">
                    <label><b>Humidity3pm</b></label>
                    <br>
                    <input type="text" name="Humidity3pm" id="Humidity3pm"
required>
                </div>
                <div class="inner">
```

```
                    <label><b>Pressure9am</b></label>
                    <br>
                    <input type="text" name="Pressure9am" id="Pressure9am"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure3pm</b></label>
                    <br>
                    <input type="text" name="Pressure3pm" id="Pressure3pm"
required>
                </div>
            </div>
            <div class="group group-6">
                <div class="inner">
                    <label><b>Cloud9am</b></label>
                    <br>
                    <input type="text" name="Cloud9am" id="Cloud9am"
required>
                </div>
                <div class="inner">
                    <label><b>Cloud3pm</b></label>
                    <br>
                    <input type="text" name="Cloud3pm" id="Cloud3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Temp9am</b></label>
                    <br>
                    <input type="text" name="Temp9am" id="Temp9am" required>
                </div>
            </div>
            <div class="group group-7">
                <div class="inner">
                    <label><b>Temp3pm</b></label>
                    <br>
                    <input type="text" name="Temp3pm" id="Temp3pm" required>
                </div>
                <div class="inner">
                    <label><b>RainToday</b></label>
                    <br>
                    <input type="text" name="RainToday" id="RainToday"
required>
                </div>
                <div class="inner">
                    <label><b>month</b></label>
                    <br>
                    <input type="text" name="month" id="month" required>
                </div>
```

```
            </div>
            <div class="group group-8">
                <div class="inner">
                    <label><b>day</b></label>
                    <br>
                    <input type="text" name="day" id="day" required>
                </div>
            </div>
            <div class="center-btn">
                <input type="submit" value="Predict">

        </div>


    </form>
        </div>
       <div class="center" style="margin-top: 60px;">
            <p><b>ENSEMBLE MODEL PREDICTION :{{z}}</b></p>
    </div>


    </section>
</body>

</html>

    </section>
</body>

</html>
v class="inner">
                        <label><b>Sunshine</b></label>
                        <br>
                        <input type="text" name="Sunshine" id="Sunshine"
required>

                    </div>
                    <div class="inner">
                        <label><b>WindGustDir</b></label>
                        <br>
                        <input type="text" name="WindGustDir"
id="WindGustDir" required>
                    </div>
                </div>
                <div class="group group-3">
                    <div class="inner">
                        <label><b>WindGustSpeed</b></label>
                        <br>
```

```
                        <input type="text" name="WindGustSpeed"
id="WindGustSpeed" required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir9am</b></label>
                        <br>
                        <input type="text" name="WindDir9am" id="WindDir9am"
required>
                    </div>
                    <div class="inner">
                        <label><b>WindDir3pm</b></label>
                        <br>
                        <input type="text" name="WindDir3pm" id="WindDir3pm"
required>
                    </div>

                </div>
                <div class="group group-4">
                <div class="inner">
                    <label><b>WindSpeed9am</b></label>
                    <br>
                    <input type="text" name="WindSpeed9am" id="WindSpeed9am"
required>
                </div>
                <div class="inner">
                    <label><b>WindSpeed3pm</b></label>
                    <br>
                    <input type="text" name="WindSpeed3pm" id="WindSpeed3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Humidity9am</b></label>
                    <br>
                    <input type="text" name="Humidity9am" id="Humidity9am"
required>
                </div>
            </div>
            <div class="group group-5">
                <div class="inner">
                    <label><b>Humidity3pm</b></label>
                    <br>
                    <input type="text" name="Humidity3pm" id="Humidity3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure9am</b></label>
                    <br>
```

```
                    <input type="text" name="Pressure9am" id="Pressure9am"
required>
                </div>
                <div class="inner">
                    <label><b>Pressure3pm</b></label>
                    <br>
                    <input type="text" name="Pressure3pm" id="Pressure3pm"
required>
                </div>
            </div>
            <div class="group group-6">
                <div class="inner">
                    <label><b>Cloud9am</b></label>
                    <br>
                    <input type="text" name="Cloud9am" id="Cloud9am"
required>
                </div>
                <div class="inner">
                    <label><b>Cloud3pm</b></label>
                    <br>
                    <input type="text" name="Cloud3pm" id="Cloud3pm"
required>
                </div>
                <div class="inner">
                    <label><b>Temp9am</b></label>
                    <br>
                    <input type="text" name="Temp9am" id="Temp9am" required>
                </div>
            </div>
            <div class="group group-7">
                <div class="inner">
                    <label><b>Temp3pm</b></label>
                    <br>
                    <input type="text" name="Temp3pm" id="Temp3pm" required>
                </div>
                <div class="inner">
                    <label><b>RainToday</b></label>
                    <br>
                    <input type="text" name="RainToday" id="RainToday"
required>
                </div>
                <div class="inner">
                    <label><b>month</b></label>
                    <br>
                    <input type="text" name="month" id="month" required>
                </div>
            </div>
            <div class="group group-8">
```

```
                <div class="inner">
                    <label><b>day</b></label>
                    <br>
                    <input type="text" name="day" id="day" required>
                </div>
            </div>
            <div class="center-btn">
                <input type="submit" value="Predict">

        </div>


    </form>
        </div>
       <div class="center" style="margin-top: 60px;">
            <p><b>ENSEMBLE MODEL PREDICTION :{{z}}</b></p>
    </div>


    </section>
</body>

</html>
        </div>
       <div class="center" style="margin-top: 60px;">
            <p><b>ENSEMBLE MODEL PREDICTION :{{z}}</b></p>
    </div>


    </section>
</body>

</html>
```

APP.PY

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

model = pickle.load(open('model.pkl', 'rb'))
model1 = pickle.load(open('model1.pkl', 'rb'))
model2 = pickle.load(open('model2.pkl', 'rb'))
app = Flask(__name__)


@app.route('/')
def load_page():
    return render_template('index.html')
```

```
@app.route('/predict', methods=["POST"])
def predict():
    a = float(request.form["MinTemp"])
    b = float(request.form["MaxTemp"])
    c = float(request.form["Rainfall"])
    d = float(request.form["Evaporation"])
    e = float(request.form["Sunshine"])
    f = float(request.form["WindGustDir"])
    g = float(request.form["WindGustSpeed"])
    h = float(request.form["WindDir9am"])
    i = float(request.form["WindDir3pm"])
    j = float(request.form["WindSpeed9am"])
    k = float(request.form["WindSpeed3pm"])
    l = float(request.form["Humidity9am"])
    m = float(request.form["Humidity3pm"])
    n = float(request.form["Pressure9am"])
    o = float(request.form["Pressure3pm"])
    p = float(request.form["Cloud9am"])
    q = float(request.form["Cloud3pm"])
    r = float(request.form["Temp9am"])
    s = float(request.form["Temp3pm"])
    t = float(request.form["RainToday"])
    u = float(request.form["month"])
    v = float(request.form["day"])

    x=[[a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u,
v]]

    def Ensemble_Model(x, model1, model2, model3):
        pred = []
        x = np.array(x)
        l1 = model1.predict(x)
        l2 = model2.predict(x)
        l3 = model3.predict(x)
        for i in range(len(l1)):
            pred.append(max([l1[i], l2[i], l3[i]], key=[l1[i], l2[i],
l3[i]].count))
        pred = np.array(pred)
        return pred

    if Ensemble_Model(x,model,model1,model2) == 0:
        return render_template('index.html', z='NOT RAIN')
    else:
        return render_template('index.html', z='RAIN')


if __name__ == "__main__":
    app.run(debug=True)
```