
Will it rain tomorrow?
Machine Learning Project
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01

Project Aims

Purpose and business value of this project

02

Data Preprocessing

EDA, imputation, encoding, feature scaling

03

Modelling

Logistic regression, random forest, decision tree, SVM

04

Conclusion

Model evaluation and future plans

01 Project Aims

Purpose

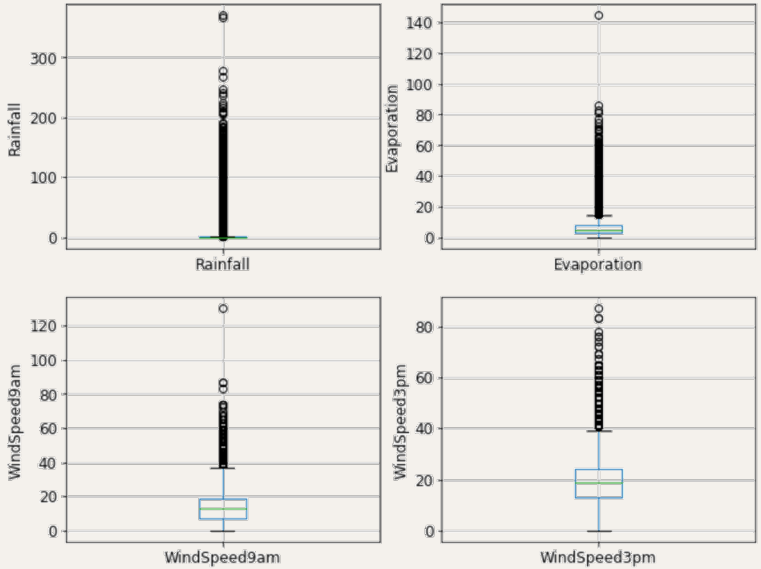
- Build a binary classification model capable of accurately predicting rainfall
- Determine the best algorithm by evaluating accuracy and variance of different models

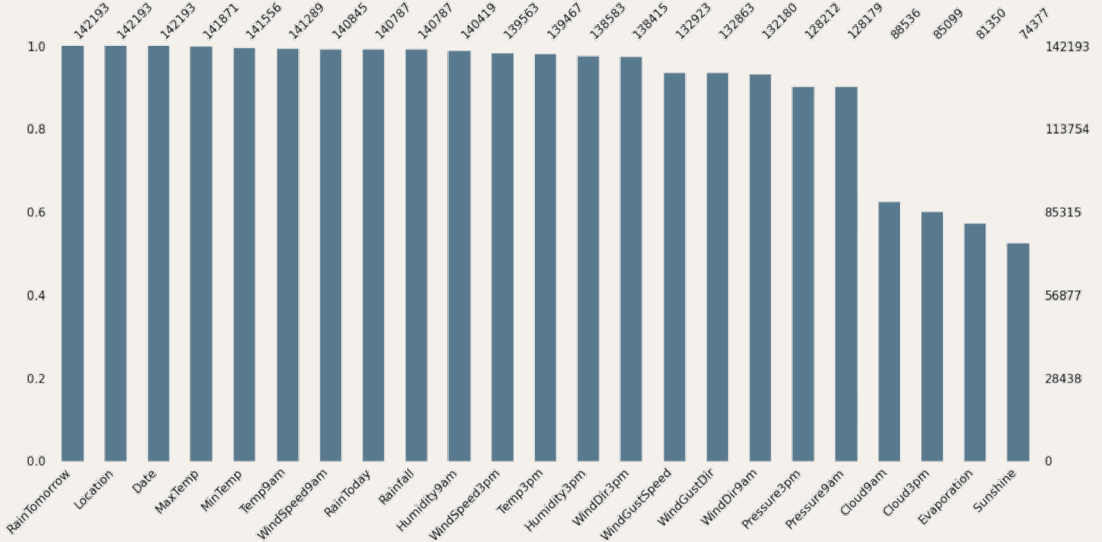
Business Value

- Major Australian industries of aviation, tourism and agriculture are especially sensitive to the weather
- Accurate weather forecasting is essential to these businesses as it allows for better preparation: increasing profits, reducing losses and protecting property

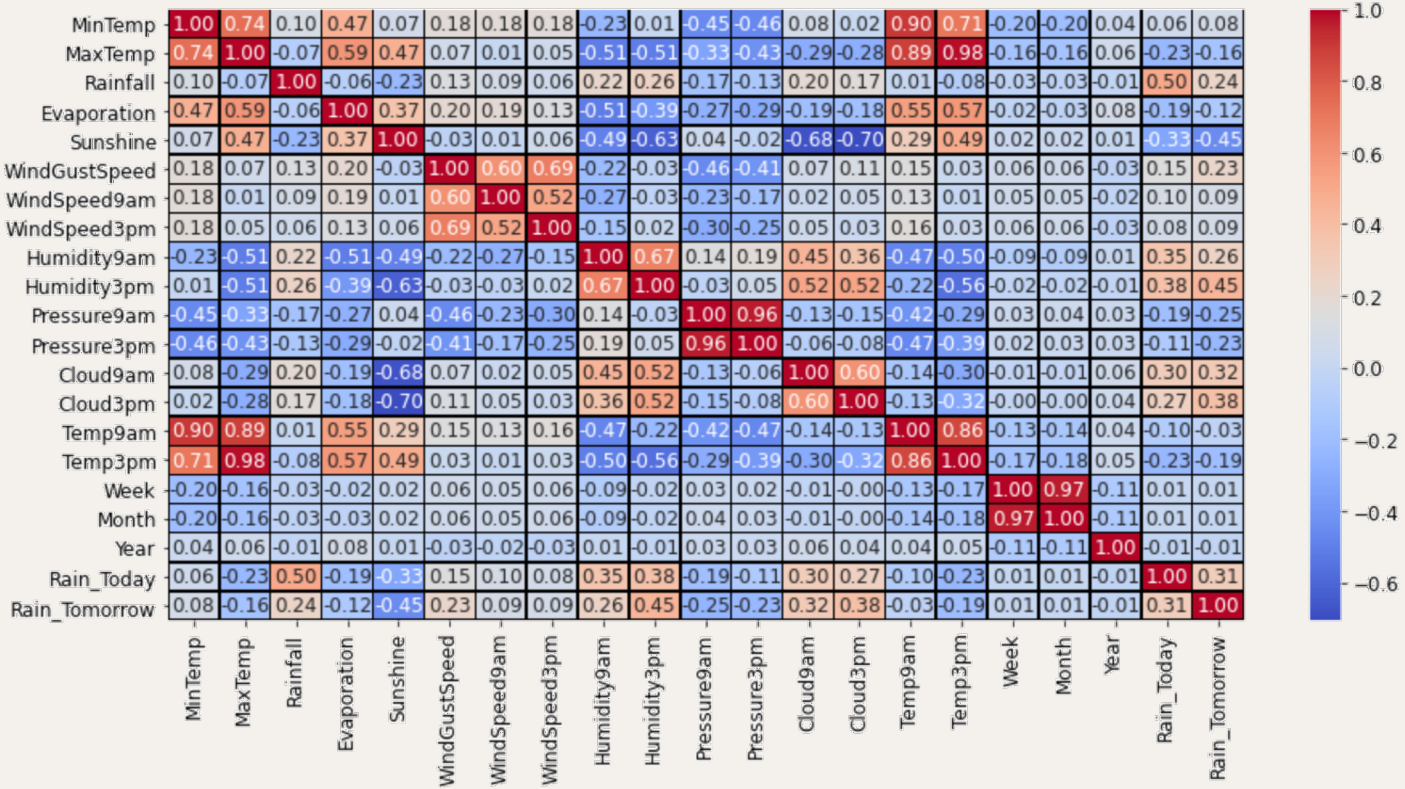
02 Data Preprocessing

Exploratory Data Analysis

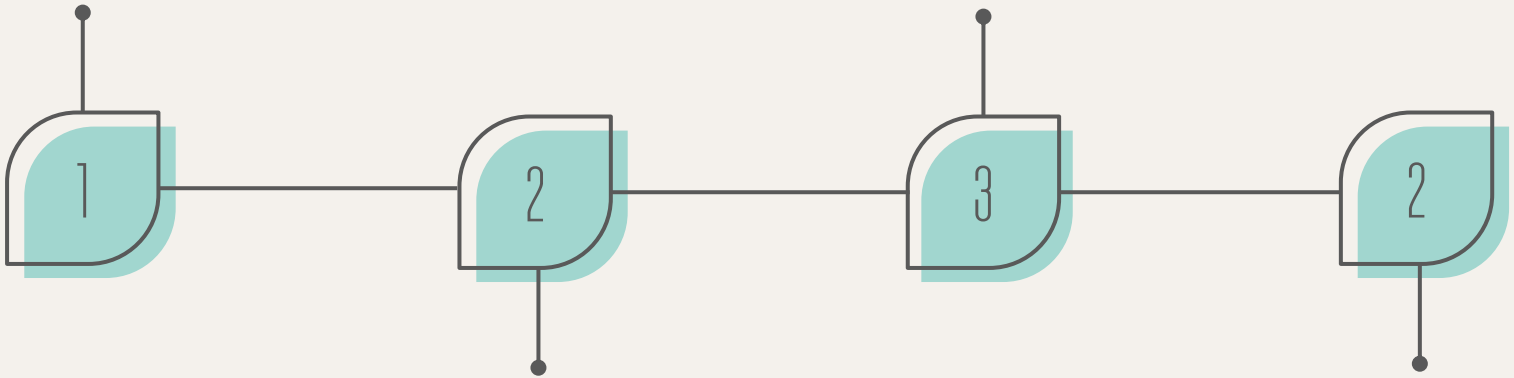




Exploratory Data Analysis



Feature Engineering



Data Split

TrainTestSplit before feature engineering to prevent data leakage

Imputation

Missing values imputed with median for numerical data; mode for categorical data

Encoding

Categorical data converted to numerical data using One-hot encoding

Scaling

Standardisation of features using StandardScaler

Dataset

	MinTemp	MaxTemp	Rainfall	WindGustSpeed	WindSpeed9am	WindSpeed3pm	Humidity9am	Humidity3pm	Pressure9am	Pressure3pm
0	0.458142	0.095453	-0.571161	2.064725	0.569429	0.387781	-1.627919	0.804606	-2.332677	-1.922876
1	-0.387724	-1.268856	2.128528	0.769746	0.115690	1.078135	1.169788	0.220135	-1.399388	-1.129926
2	0.160523	0.306428	-0.571161	-0.753759	-0.905225	-0.187514	0.536345	0.561076	1.119013	0.934739
3	-0.716672	-1.184466	-0.571161	4.121456	1.817213	1.883547	-0.888902	-0.315630	-1.932696	-2.072490
4	0.113530	-0.143653	-0.571161	-0.220532	0.115690	0.157663	0.008476	0.025312	0.793102	0.889855
...	...	...	...	...	...	...	...	...	...	...
113749	-0.497373	-0.607799	2.128528	0.236519	0.682864	-0.417632	0.061263	0.025312	-0.021674	0.366208
113750	0.144859	-0.467149	1.959797	-0.068182	-1.358964	-0.647749	1.117001	0.171429	0.067210	0.441015
113751	-0.215418	0.320493	-0.571161	0.312695	1.363473	-0.417632	-1.469558	-1.484571	-0.288329	-0.396820
113752	-0.137097	-0.256173	-0.571161	-0.068182	0.569429	0.387781	0.325197	1.340370	-0.006860	-0.007826
113753	-0.293739	0.686184	-0.571161	0.465045	0.115690	-0.647749	-0.941689	-1.143630	-0.006860	-0.007826

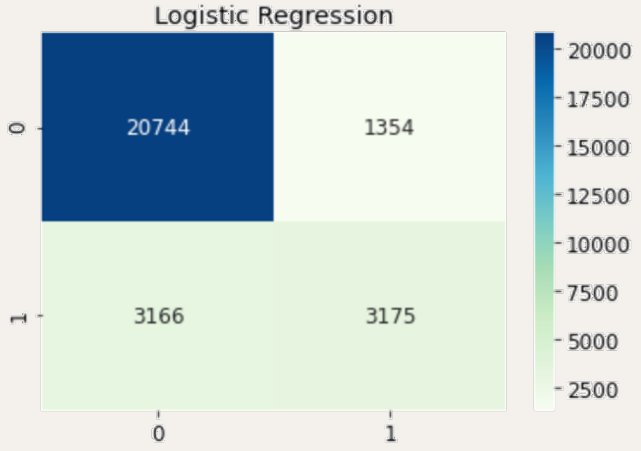
03 Modelling

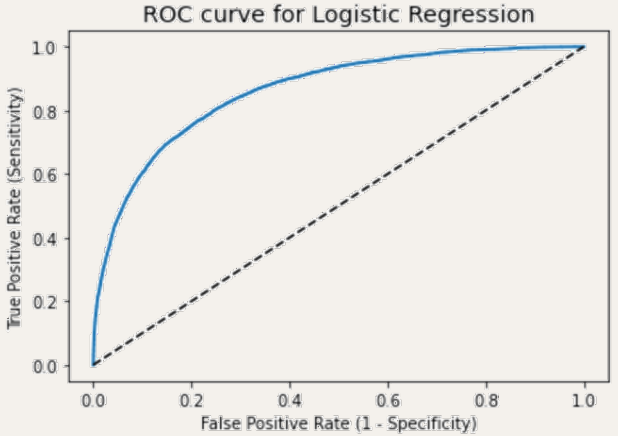
Logistic Regression

```
LOGISTIC REGRESSION
Model accuracy score: 0.8411
Training set score: 0.8445
Test set score: 0.8411
Time Taken: 1.3077
              precision    recall  f1-score   support

           0       0.87      0.94      0.90     22098
           1       0.70      0.50      0.58      6341

    accuracy                           0.84     28439
   macro avg       0.78      0.72      0.74     28439
weighted avg       0.83      0.84      0.83     28439
```



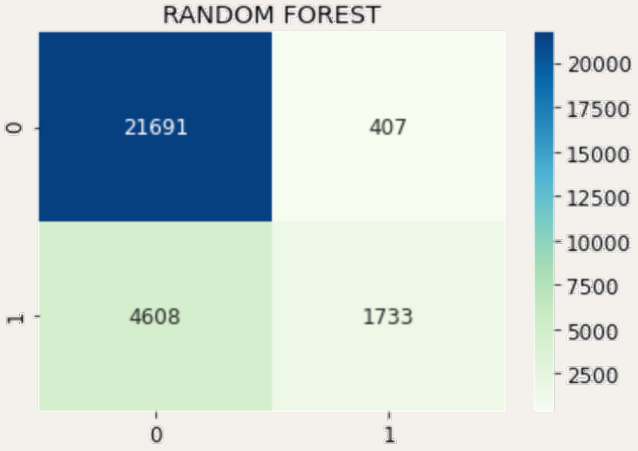


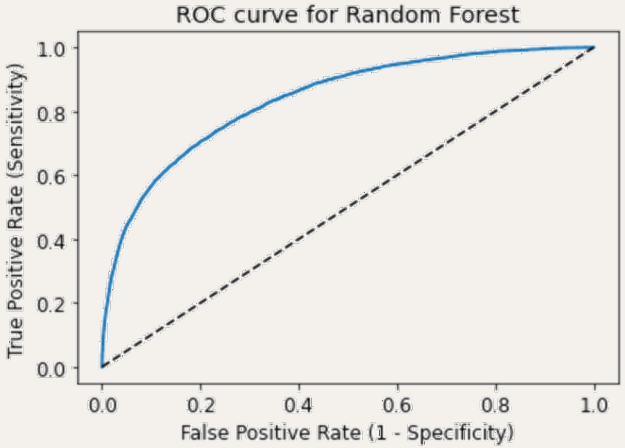
Random Forest

```
RANDOM FOREST
Model accuracy score: 0.8237
Training set score: 0.8263
Test set score: 0.8237
Time Taken: 36.9789
ROC AUC : 0.8377
              precision    recall  f1-score   support

           0       0.82      0.98      0.90     22098
           1       0.81      0.27      0.41      6341

    accuracy                           0.82     28439
   macro avg       0.82      0.63      0.65     28439
weighted avg       0.82      0.82      0.79     28439
```



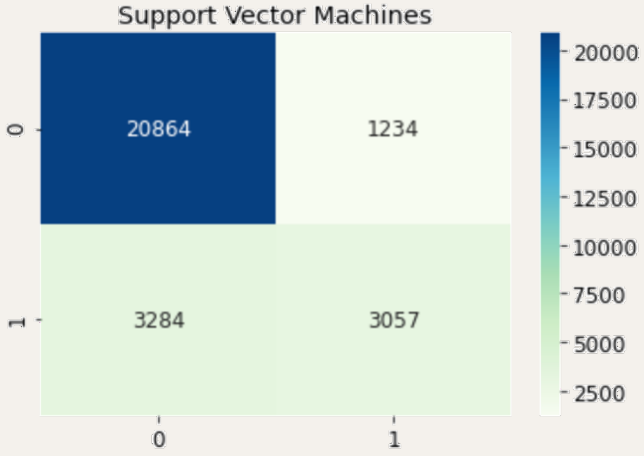


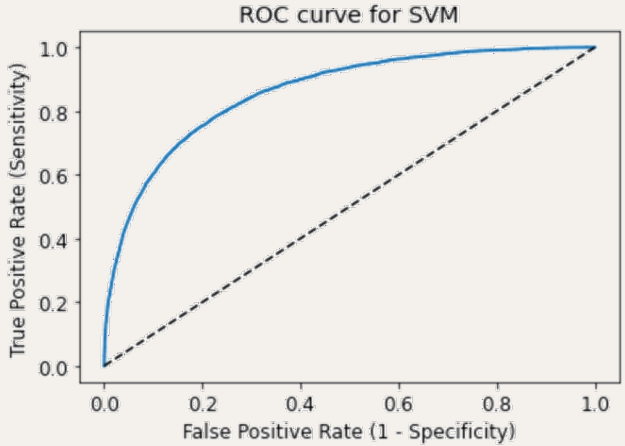
Support Vector Machines (SVM)

```
SUPPORT VECTOR MACHINES
Model accuracy score: 0.8407
Training set score: 0.8441
Test set score: 0.8407
Time Taken: 71.7474
ROC AUC : 0.7127
              precision    recall  f1-score   support

           0       0.86      0.94      0.90     22098
           1       0.71      0.48      0.57      6341

    accuracy                           0.84     28439
   macro avg       0.79      0.71      0.74     28439
weighted avg       0.83      0.84      0.83     28439
```

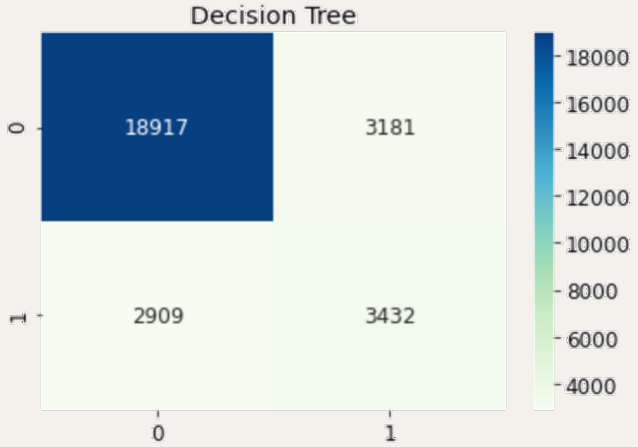


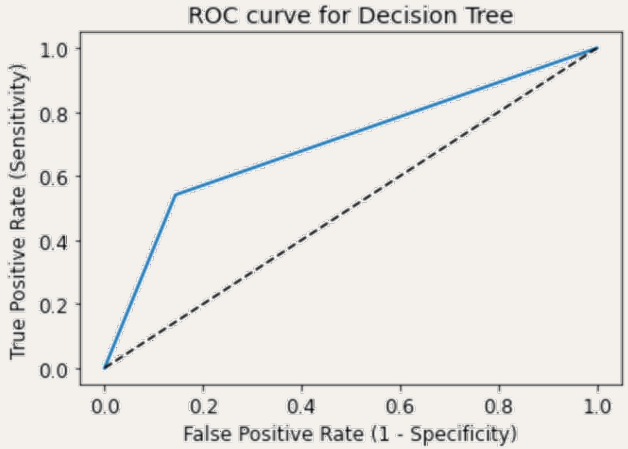


Decision Tree

```
DECISION TREE
Model accuracy score: 0.7860
Training set score: 1.0000
Test set score: 0.7860
Time Taken: 6.7330
ROC AUC : 0.6986
```

	precision	recall	f1-score	support
0	0.87	0.86	0.86	22098
1	0.52	0.54	0.53	6341
accuracy			0.79	28439
macro avg	0.69	0.70	0.70	28439
weighted avg	0.79	0.79	0.79	28439

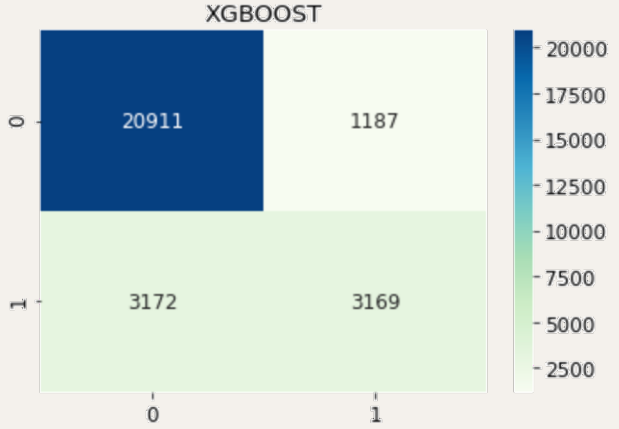


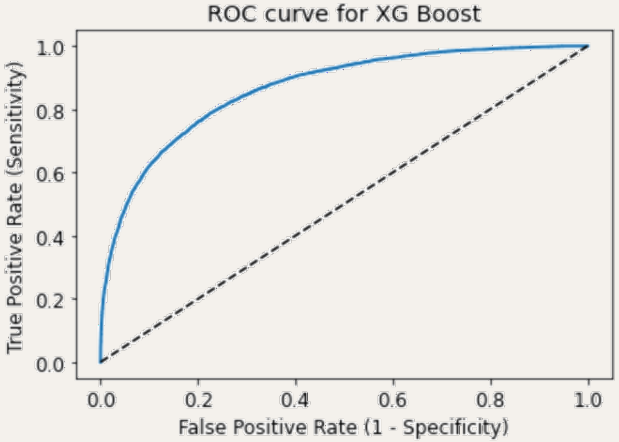


XGBoost

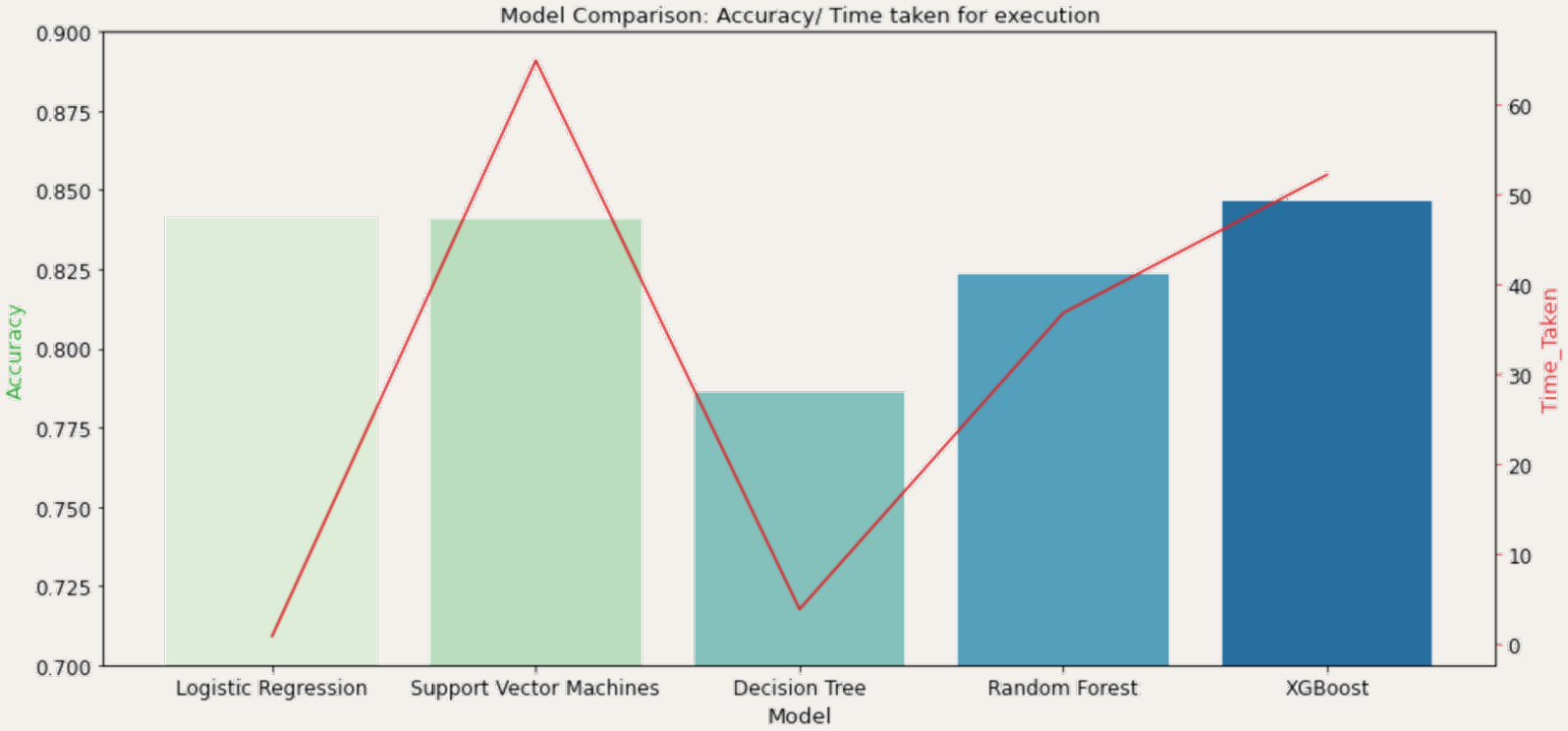
XGBOOST
Model accuracy score: 0.8467
Training set score: 0.8507
Test set score: 0.8467
Time Taken: 57.9336
ROC AUC : 0.8653

	precision	recall	f1-score	support
0	0.87	0.95	0.91	22098
1	0.73	0.50	0.59	6341
accuracy			0.85	28439
macro avg	0.80	0.72	0.75	28439
weighted avg	0.84	0.85	0.84	28439





Comparison

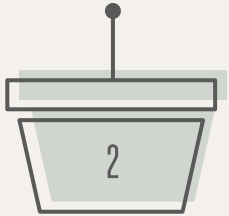

Model Comparison: Accuracy/ Time taken for execution
Accuracy
Time_Taken
0.900
0.875
0.850
0.825
0.800
0.775
0.750
0.725
0.700
60
50
40
30
20
10
0
Logistic Regression
Support Vector Machines
Decision Tree
Random Forest
XGBoost
Model

04 Conclusion

Model Evaluation

Logistic Regression

- **Accuracy:** 0.8411
- **Train vs. test score delta:** 0.0034
- **Time taken:** 1.3s



XG Boost

- **Accuracy:** 0.8467
- **Train vs. test score delta:** 0.0040
- **Time taken:** 57.9s

Random Forest

- **Accuracy:** 0.8237
- **Train vs. test score delta:** 0.0026
- **Time taken:** 37.0s

In the future...

Increasing range of forecast

Forecasting volume of rain

Implement deep learning methods