IISC Bengaluru CCE 2022

Computing for Artificial Intelligence and Machine Learning

Project Report

On

Transportation Choice Prediction for office employees using Machine Learning

Using different 26 machine learning models to predict whether an employee will choose public transport or private transport basis on the features like Age, Gender, Education, Salary & license possession

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Data Understanding:

Age: Age of the Employee in Years

Gender: Gender of the Employee

Engineer: For Engineer =1 ,

Non Engineer =0

MBA: For MBA =1 ,

Non MBA =0

Work Exp: Experience in years

Salary: Salary in Lakhs per Annum

Distance: Distance in Kms from Home to Office

license: If Employee has Driving Licence -1, If not, then 0

Transport: Mode of Transport

Exploratory Data Analysis:

Sample of the Dataset:

	Age	Gender	Engineer	MBA	Work Exp	Salary	Distance	license	Transport
0	28	Male	0	0	4	14.3	3.2	0	Public Transport
1	23	Female	1	0	4	8.3	3.3	0	Public Transport
2	29	Male	1	0	7	13.4	4.1	0	Public Transport
3	28	Female	1	1	5	13.4	4.5	0	Public Transport
4	27	Male	1	0	4	13.4	4.6	0	Public Transport

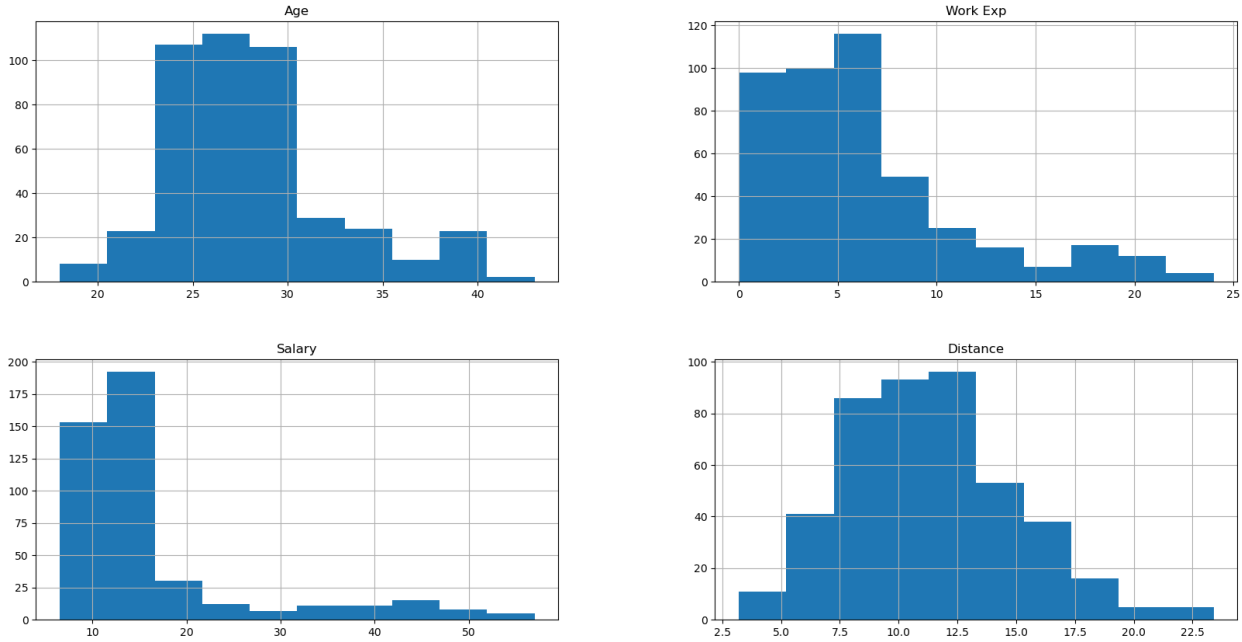
Shape & Info of the dataset:

```
number of rows: 444
number of columns: 9
```

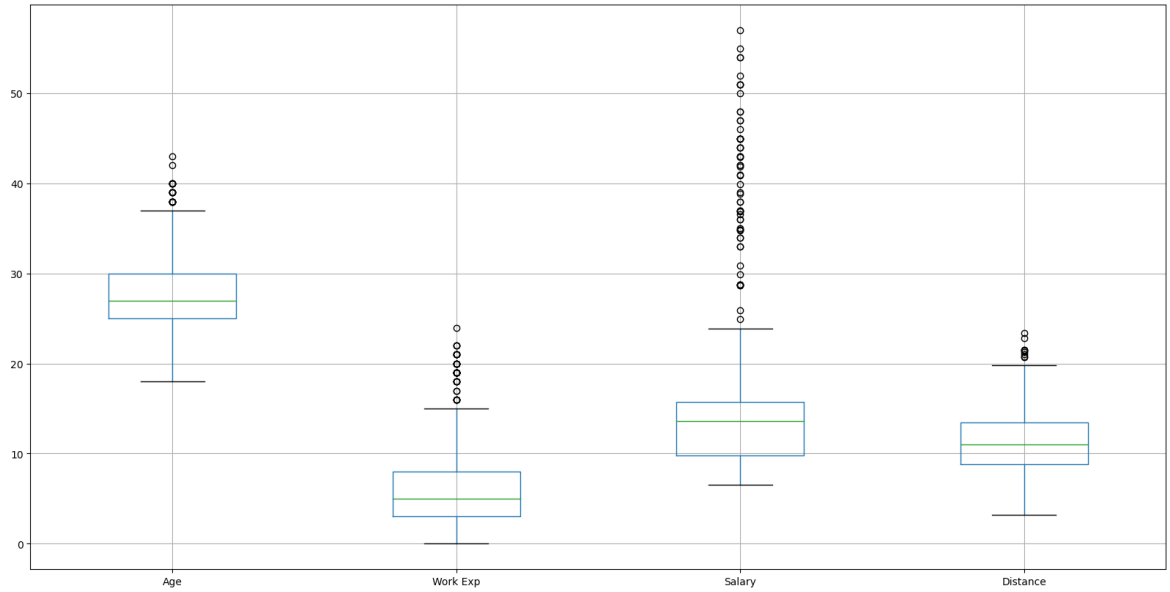
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 444 entries, 0 to 443
Data columns (total 9 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Age          444 non-null    float64
 1   Work Exp     444 non-null    float64
 2   Salary       444 non-null    float64
 3   Distance     444 non-null    float64
 4   Transport    444 non-null    int8
 5   Gender_Male  444 non-null    uint8
 6   Engineer_1   444 non-null    uint8
 7   MBA_1        444 non-null    uint8
 8   license_1    444 non-null    uint8
dtypes: float64(4), int8(1), uint8(4)
memory usage: 16.2 KB
```

The dataset has 444 rows and 9 columns Gender, Transport variables are of object / categorical data type Salary, Distance variables are of Float type the remaining 5 variables are of Integer type. None of the variables have null values

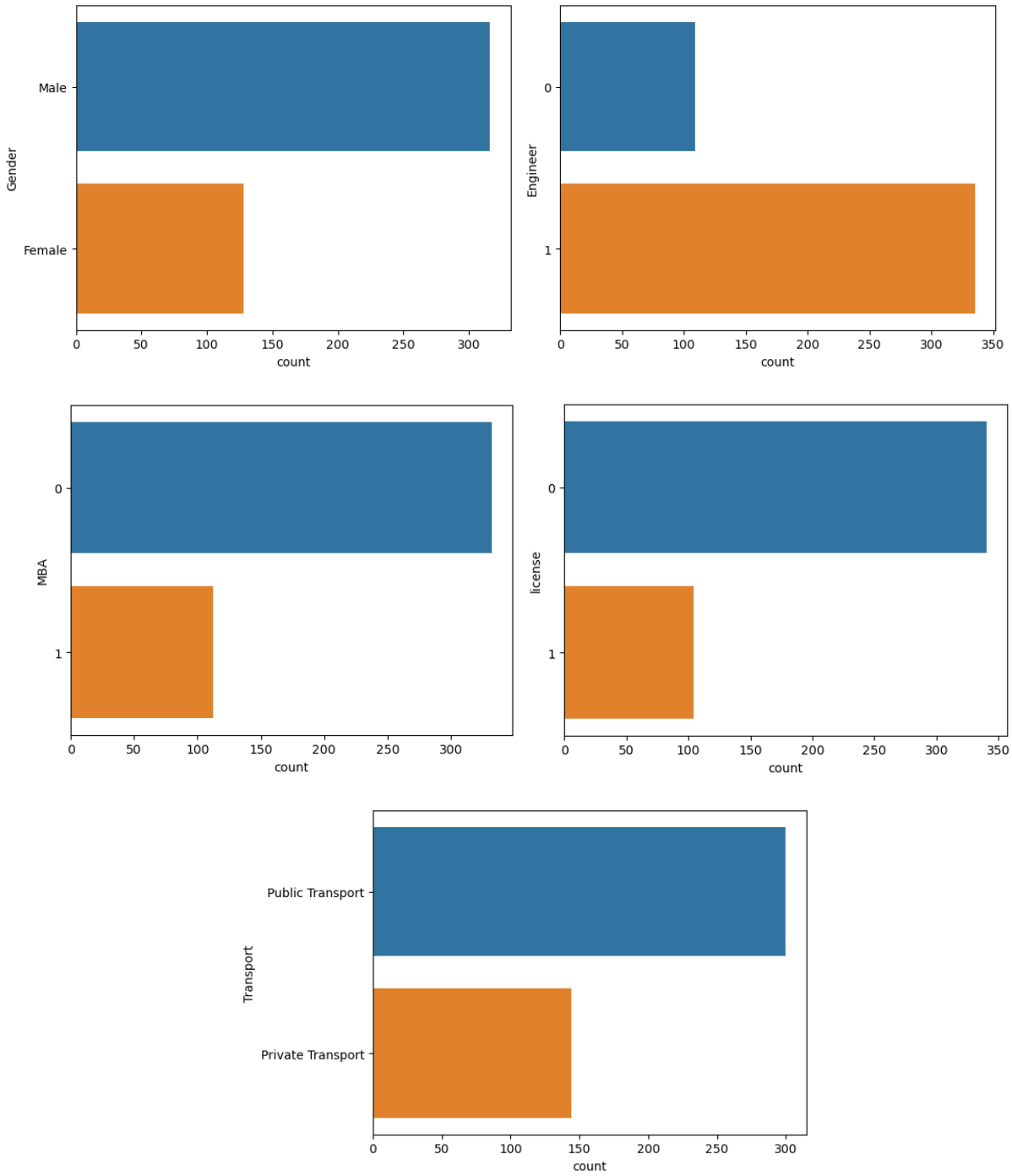
Univariate Analysis: There are 4 numerical data type all of which are skewed



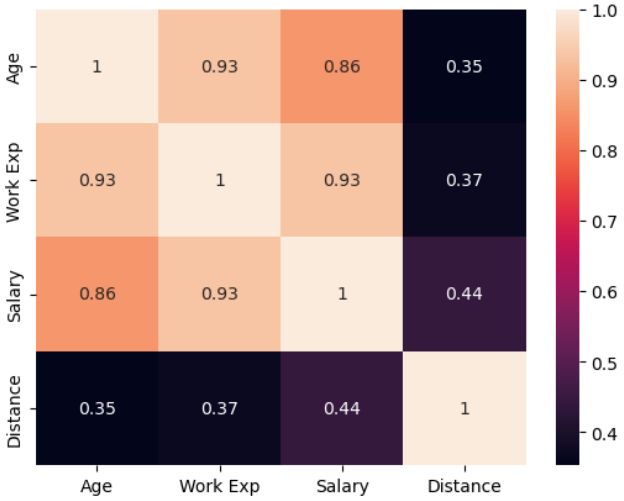
Following figure shows that, some data has outliers in it. This can be remove for better efficiency in accuracy.

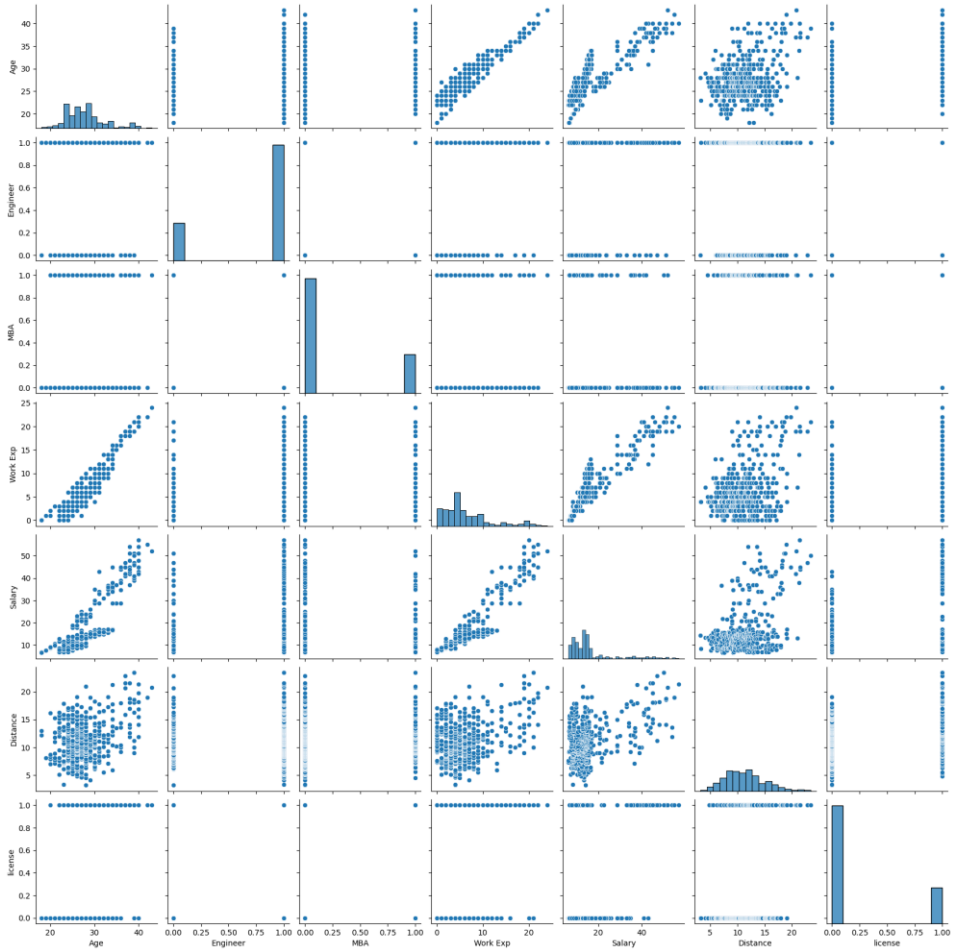


Count Chart shows the actual count of employees in each feature type.



Multivariate Analysis: It is found that Age & Work Ex. And Age and Salary are highly correlated. There is a poor or less correlation between distance and other feature types.





Machine Learning:

26 Machine learning models are evaluated for better understanding and to find the best model using Lazy Predict code.

Out[41]:

Model	Accuracy	Balanced Accuracy	ROC AUC	F1 Score	Time Taken
RandomForestClassifier	0.84	0.78	0.78	0.83	0.35
ExtraTreesClassifier	0.80	0.74	0.74	0.79	0.26
BaggingClassifier	0.79	0.74	0.74	0.79	0.07
ExtraTreeClassifier	0.78	0.74	0.74	0.78	0.03
LGBMClassifier	0.81	0.73	0.73	0.79	0.12
LabelPropagation	0.78	0.72	0.72	0.77	0.03
XGBClassifier	0.78	0.72	0.72	0.77	0.18
LabelSpreading	0.77	0.71	0.71	0.76	0.04
SVC	0.79	0.69	0.69	0.76	0.05
LogisticRegression	0.78	0.69	0.69	0.75	0.05
AdaBoostClassifier	0.76	0.69	0.69	0.75	0.33
RidgeClassifierCV	0.78	0.68	0.68	0.75	0.03
CalibratedClassifierCV	0.78	0.68	0.68	0.75	0.11
LinearDiscriminantAnalysis	0.77	0.68	0.68	0.75	0.03
LinearSVC	0.76	0.68	0.68	0.74	0.03
NearestCentroid	0.75	0.67	0.67	0.73	0.03
RidgeClassifier	0.76	0.67	0.67	0.73	0.03
BernoulliNB	0.73	0.67	0.67	0.72	0.02
Perceptron	0.74	0.66	0.66	0.72	0.05
GaussianNB	0.76	0.66	0.66	0.72	0.03
QuadraticDiscriminantAnalysis	0.74	0.66	0.66	0.72	0.02
SGDClassifier	0.70	0.64	0.64	0.69	0.05
KNeighborsClassifier	0.75	0.64	0.64	0.71	0.04
DecisionTreeClassifier	0.68	0.63	0.63	0.68	0.02
NuSVC	0.74	0.62	0.62	0.68	0.06
DummyClassifier	0.66	0.50	0.50	0.53	0.01
PassiveAggressiveClassifier	0.51	0.46	0.46	0.51	0.02

Conclusion :

The bivariate analysis indicate that based on gender and availability of license, both males and females having license prefer private transport. Therefore, apart from gender, license is another deciding factor in determining the use the private or public transport.

Based on the accuracy of the various models, it can be concluded that the Random Forest classifier model is the best model for the given dataset as this model gives the highest accuracy.