In [1]:
```
!dir
#!pip install openpyxl
!python.exe -m pip install --upgrade pip
```

```
 Volume in drive E is Kingston-SSD
 Volume Serial Number is D895-0755

 Directory of E:\WPU\Final_internship

28-02-2023  18:45    <DIR>          .
23-02-2023  23:13    <DIR>          ..
28-02-2023  17:13    <DIR>          .ipynb_checkpoints
10-04-2022  17:25           737,063 EDA_EmployeeAttrition_Amitkumar.ipynb
28-02-2023  18:45           246,458 EDA_Employee_Performance.ipynb
23-02-2023  23:14               511 New Text Document.txt
28-02-2023  16:40         1,565,147 Test_data.csv
28-02-2023  16:40         3,759,647 Train_data.csv
               5 File(s)      6,308,826 bytes
               3 Dir(s)  196,329,910,272 bytes free
Requirement already satisfied: pip in c:\users\amit pc\appdata\local\programs\python\python37\lib\site-packages (23.0.1)
```

Loading data

In [2]:
```
import pandas as pd

train_data = pd.read_csv("Train_data.csv")

train_data.head()

test_data = pd.read_csv("Test_data.csv")

test_data.head()
```

Out[2]:

	employee_id	department	region	education	gender	recruitment_channel	no_of_trainings	age	previous_year_rating	length_of_service	KPIs_met >80%	awards_won?	avg_training_score
0	8724	Technology	region_26	Bachelor's	m	sourcing	1	24	NaN	1	1	0	77
1	74430	HR	region_4	Bachelor's	f	other	1	31	3.0	5	0	0	51
2	72255	Sales & Marketing	region_13	Bachelor's	m	other	1	31	1.0	4	0	0	47
3	38562	Procurement	region_2	Bachelor's	f	other	3	31	2.0	9	0	0	65
4	64486	Finance	region_29	Bachelor's	m	sourcing	1	30	4.0	7	0	0	61

Data Info

In [3]:
```
train_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 54808 entries, 0 to 54807
Data columns (total 14 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   employee_id           54808 non-null  int64
 1   department            54808 non-null  object
 2   region                54808 non-null  object
 3   education             52399 non-null  object
```

```
 4   gender                54808 non-null  object
 5   recruitment_channel   54808 non-null  object
 6   no_of_trainings       54808 non-null  int64
 7   age                   54808 non-null  int64
 8   previous_year_rating  50684 non-null  float64
 9   length_of_service     54808 non-null  int64
 10  KPIs_met >80%         54808 non-null  int64
 11  awards_won?           54808 non-null  int64
 12  avg_training_score    54808 non-null  int64
 13  is_promoted           54808 non-null  int64
dtypes: float64(1), int64(8), object(5)
memory usage: 5.9+ MB
```

In [4]:
```
train_data.dtypes
```

Out[4]:
```
employee_id              int64
department              object
region                  object
education               object
gender                  object
recruitment_channel     object
no_of_trainings          int64
age                      int64
previous_year_rating   float64
length_of_service        int64
KPIs_met >80%            int64
awards_won?              int64
avg_training_score       int64
is_promoted              int64
dtype: object
```

Data Cleaning

In [5]:
```
#Checking for NULL values
train_data.isna().sum()
```

Out[5]:
```
employee_id              0
department               0
region                   0
education             2409
gender                   0
recruitment_channel      0
no_of_trainings          0
age                      0
previous_year_rating    4124
length_of_service        0
KPIs_met >80%            0
awards_won?              0
avg_training_score       0
is_promoted              0
dtype: int64
```

In [6]:
```
# Replacing NAs in education by 'Other'

train_data['education'] = train_data['education'].fillna('Other')
test_data['education'] = test_data['education'].fillna('Other')
```

In [7]:
```
# Replacing NAs in previous_year_rating by '0'

train_data['previous_year_rating'] = train_data['previous_year_rating'].fillna(0)
test_data['previous_year_rating'] = test_data['previous_year_rating'].fillna(0)
```

In [8]:
```
# All NULL values are gone
train_data.isna().sum()
```

Out[8]:
```
employee_id             0
department              0
region                  0
education               0
gender                  0
recruitment_channel     0
no_of_trainings         0
age                     0
previous_year_rating    0
length_of_service       0
KPIs_met >80%           0
awards_won?             0
avg_training_score      0
is_promoted             0
dtype: int64
```

In [9]:
```
# Checking for duplicates
train_data.duplicated().sum()
```

Out[9]:
```
0
```

In [10]:
```
# Dropping employee_id since it is redundant
train_data = train_data.drop(["employee_id"], axis=1)
test_data = test_data.drop(["employee_id"], axis=1)
```

Checking for column types

In [11]:
```
import numpy as np

numeric_columns = list(train_data.select_dtypes(include=np.number).columns)
categorical_columns = list(train_data.select_dtypes(include="object").columns)
```

Numeric Columns

In [12]:
```
train_data[numeric_columns].describe()
```

Out[12]:

	no_of_trainings	age	previous_year_rating	length_of_service	KPIs_met >80%	awards_won?	avg_training_score	is_promoted
count	54808.000000	54808.000000	54808.000000	54808.000000	54808.000000	54808.000000	54808.000000	54808.000000
mean	1.253011	34.803915	3.078748	5.865512	0.351974	0.023172	63.386750	0.085170
std	0.609264	7.660169	1.496458	4.265094	0.477590	0.150450	13.371559	0.279137
min	1.000000	20.000000	0.000000	1.000000	0.000000	0.000000	39.000000	0.000000
25%	1.000000	29.000000	2.000000	3.000000	0.000000	0.000000	51.000000	0.000000
50%	1.000000	33.000000	3.000000	5.000000	0.000000	0.000000	60.000000	0.000000
75%	1.000000	39.000000	4.000000	7.000000	1.000000	0.000000	76.000000	0.000000
max	10.000000	60.000000	5.000000	37.000000	1.000000	1.000000	99.000000	1.000000

Categorical Columns

In [13]:
```
train_data[categorical_columns].describe()
```

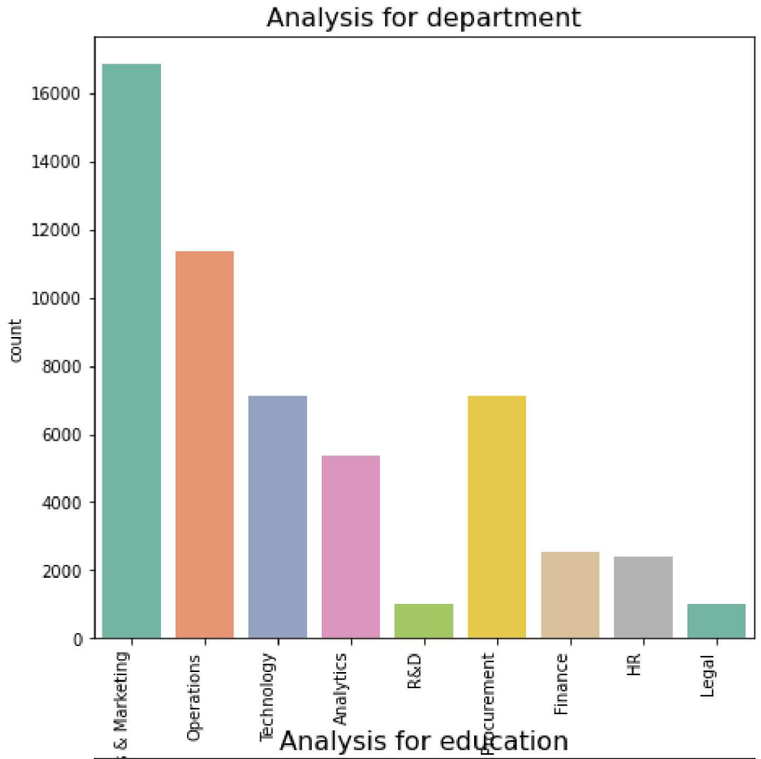
Out[13]:

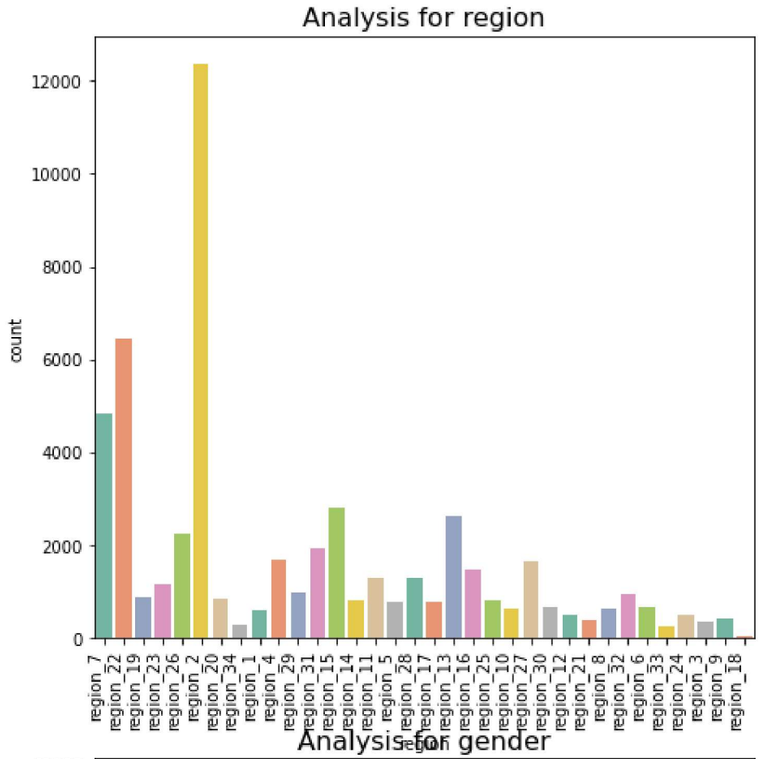
	department	region	education	gender	recruitment_channel
count	54808	54808	54808	54808	54808
unique	9	34	4	2	3
top	Sales & Marketing	region_2	Bachelor's	m	other
freq	16840	12343	36669	38496	30446

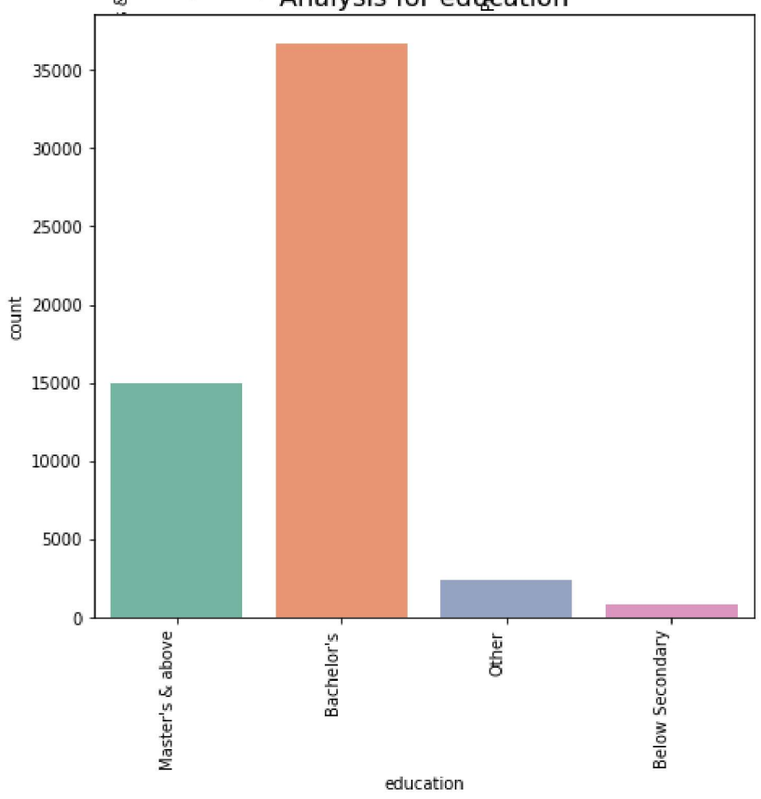
Categorical Column Data Analysis

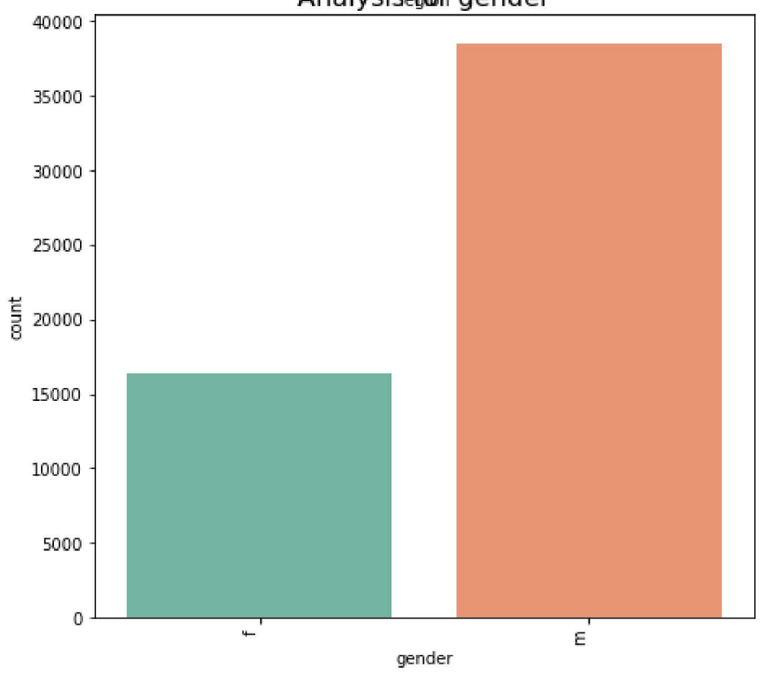
In [14]:
```
import matplotlib.pyplot as plt
import seaborn as sns

fig, ax = plt.subplots(2,2, figsize = (16,15))

ax = np.ravel(ax)
for i in range(len(categorical_columns)):
    sns.countplot(data = train_data, x = categorical_columns[i], ax = ax[i], palette="Set2")
    ax[i].set_xticklabels(labels = train_data[categorical_columns[i]].unique(), rotation=90, ha='right')
    ax[i].set_title(label = "Analysis for "+categorical_columns[i],fontsize=16)
ax = np.reshape(ax, (2, 2))
plt.tight_layout()
```

```
---------------------------------------------------------------------------
IndexError                                Traceback (most recent call last)
<ipython-input-14-abd4a960abcf> in <module>
      6 ax = np.ravel(ax)
      7 for i in range(len(categorical_columns)):
----> 8     sns.countplot(data = train_data, x = categorical_columns[i], ax = ax[i], palette="Set2")
      9     ax[i].set_xticklabels(labels = train_data[categorical_columns[i]].unique(), rotation=90, ha='right')
     10     ax[i].set_title(label = "Analysis for "+categorical_columns[i],fontsize=16)

IndexError: index 4 is out of bounds for axis 0 with size 4
```









One Hot Encoding for Categorical Data

In [15]:
```
from sklearn.preprocessing import LabelEncoder
label_encoder = LabelEncoder()

train_data["department"] = label_encoder.fit_transform(train_data["department"])
train_data["region"] = label_encoder.fit_transform(train_data["region"])
train_data["education"] = label_encoder.fit_transform(train_data["education"])
train_data["gender"] = label_encoder.fit_transform(train_data["gender"])
train_data["recruitment_channel"] = label_encoder.fit_transform(train_data["recruitment_channel"])
```

In [16]:
```
X = train_data.loc[:, train_data.columns != "is_promoted"].copy()
y = train_data.loc[:, "is_promoted"].copy()

y = label_encoder.fit_transform(y)
y = pd.DataFrame(y, index= train_data.index, columns=["is_promoted"])

categorical_cols_features = list(X.select_dtypes(include="object").columns)
```

In [17]:
```
# Data After Encoding
X.head()
```

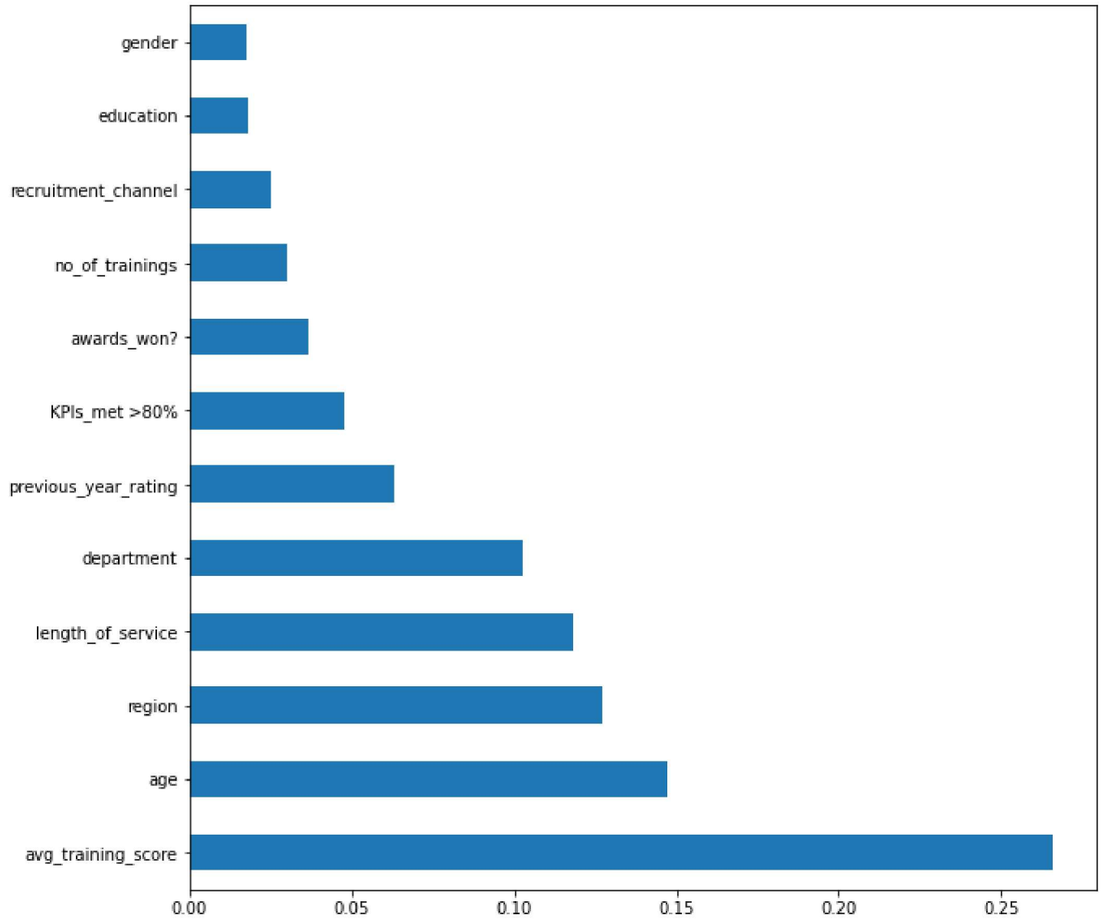
Out[17]:

	department	region	education	gender	recruitment_channel	no_of_trainings	age	previous_year_rating	length_of_service	KPIs_met >80%	awards_won?	avg_training_score
0	7	31	2	0	2	1	35	5.0	8	1	0	49
1	4	14	0	1	0	1	30	5.0	4	0	0	60
2	7	10	0	1	2	1	34	3.0	7	0	0	50
3	7	15	0	1	0	2	39	1.0	10	0	0	50
4	8	18	0	1	0	1	45	3.0	2	0	0	73

Feature Importance

Getting the feature importance for every column with respect to Target variable

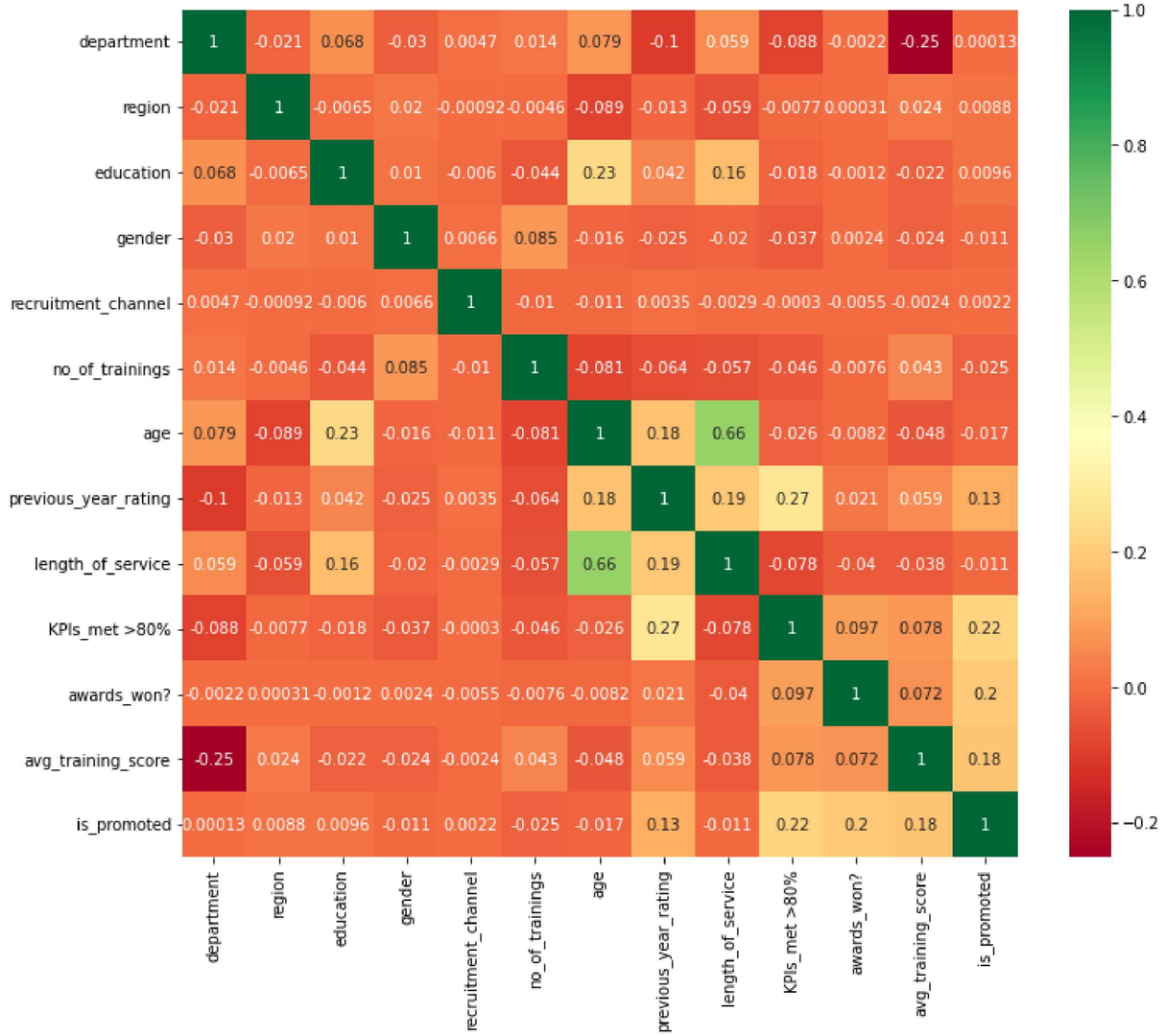
In [18]:
```
from sklearn.ensemble import ExtraTreesClassifier
import matplotlib.pyplot as plt

model = ExtraTreesClassifier()
model.fit(X,np.ravel(y))


f = plt.figure()
f.set_figwidth(10)
f.set_figheight(10)


#plot graph of feature importances for better visualization
feat_importances = pd.Series(model.feature_importances_, index=X.columns)
feat_importances.nlargest(35).plot(kind='barh')
plt.show()
```



Correlation Matrix

In [19]:

```
#get correlations of each features in dataset
corrmat = train_data.corr()
top_corr_features = corrmat.index
plt.figure(figsize=(12,10))
#plot heat map
g=sns.heatmap(train_data[top_corr_features].corr(),annot=True,cmap="RdYlGn")
```



Inference

- From categorical importance we can infer that there is a hugh class imbalance in all the 4 attributes
- From the feature importance and Correlation Matrix we understand the importance of each attribute among which avg_training_score scores the highest
- All preprocessing steps are performed and after performing EDA in this module are data is ready to train under a classifier

In [ ]: