In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix,accuracy_score
from sklearn import tree,svm
from sklearn.ensemble import RandomForestClassifier
import pickle
```

In [2]:

```
df = pd.read_csv('mldata.csv')
df.head()
```

Out[2]:

	Logical quotient rating	hackathons	coding skills rating	public speaking points	self-learning capability?	Extra-courses did	certifications	reading and writing skills	mem capab sc
0	5	0	6	2	yes	no	information security	poor	p
1	7	6	4	3	no	yes	shell programming	excellent	med
2	2	3	9	1	no	yes	information security	excellent	p
3	2	6	3	5	no	yes	r programming	excellent	p
4	2	0	3	4	yes	no	distro making	excellent	med

In [3]:

```
print('The shape of our training set: %s professionals and %s features'%(df.shape[0],df.sha
```

```
The shape of our training set: 6901 professionals and 17 features
```

Data Preprocessing

In [4]:

```
print("Columns in our dataset: " , df.columns)
```

```
Columns in our dataset:  Index(['Logical quotient rating', 'hackathons', 'co
ding skills rating',
       'public speaking points', 'self-learning capability?',
       'Extra-courses did', 'certifications', 'reading and writing skills',
       'memory capability score', 'Interested subjects',
       'interested career area ', 'Type of company want to settle in?',
       'Taken inputs from seniors or elders', 'Management or Technical',
       'hard/smart worker', 'worked in teams ever?', 'Suggested Job Role'],
      dtype='object')
```

In [5]:

```
print("List of Numerical features: \n" , df.select_dtypes(include=np.number).columns.tolist
print("\n\nList of Categorical features: \n" , df.select_dtypes(include=['object']).columns
```

```
List of Numerical features:
 ['Logical quotient rating', 'hackathons', 'coding skills rating', 'public s
peaking points']


List of Categorical features:
 ['self-learning capability?', 'Extra-courses did', 'certifications', 'readi
ng and writing skills', 'memory capability score', 'Interested subjects', 'i
nterested career area ', 'Type of company want to settle in?', 'Taken inputs
from seniors or elders', 'Management or Technical', 'hard/smart worker', 'wo
rked in teams ever?', 'Suggested Job Role']
```

Checking Missing Values

In [6]:

```
df.isnull().sum(axis=0)
```

Out[6]:

```
Logical quotient rating               0
hackathons                            0
coding skills rating                  0
public speaking points                0
self-learning capability?             0
Extra-courses did                     0
certifications                        0
reading and writing skills            0
memory capability score               0
Interested subjects                   0
interested career area                0
Type of company want to settle in?    0
Taken inputs from seniors or elders   0
Management or Technical               0
hard/smart worker                     0
worked in teams ever?                 0
Suggested Job Role                    0
dtype: int64
```

Observation: No missing values.

Distinct Values for Categorical Features

In [7]:

```
categorical_col = df[['self-learning capability?', 'Extra-courses did','reading and writing
                      'Taken inputs from seniors or elders', 'Management or Technical', 'ha
                     'interested career area ']]
for i in categorical_col:
    print(df[i].value_counts(), end="\n\n")
```

```
yes    3496
no     3405
Name: self-learning capability?, dtype: int64

no     3529
yes    3372
Name: Extra-courses did, dtype: int64

excellent    2328
medium       2315
poor         2258
Name: reading and writing skills, dtype: int64

medium       2317
excellent    2303
poor         2281
Name: memory capability score, dtype: int64

yes    3501
no     3400
Name: Taken inputs from seniors or elders, dtype: int64

Management    3461
Technical     3440
Name: Management or Technical, dtype: int64

smart worker    3523
hard worker     3378
Name: hard/smart worker, dtype: int64

no     3470
yes    3431
Name: worked in teams ever?, dtype: int64

system developer            1178
security                    1177
Business process analyst    1154
developer                   1145
testing                     1128
cloud computing             1119
Name: interested career area , dtype: int64
```

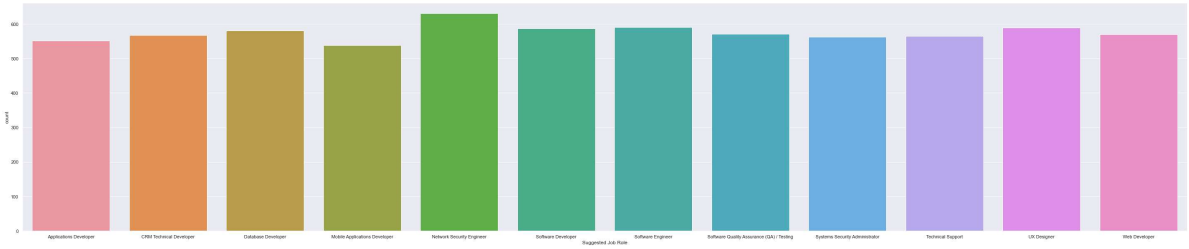
Data Balancing for Classification

In [8]:

```
sns.set(rc={'figure.figsize':(50,10)})
sns.countplot(x = df["Suggested Job Role"])
```

Out[8]:

```
<AxesSubplot:xlabel='Suggested Job Role', ylabel='count'>
```



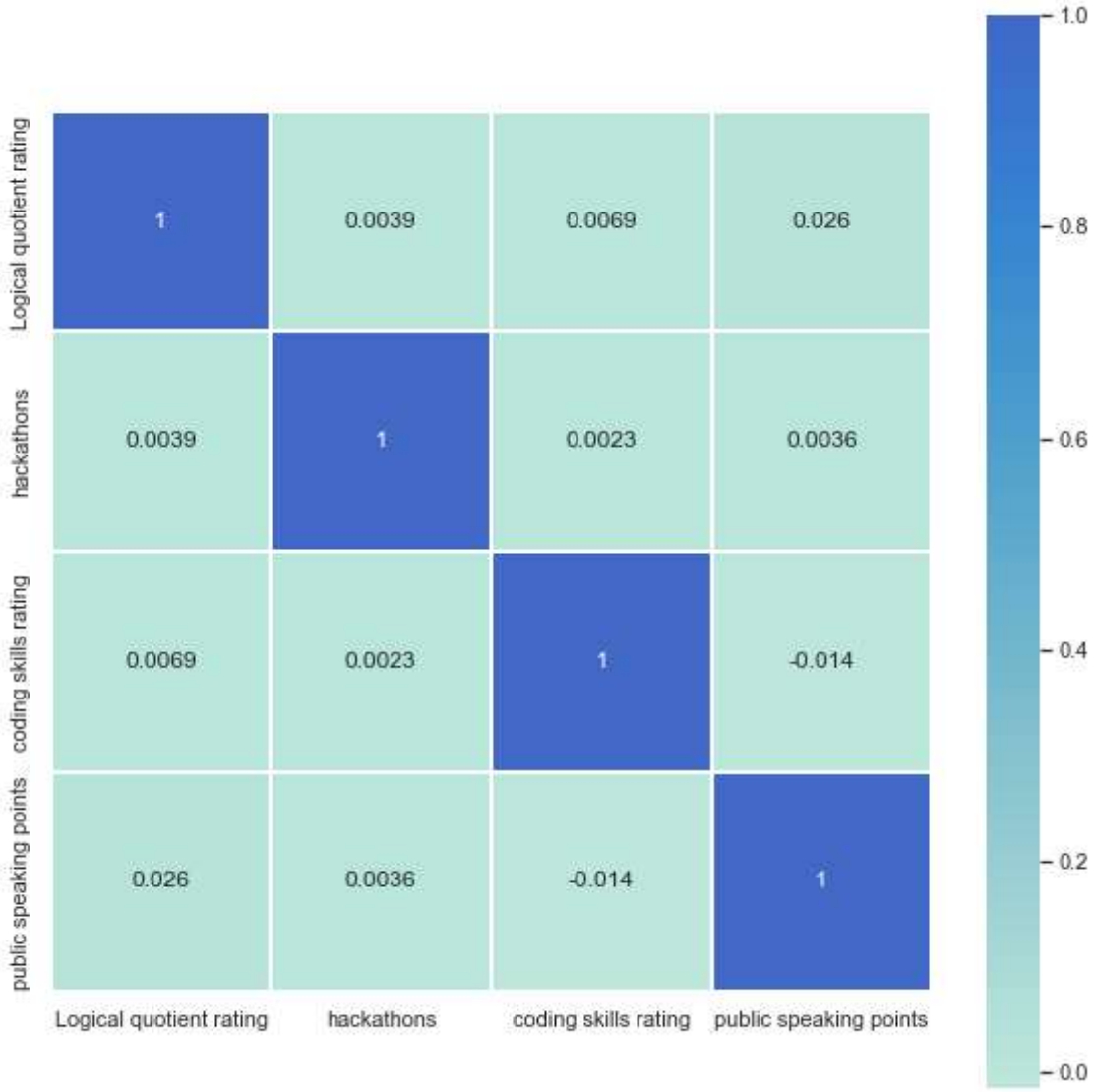
Correlation Between Numerical Features

In [9]:

```
corr = df[['Logical quotient rating', 'hackathons',
           'coding skills rating', 'public speaking points']].corr()
f,axes = plt.subplots(1,1,figsize = (10,10))
sns.heatmap(corr,square=True,annot = True,linewidth = .4,center = 2,ax = axes)
```

Out[9]:

```
<AxesSubplot:>
```



No highly corelated numerical pair found

Visualization for Categorical Variables

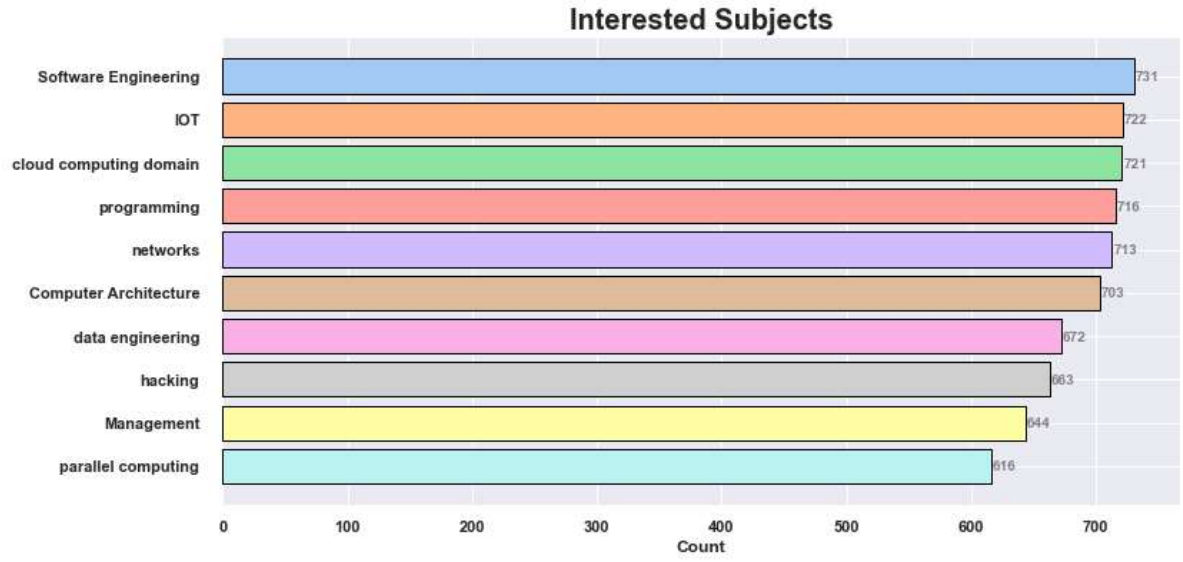
In [10]:

```
print(df["Interested subjects"].value_counts())
```

```
Software Engineering      731
IOT                       722
cloud computing domain    721
programming               716
networks                  713
Computer Architecture     703
data engineering          672
hacking                   663
Management                644
parallel computing        616
Name: Interested subjects, dtype: int64
```

In [11]:

```
# Figure Size
fig, ax = plt.subplots(figsize=(12,6))

# Horizontal Bar Plot
title_cnt=df["Interested subjects"].value_counts().sort_values(ascending=False).reset_index
mn= ax.barh(title_cnt.iloc[:,0], title_cnt.iloc[:,1],edgecolor='black', color=sns.color_pal



# Remove axes splines
for s in ['top','bottom','left','right']:
    ax.spines[s].set_visible(False)

# Remove x,y Ticks
ax.xaxis.set_ticks_position('none')
ax.yaxis.set_ticks_position('none')
# Add padding between axes and labels
ax.xaxis.set_tick_params(pad=5)
ax.yaxis.set_tick_params(pad=10)


# Show top values
ax.invert_yaxis()

# Add Plot Title
ax.set_title('Interested Subjects',weight='bold',fontsize=20)
ax.set_xlabel('Count', weight='bold')

# Add annotation to bars
for i in ax.patches:
    ax.text(i.get_width()+1, i.get_y()+0.5, str(round((i.get_width()), 2)),
            fontsize=10, fontweight='bold', color='grey')
plt.yticks(weight='bold')
plt.xticks(weight='bold')

# Show Plot
plt.show()
```



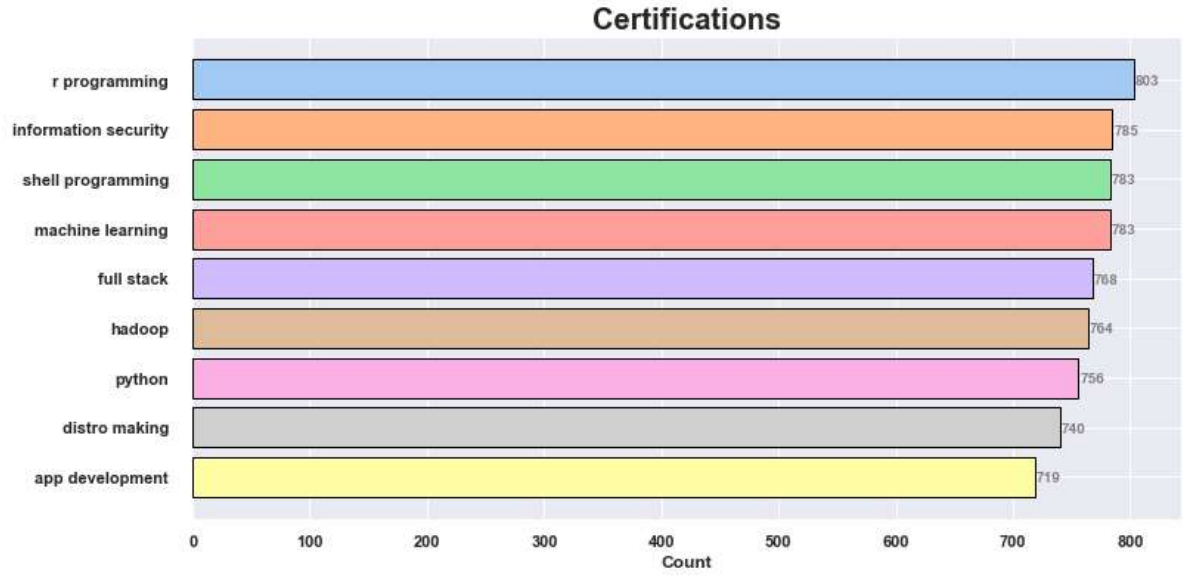
In [12]:

```
print(df["certifications"].value_counts())
```

```
r programming           803
information security    785
shell programming       783
machine learning        783
full stack              768
hadoop                  764
python                  756
distro making           740
app development         719
Name: certifications, dtype: int64
```

In [13]:

```
# Figure Size
fig, ax = plt.subplots(figsize=(12,6))

# Horizontal Bar Plot
title_cnt=df.certifications.value_counts().sort_values(ascending=False).reset_index()
mn= ax.barh(title_cnt.iloc[:,0], title_cnt.iloc[:,1],edgecolor='black', color=sns.color_pal



# Remove axes splines
for s in ['top','bottom','left','right']:
    ax.spines[s].set_visible(False)

# Remove x,y Ticks
ax.xaxis.set_ticks_position('none')
ax.yaxis.set_ticks_position('none')
# Add padding between axes and labels
ax.xaxis.set_tick_params(pad=5)
ax.yaxis.set_tick_params(pad=10)


# Show top values
ax.invert_yaxis()

# Add Plot Title
ax.set_title('Certifications',weight='bold',fontsize=20)
ax.set_xlabel('Count', weight='bold')

# Add annotation to bars
for i in ax.patches:
    ax.text(i.get_width()+1, i.get_y()+0.5, str(round((i.get_width()), 2)),
            fontsize=10, fontweight='bold', color='grey')
plt.yticks(weight='bold')
plt.xticks(weight='bold')

# Show Plot
plt.show()
```



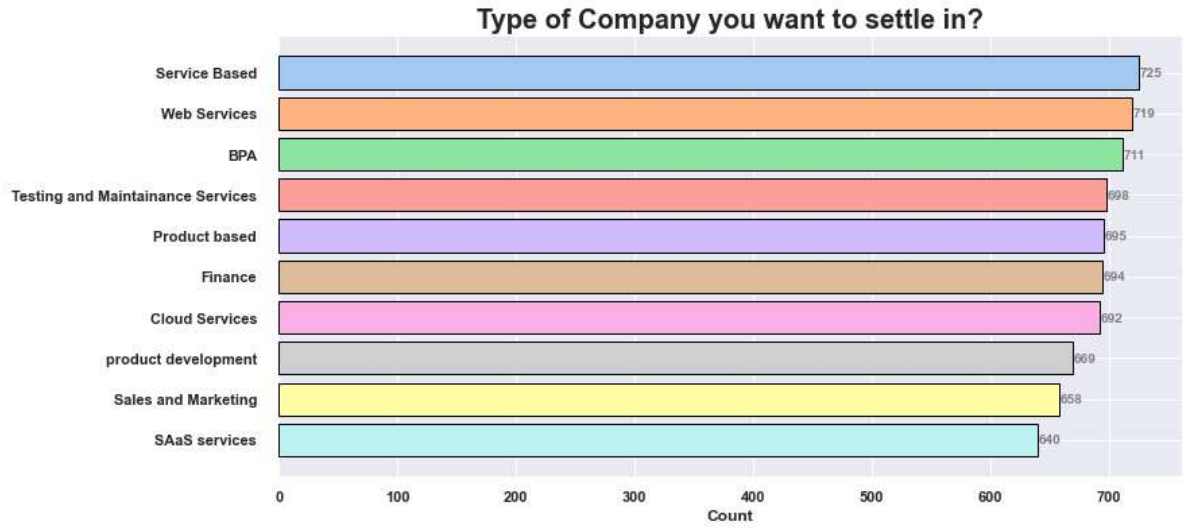
In [14]:

```
print(df["Type of company want to settle in?"].value_counts())
```

```
Service Based                          725
Web Services                           719
BPA                                    711
Testing and Maintainance Services      698
Product based                          695
Finance                                694
Cloud Services                         692
product development                    669
Sales and Marketing                    658
SAaS services                          640
Name: Type of company want to settle in?, dtype: int64
```

In [15]:

```
# Figure Size
fig, ax = plt.subplots(figsize=(12,6))

# Horizontal Bar Plot
title_cnt=df["Type of company want to settle in?"].value_counts().sort_values(ascending=Fal
mn= ax.barh(title_cnt.iloc[:,0], title_cnt.iloc[:,1],edgecolor='black', color=sns.color_pal



# Remove axes splines
for s in ['top','bottom','left','right']:
    ax.spines[s].set_visible(False)

# Remove x,y Ticks
ax.xaxis.set_ticks_position('none')
ax.yaxis.set_ticks_position('none')
# Add padding between axes and labels
ax.xaxis.set_tick_params(pad=5)
ax.yaxis.set_tick_params(pad=10)


# Show top values
ax.invert_yaxis()

# Add Plot Title
ax.set_title('Type of Company you want to settle in?',weight='bold',fontsize=20)
ax.set_xlabel('Count', weight='bold')

# Add annotation to bars
for i in ax.patches:
    ax.text(i.get_width()+1, i.get_y()+0.5, str(round((i.get_width()), 2)),
            fontsize=10, fontweight='bold', color='grey')
plt.yticks(weight='bold')
plt.xticks(weight='bold')

# Show Plot
plt.show()
```



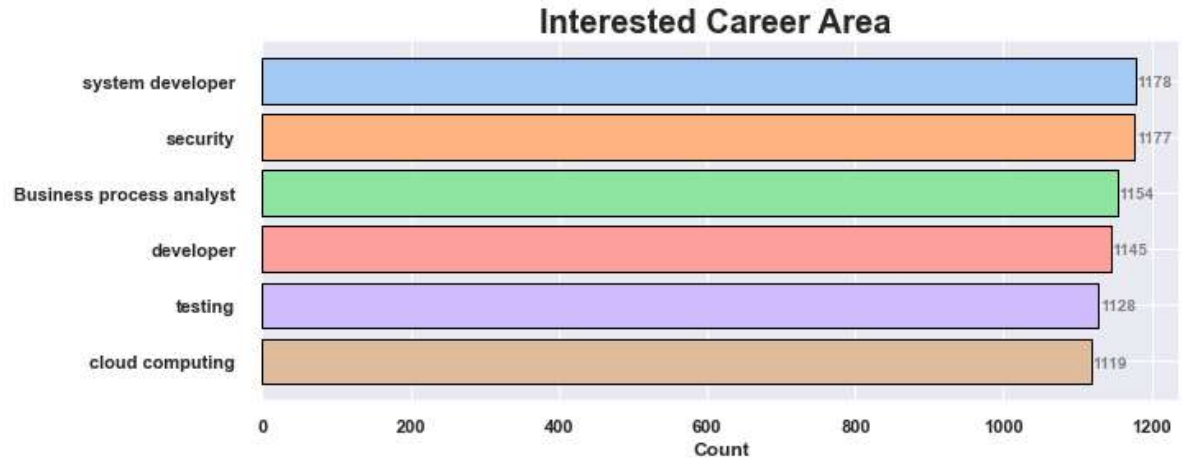
In [16]:

```
print(df["interested career area "].value_counts())
```

```
system developer            1178
security                    1177
Business process analyst    1154
developer                   1145
testing                     1128
cloud computing             1119
Name: interested career area , dtype: int64
```

In [17]:

```
# Figure Size
fig, ax = plt.subplots(figsize=(10,4)) #width,height

# Horizontal Bar Plot
title_cnt=df["interested career area "].value_counts().sort_values(ascending=False).reset_i
mn= ax.barh(title_cnt.iloc[:,0], title_cnt.iloc[:,1],edgecolor='black', color=sns.color_pal



# Remove axes splines
for s in ['top','bottom','left','right']:
    ax.spines[s].set_visible(False)

# Remove x,y Ticks
ax.xaxis.set_ticks_position('none')
ax.yaxis.set_ticks_position('none')
# Add padding between axes and labels
ax.xaxis.set_tick_params(pad=5)
ax.yaxis.set_tick_params(pad=10)


# Show top values
ax.invert_yaxis()

# Add Plot Title
ax.set_title('Interested Career Area ',weight='bold',fontsize=20)
ax.set_xlabel('Count', weight='bold')

# Add annotation to bars
for i in ax.patches:
    ax.text(i.get_width()+1, i.get_y()+0.5, str(round((i.get_width()), 2)),
            fontsize=10, fontweight='bold', color='grey')
plt.yticks(weight='bold')
plt.xticks(weight='bold')

# Show Plot
plt.show()
```



Binary Encoding for Categorical Variables

In [18]:

```
cols = df[["self-learning capability?", "Extra-courses did","Taken inputs from seniors or e
for i in cols:
    cleanup_nums = {i: {"yes": 1, "no": 0, "smart worker": 1, "hard worker": 0, "Management

    df = df.replace(cleanup_nums)
```

Number Encoding for Categorical

In [19]:

```
mycol = df[['reading and writing skills', 'memory capability score', 'certifications', 'Man
           'hard/smart worker', 'Type of company want to settle in?', 'Interested subjects
for i in mycol:
    cleanup_nums = {i: {"poor": 0, "medium": 1, "excellent": 2, "r programming": 1, "inform
                        "shell programming": 3, "machine learning": 4, "full stack": 5, "ha
                        "distro making": 8, "app development": 9, "Service Based": 1, "Web
                        "BPA": 3, "Testing and Maintainance Services": 4, "Product based":
                        "product development": 8, "Sales and Marketing": 9, "SAaS services"
                        "Business process analyst": 3, "developer": 4, "testing": 5, "cloud
                        "Software Engineering": 1, "IOT": 2, "cloud computing domain": 3, "
                        "hacking": 8, "Management": 9, "parallel computing": 10}}
    df = df.replace(cleanup_nums)


print("\n\nList of Categorical features: \n" , df.select_dtypes(include=['object']).columns
```

```
List of Categorical features:
 ['Suggested Job Role']
```

Dummy Variable Encoding

In [20]:

```
df.head()
```

Out[20]:

	Logical quotient rating	hackathons	coding skills rating	public speaking points	self-learning capability?	Extra-courses did	certifications	reading and writing skills	memo capabi sc
0	5	0	6	2	1	0	2	0	
1	7	6	4	3	0	1	3	2	
2	2	3	9	1	0	1	2	2	
3	2	6	3	5	0	1	1	2	
4	2	0	3	4	1	0	8	2	

In [21]:

```
print("List of Numerical features: \n" , df.select_dtypes(include=np.number).columns.tolist
```

```
List of Numerical features:
 ['Logical quotient rating', 'hackathons', 'coding skills rating', 'public s
peaking points', 'self-learning capability?', 'Extra-courses did', 'certific
ations', 'reading and writing skills', 'memory capability score', 'Intereste
d subjects', 'interested career area ', 'Type of company want to settle i
n?', 'Taken inputs from seniors or elders', 'Management or Technical', 'har
d/smart worker', 'worked in teams ever?']
```

Building Machine Learning Model

In [22]:

```
feed = df[['Logical quotient rating', 'hackathons', 'coding skills rating',
       'public speaking points', 'self-learning capability?',
       'Extra-courses did', 'certifications', 'reading and writing skills',
       'memory capability score', 'Interested subjects',
       'interested career area ', 'Type of company want to settle in?',
       'Taken inputs from seniors or elders', 'Management or Technical',
       'hard/smart worker', 'worked in teams ever?', 'Suggested Job Role']]

# Taking all independent variable columns
df_train_x = feed.drop('Suggested Job Role',axis = 1)

# Target variable column
df_train_y = feed['Suggested Job Role']

x_train, x_test, y_train, y_test = train_test_split(df_train_x, df_train_y, test_size=0.40,
```

Decision Tree Classifier

In [23]:

```
clf = tree.DecisionTreeClassifier()
clf.fit(x_train, y_train)
clf = clf.fit(x_train, y_train)
y_pred = clf.predict(x_test)
accuracy = accuracy_score(y_test,y_pred)
print("accuracy=",accuracy*100)
```

```
accuracy= 9.127127852227455
```

Random Forest Classifier

In [24]:

```
clf_1 = RandomForestClassifier()
clf_1.fit(x_train, y_train)
y_pred_1 = clf_1.predict(x_test)
accuracy_1 = accuracy_score(y_test,y_pred_1)
print("accuracy=",accuracy_1*100)
```

```
accuracy= 7.135095979717494
```

Predicting class

In [25]:

```
userdata = [['5','0','6','2','1','0','2','0','0','4','5','3','0','1','1','1']]
ynewclass = clf.predict(userdata)
ynew = clf.predict_proba(userdata)
print(ynewclass)
print("Probabilities of all classes: ", ynew)
print("Probability of Predicted class : ", np.max(ynew))
```

```
['Applications Developer']
Probabilities of all classes:  [[1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.]]
Probability of Predicted class :  1.0

C:\Users\mahad\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but DecisionTreeClassifier was fitted w
ith feature names
  warnings.warn(
C:\Users\mahad\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning:
X does not have valid feature names, but DecisionTreeClassifier was fitted w
ith feature names
  warnings.warn(
```

In [26]:

```
pickle.dump(clf,open('model.pkl','wb'))
```