About Dataset:

- Age: Age of the candidate
- Gender: Gneder of the candidate
- EducationLevel: Highest level of education attained by the candidate(1:Bachelor's (Type 1), 2: Bachelor's (Type 2) 3: Master's, 4: PhDs)
- ExperienceYears: Number of years of professional experience
- PreviousCompanies: Number of previous companies where the candidate has worked
- Distance From Company: Distance in kilometers from the candidate's residence to the hiring company
- Interview Score: Score achieved by the candidate in the interview process
- Skill Score: Assessment score of the candidate's technical skills
- Personality Score: Evaluation score of the candidate's personality traits
- Recruitment Strategy: Strategy adopted by the hiring team for recruitment(1: Aggressive, 2: Moderate, 3: Conservative)
- Hiring Decision (Target Variable): Outcome of the hiring decision
  If you need more information about dataset you can check here

In [308…
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [309…
```
df = pd.read_csv('recruitment_data.csv')
```

In [310…
```
df.head()
```

Out[310…

	Age	Gender	EducationLevel	ExperienceYears	PreviousCompanies	DistanceFromCompany	InterviewSc
0	26	1	2	0	3	26.783828	
1	39	1	4	12	3	25.862694	
2	48	0	2	3	2	9.920805	
3	34	1	2	5	2	6.407751	
4	30	0	1	6	1	43.105343	

In [311…
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1500 entries, 0 to 1499
Data columns (total 11 columns):
 #   Column               Non-Null Count  Dtype  
---  ------               --------------  -----  
 0   Age                  1500 non-null   int64  
 1   Gender               1500 non-null   int64  
 2   EducationLevel       1500 non-null   int64  
 3   ExperienceYears      1500 non-null   int64  
 4   PreviousCompanies    1500 non-null   int64  
 5   DistanceFromCompany  1500 non-null   float64
 6   InterviewScore       1500 non-null   int64  
 7   SkillScore           1500 non-null   int64  
 8   PersonalityScore     1500 non-null   int64  
 9   RecruitmentStrategy  1500 non-null   int64  
 10  HiringDecision       1500 non-null   int64  
dtypes: float64(1), int64(10)
memory usage: 129.0 KB
```

In [312…
```
df.isnull().sum()
```

Out[312…
```
Age                    0
Gender                 0
EducationLevel         0
ExperienceYears        0
PreviousCompanies      0
DistanceFromCompany    0
InterviewScore         0
SkillScore             0
PersonalityScore       0
RecruitmentStrategy    0
HiringDecision         0
dtype: int64
```

In [313…
```
df.describe()
```

Out[313…

	Age	Gender	EducationLevel	ExperienceYears	PreviousCompanies	DistanceFromComp
count	1500.000000	1500.000000	1500.000000	1500.000000	1500.00000	1500.000
mean	35.148667	0.492000	2.188000	7.694000	3.00200	25.505
std	9.252728	0.500103	0.862449	4.641414	1.41067	14.567
min	20.000000	0.000000	1.000000	0.000000	1.00000	1.031
25%	27.000000	0.000000	2.000000	4.000000	2.00000	12.838
50%	35.000000	0.000000	2.000000	8.000000	3.00000	25.502
75%	43.000000	1.000000	3.000000	12.000000	4.00000	37.737
max	50.000000	1.000000	4.000000	15.000000	5.00000	50.992

In [314…
```
df.duplicated().sum()
```

Out[314…
```
0
```

In [315…
```
df.shape
```

Out[315…
```
(1500, 11)
```

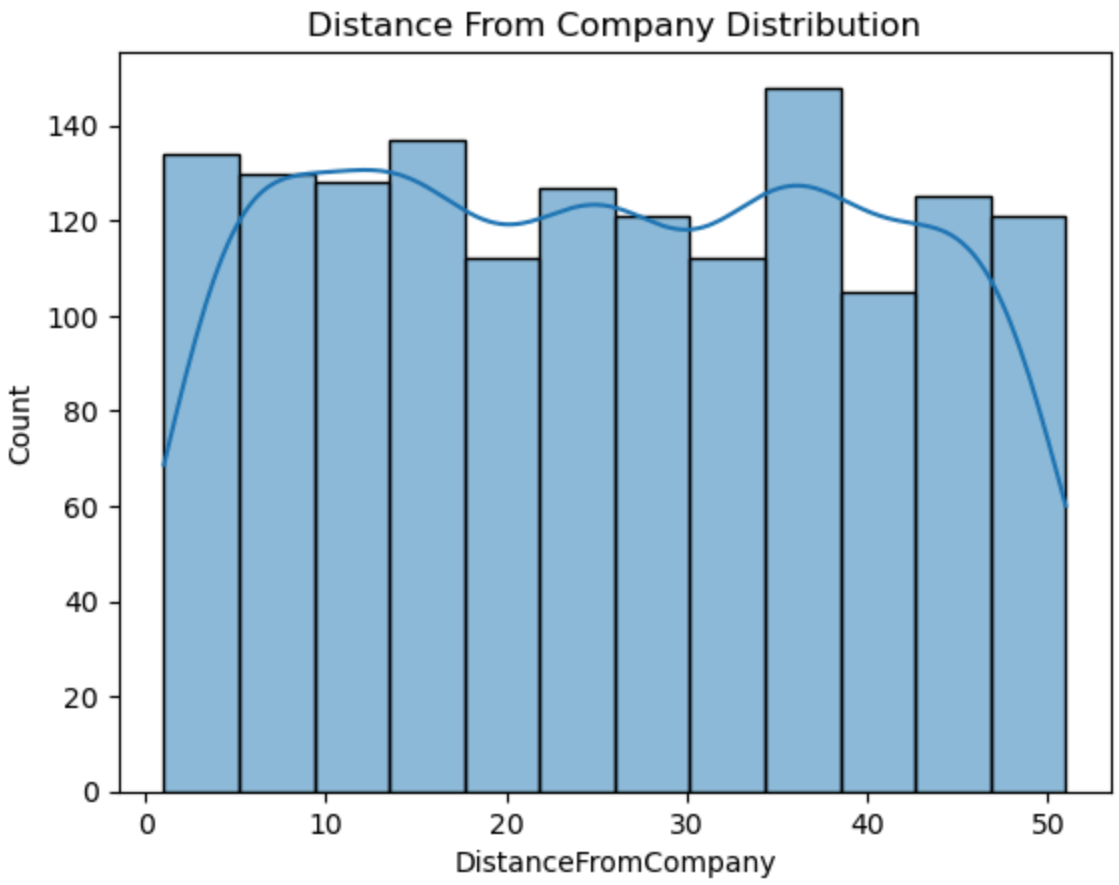
Exploratory Data Analysis (EDA)

In [317…
```
sns.countplot(data=df, x='Gender', hue='HiringDecision')
plt.title('Gender vs Hiring Decision')
```

Out[317…
```
Text(0.5, 1.0, 'Gender vs Hiring Decision')
```

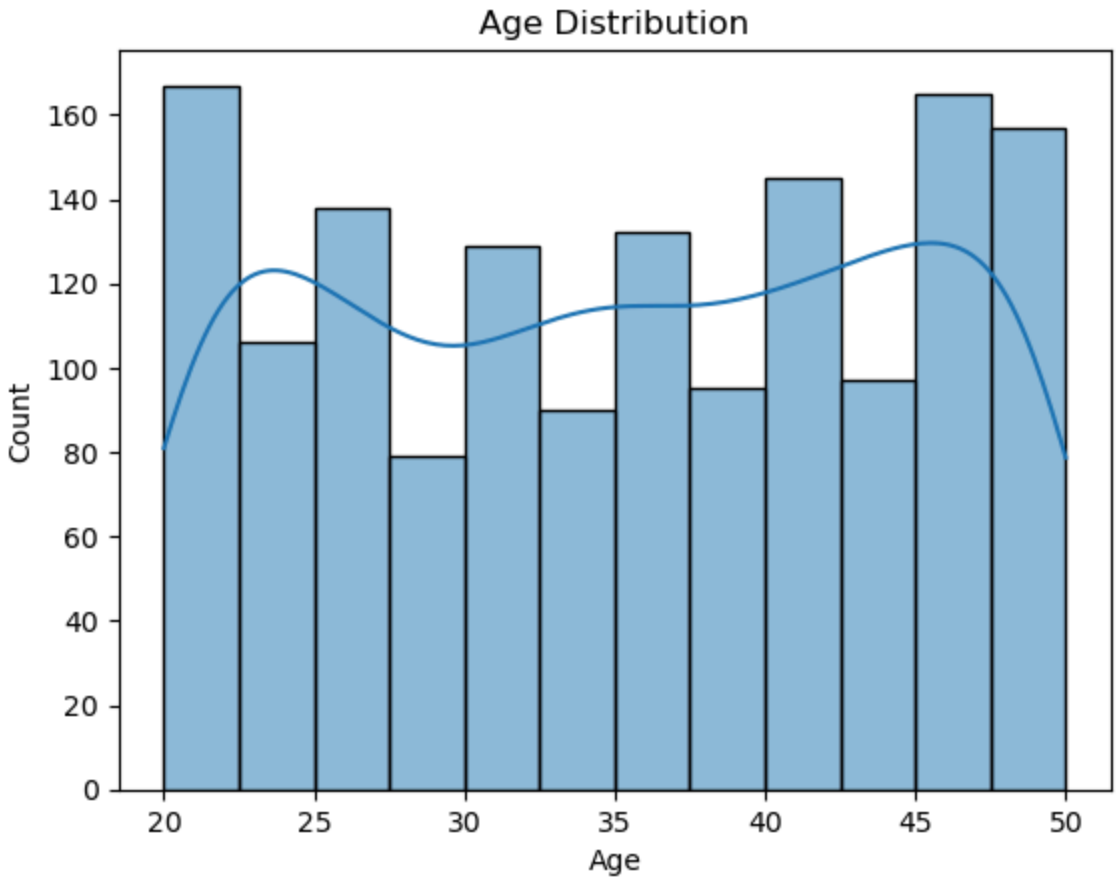
In [318…
```
sns.histplot(df['DistanceFromCompany'], kde=True)
plt.title('Distance From Company Distribution')
```

Out[318…
```
Text(0.5, 1.0, 'Distance From Company Distribution')
```



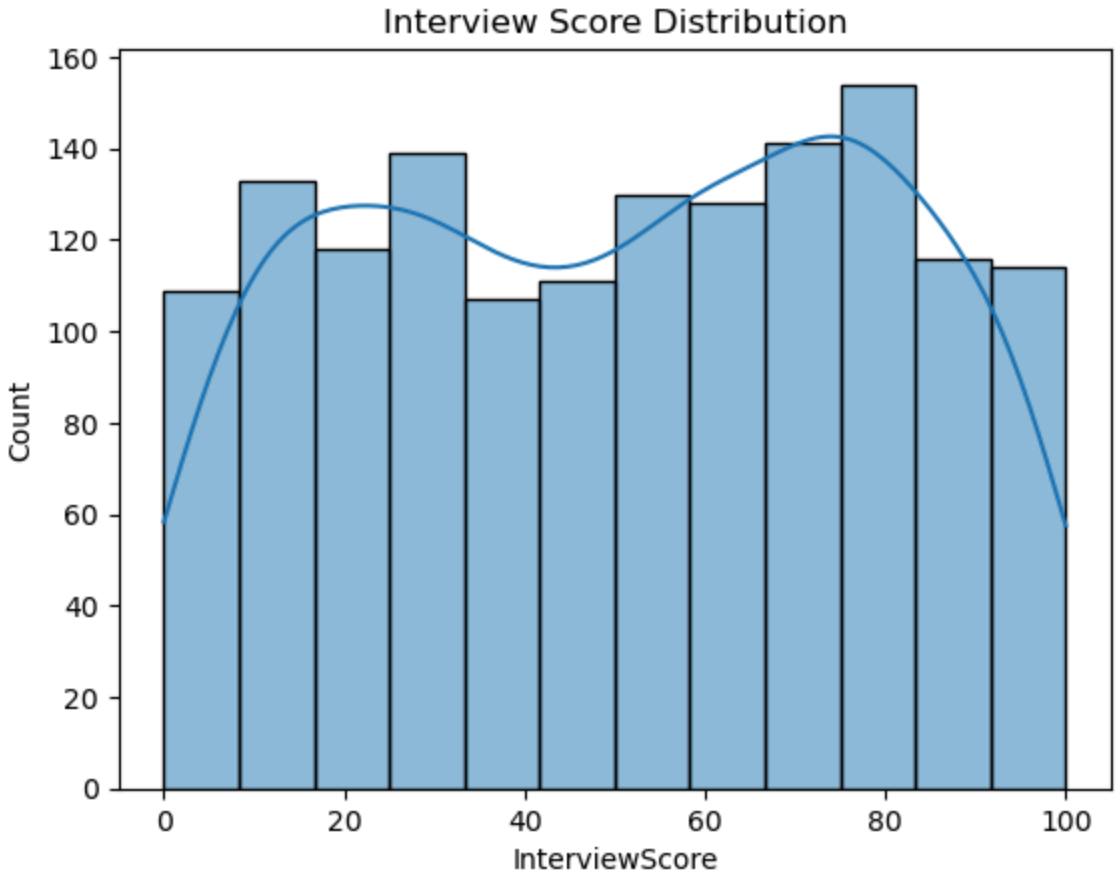
In [319…
```
sns.histplot(df['Age'], kde=True)
plt.title('Age Distribution')
```

Out[319… Text(0.5, 1.0, 'Age Distribution')



In [320…
```
sns.histplot(df['InterviewScore'], kde=True)
plt.title('Interview Score Distribution')
```

Out[320… Text(0.5, 1.0, 'Interview Score Distribution')

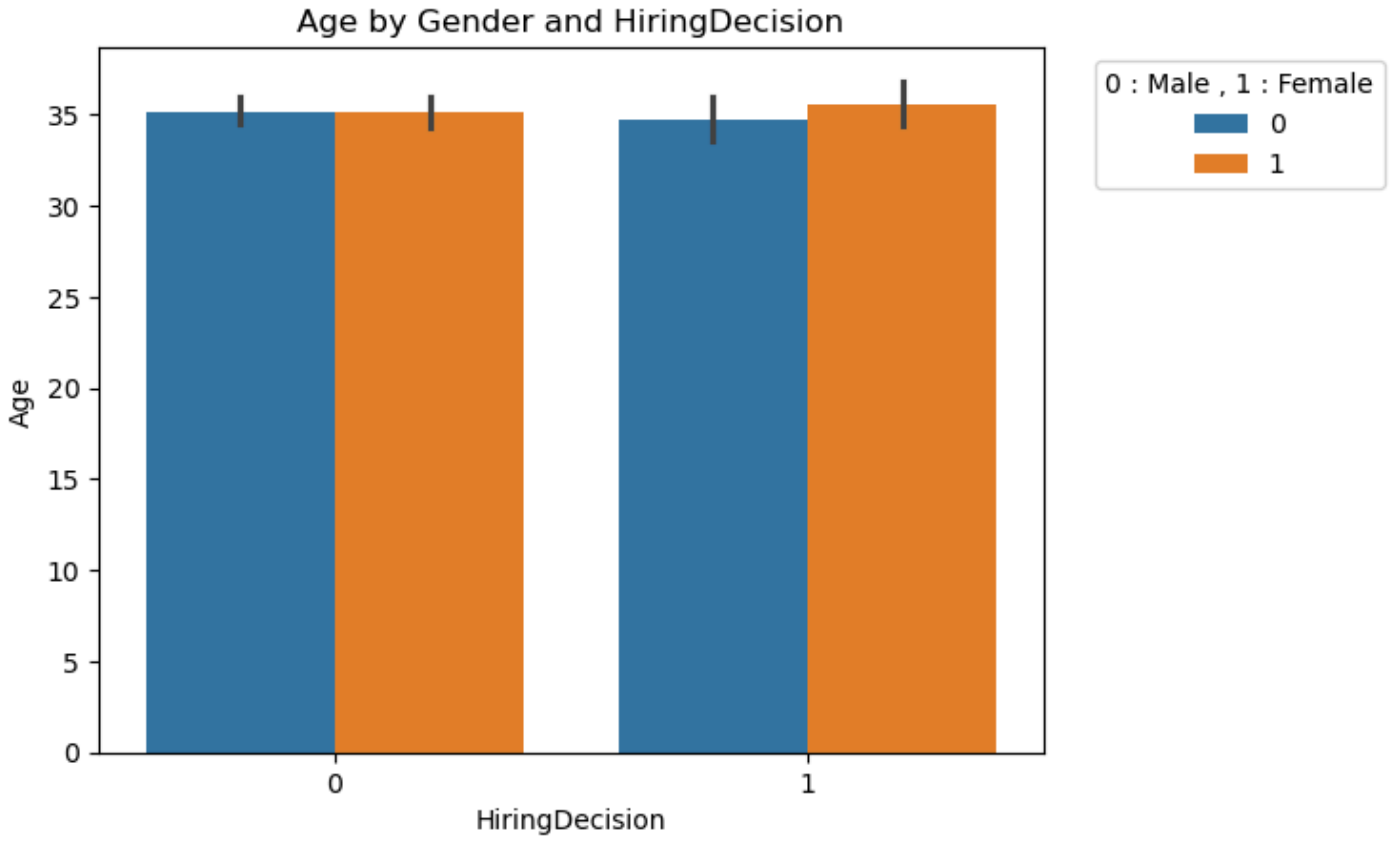


In [321…
```
sns.boxplot(data=df, y='ExperienceYears', x='HiringDecision')
plt.ylabel('Years of Exprience')
plt.title('Years of Exprience vs HiringDecision')
```

Out[321… Text(0.5, 1.0, 'Years of Exprience vs HiringDecision')

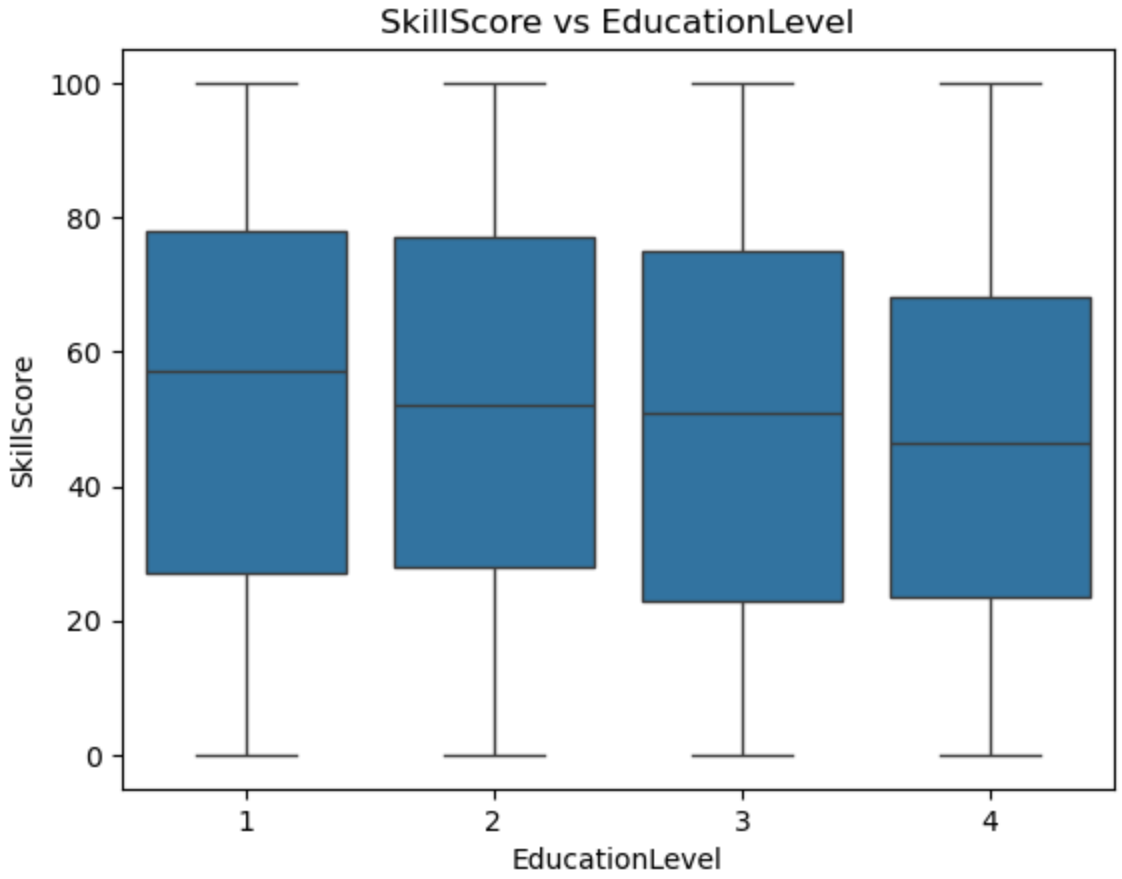
In [322…
```
sns.barplot(data=df, y='Age', x='HiringDecision', hue='Gender')
plt.legend(bbox_to_anchor=(1.04, 1), loc="upper left", title='0 : Male , 1 : Female')
plt.title('Age by Gender and HiringDecision')
```

Out[322…
```
Text(0.5, 1.0, 'Age by Gender and HiringDecision')
```



In [323…
```
sns.boxplot(x='EducationLevel', y='SkillScore', data=df)
plt.title('SkillScore vs EducationLevel')
```

Out[323…
```
Text(0.5, 1.0, 'SkillScore vs EducationLevel')
```



In [324…
```
sns.countplot(data=df, x='RecruitmentStrategy', hue='HiringDecision')
plt.legend(bbox_to_anchor=(1.04, 1), loc="upper left", title='0 : Not Hiring , 1 : Hiring')
plt.title('RecruitmentStrategy by HiringDecision')
```

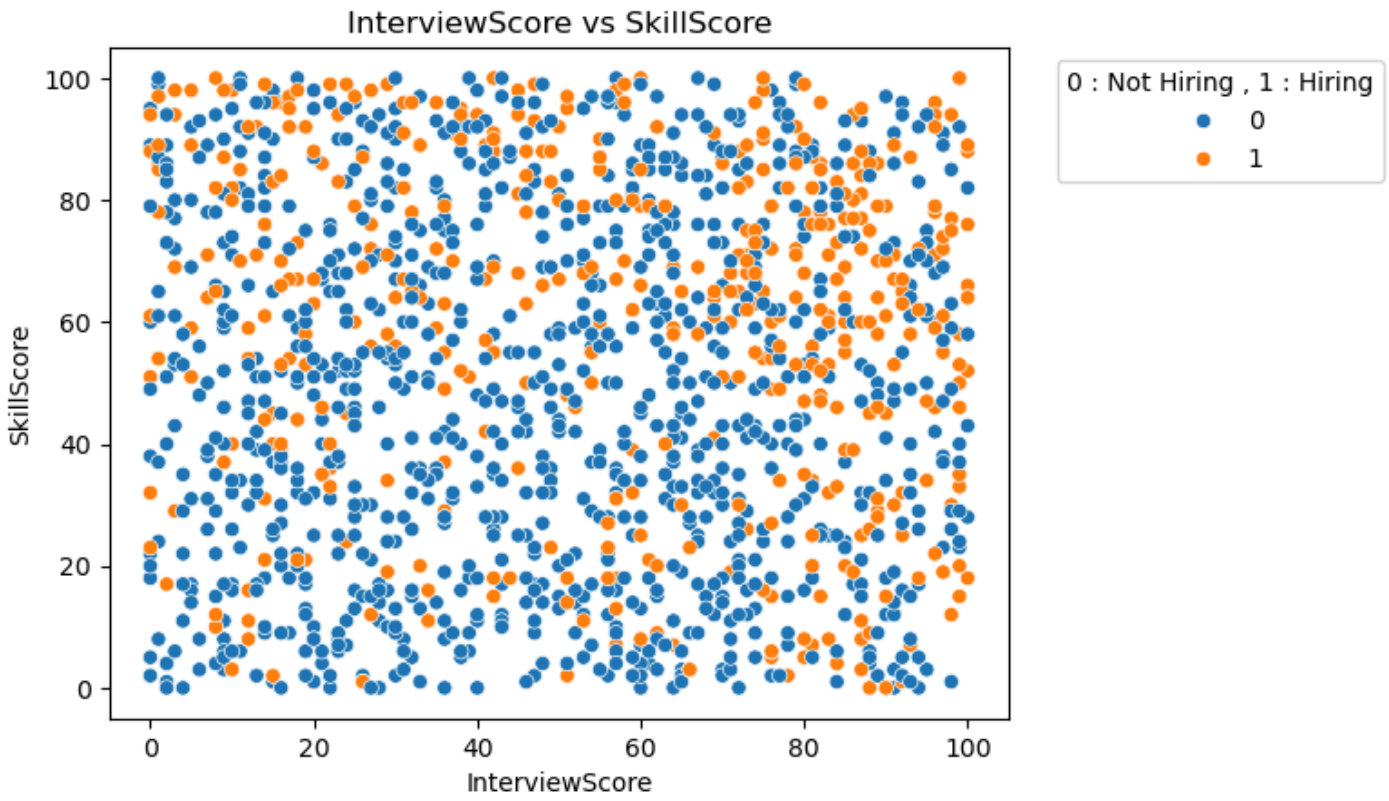
Out[324…
```
Text(0.5, 1.0, 'RecruitmentStrategy by HiringDecision')
```

In [325…
```
sns.boxplot(x='RecruitmentStrategy', y='InterviewScore', hue='HiringDecision', data=df)
plt.legend(bbox_to_anchor=(1.04, 1), loc="upper left", title='0 : Not Hiring , 1 : Hiring')
plt.title('InterviewScore by RecruitmentStrategy and HiringDecision')
```

Out[325…
```
Text(0.5, 1.0, 'InterviewScore by RecruitmentStrategy and HiringDecision')
```

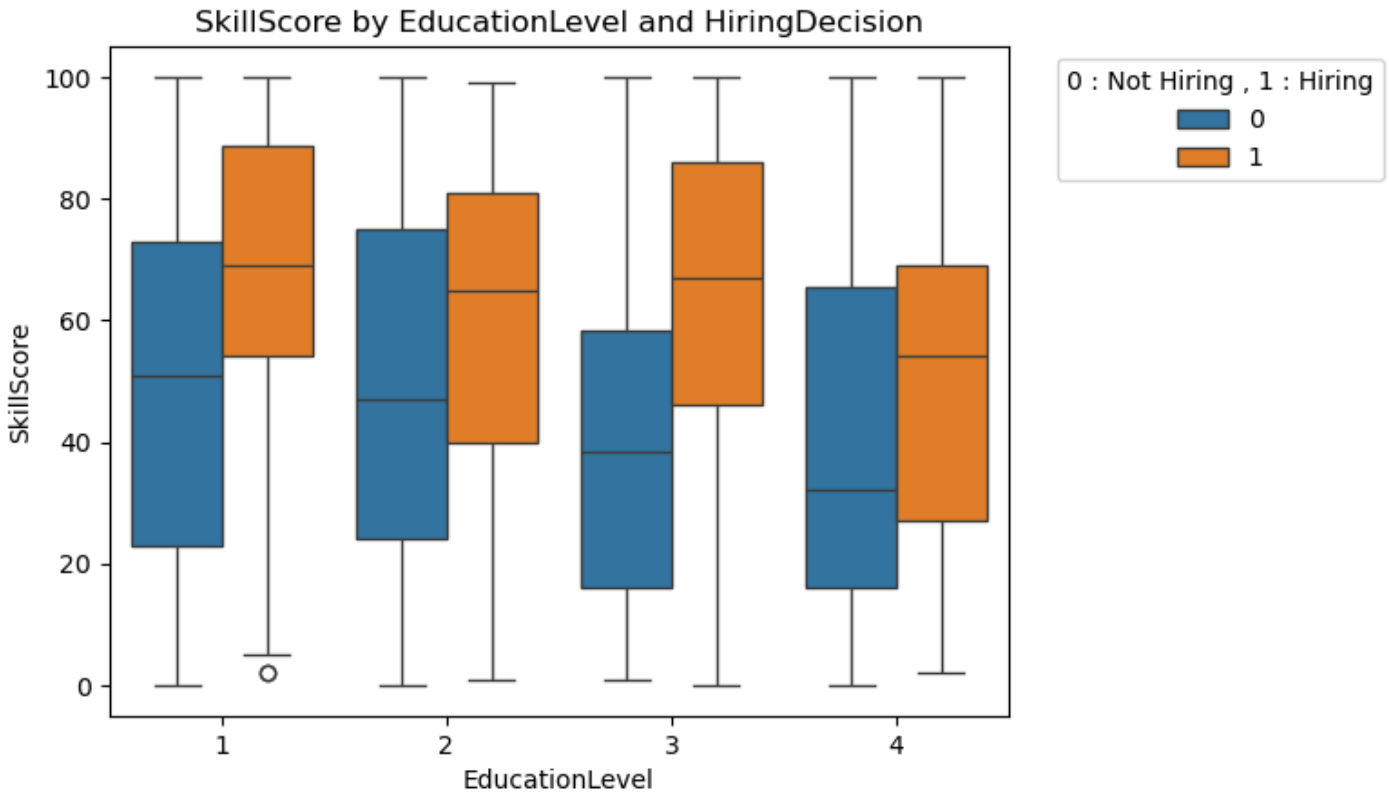
In [326…
```
sns.scatterplot(x='InterviewScore', y='SkillScore', hue='HiringDecision', data=df)
plt.legend(bbox_to_anchor=(1.04, 1), loc="upper left", title='0 : Not Hiring , 1 : Hiring')
plt.title('InterviewScore vs SkillScore')
```

Out[326… Text(0.5, 1.0, 'InterviewScore vs SkillScore')



In [327…
```
sns.boxplot(x='EducationLevel', y='SkillScore', data=df, hue='HiringDecision')
plt.legend(bbox_to_anchor=(1.04, 1), loc="upper left", title='0 : Not Hiring , 1 : Hiring')
plt.title('SkillScore by EducationLevel and HiringDecision')
```

Out[327… Text(0.5, 1.0, 'SkillScore by EducationLevel and HiringDecision')



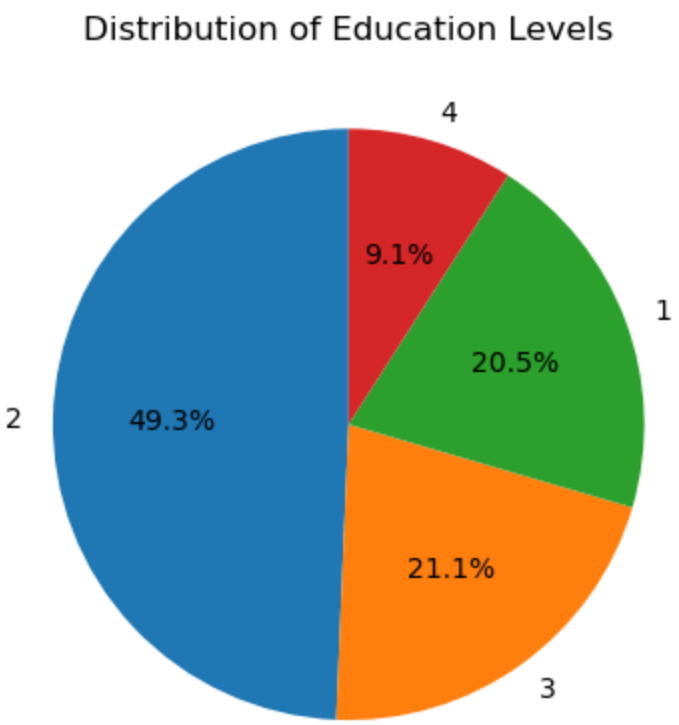
In [328…
```
sns.boxplot(x='HiringDecision', y='PersonalityScore', data=df)
```

```
plt.title('PersonalityScore vs HiringDecision')
```

Out[328… Text(0.5, 1.0, 'PersonalityScore vs HiringDecision')

In [329…
```
edu_level_counts = df['EducationLevel'].value_counts(normalize=True) * 100
edu_level_counts.plot(kind='pie', autopct='%1.1f%%', startangle=90)
plt.title("Distribution of Education Levels")
plt.ylabel('')
```

Out[329… Text(0, 0.5, '')

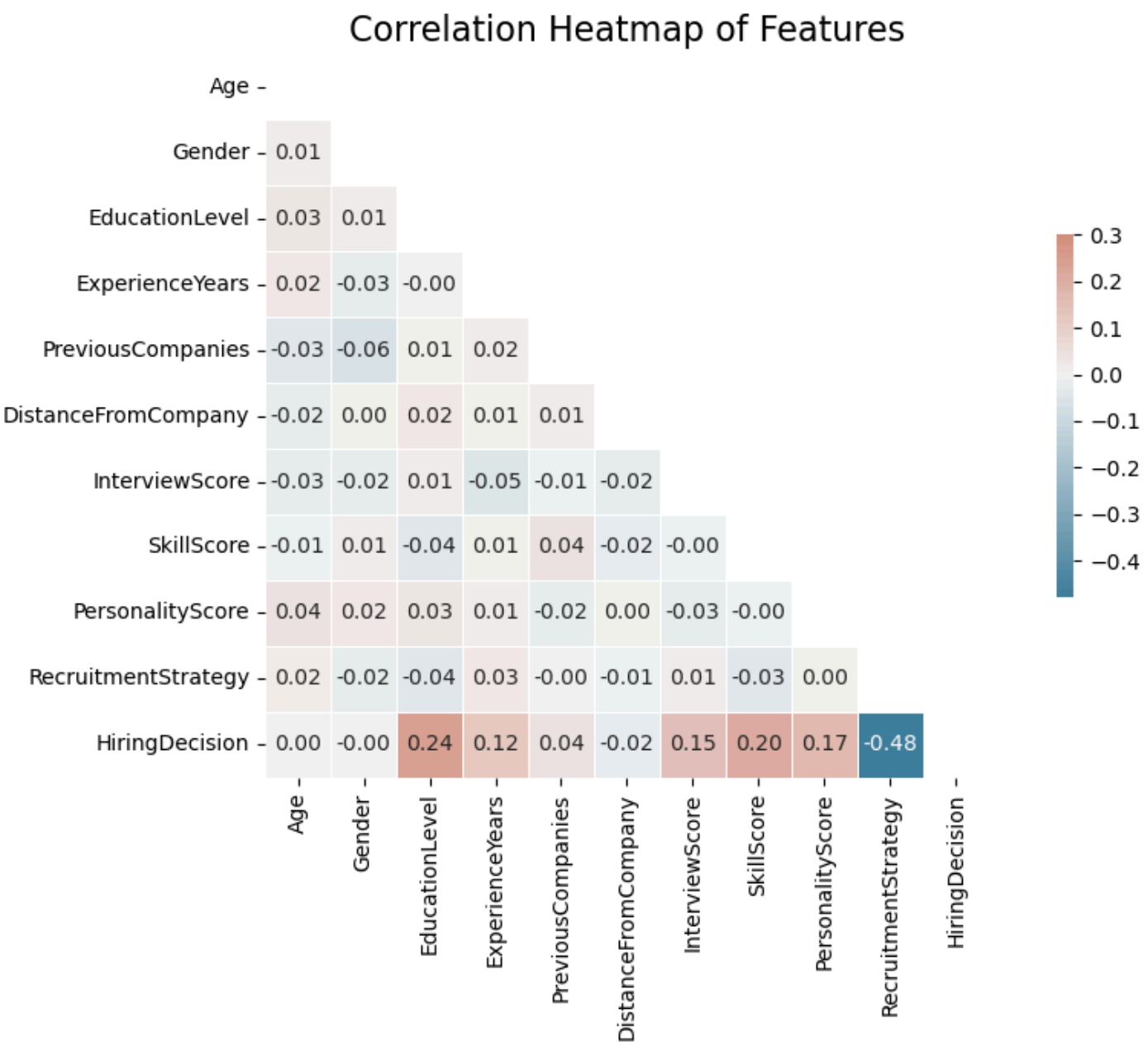


In [330…

```
corr_matrix = df.corr()
```

In [331…

```
plt.figure(figsize=(10, 7))
mask = np.triu(np.ones_like(corr_matrix, dtype=bool))
cmap = sns.diverging_palette(230, 20, as_cmap=True)
sns.heatmap(corr_matrix, mask=mask, cmap=cmap, vmax=.3, center=0,
            square=True, linewidths=.5, cbar_kws={"shrink": .5}, annot=True, fmt='.2f')
plt.title('Correlation Heatmap of Features', fontsize=16)
plt.tight_layout()
```



Model Training (Logistic Regression)

In [333…
```
from sklearn.model_selection import train_test_split
```

In [334…
```
X = df.drop('HiringDecision', axis=1)
y = df['HiringDecision']
```

In [335…
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
```

In [336…
```
from sklearn.linear_model import LogisticRegression
```

In [337…
```
logr = LogisticRegression()
```

In [338…
```
logr.fit(X_train, y_train)
```

```
C:\Users\negar\anaconda3\Lib\site-packages\sklearn\linear_model\_logistic.py:469: ConvergenceWarn
ing: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

Out[338…

LogisticRegression

```
LogisticRegression()
```

Model Evaluating

In [340…

```
logr_pred = logr.predict(X_test)
```

In [341…

```
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score, ConfusionMa
```

In [342…

```
print('Confusion Matrix:\n', confusion_matrix(y_test, logr_pred))
print('\n')
print('Classification Report:\n ', classification_report(y_test, logr_pred))
print('\n')
print('Accuracy Score:\n ', accuracy_score(y_test, logr_pred))
```

```
Confusion Matrix:
 [[297  24]
 [ 31  98]]


Classification Report:
                precision    recall  f1-score   support

           0       0.91      0.93      0.92       321
           1       0.80      0.76      0.78       129

    accuracy                           0.88       450
   macro avg       0.85      0.84      0.85       450
weighted avg       0.88      0.88      0.88       450



Accuracy Score:
  0.8777777777777778
```

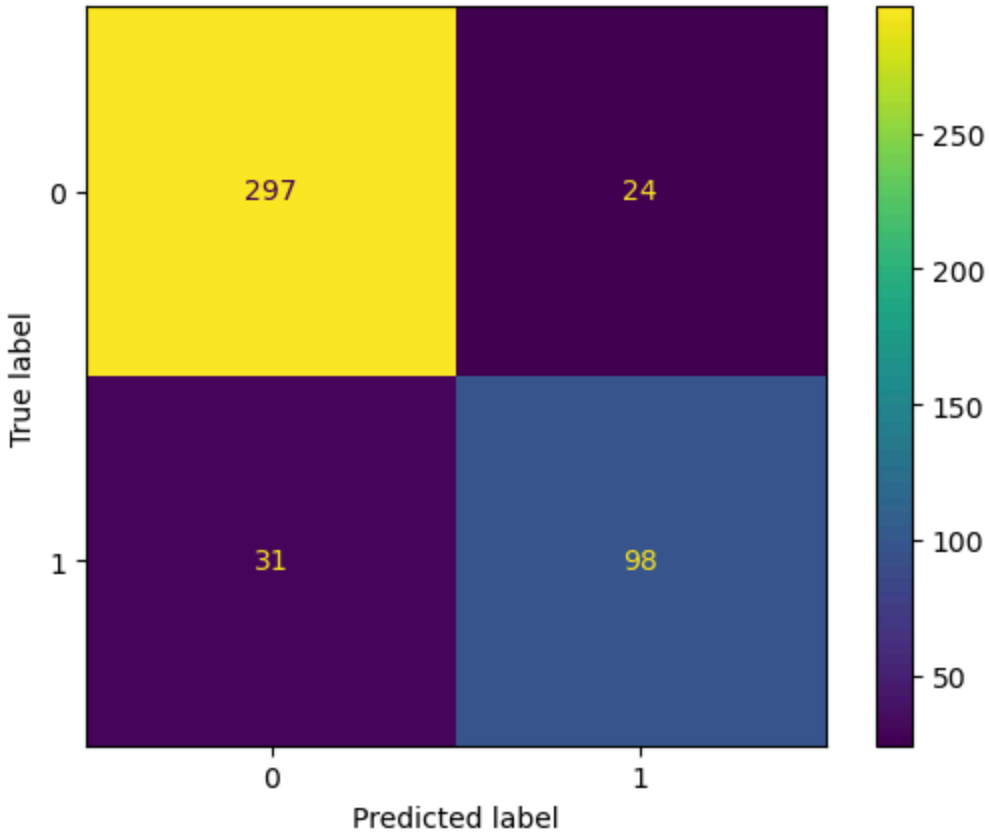
Display Confusion Matrix

In [344…

```
cm_logr = confusion_matrix(y_test, logr_pred, labels=logr.classes_)
disp_logr = ConfusionMatrixDisplay(confusion_matrix=cm_logr,
                                   display_labels=logr.classes_)
disp_logr.plot()
```

Out[344…

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x2753099df40>
```



Model Training (Random Forest)

In [346…
```
from sklearn.ensemble import RandomForestClassifier
```

In [347…
```
rfc = RandomForestClassifier(n_estimators=100)
```

In [348…
```
rfc.fit(X_train, y_train)
```

Out[348…
```
RandomForestClassifier
RandomForestClassifier()
```

Model Evaluating

In [350…
```
rfc_pred = rfc.predict(X_test)
```

In [351…
```
print('Confusion Matrix:\n', confusion_matrix(y_test, rfc_pred))
print('\n')
print('Classification Report:\n ', classification_report(y_test, rfc_pred))
print('\n')
print('Accuracy Score:\n ', accuracy_score(y_test, rfc_pred))
```

```
Confusion Matrix:
 [[314   7]
 [ 24 105]]


Classification Report:
                precision    recall  f1-score   support

           0       0.93      0.98      0.95       321
           1       0.94      0.81      0.87       129

    accuracy                           0.93       450
   macro avg       0.93      0.90      0.91       450
weighted avg       0.93      0.93      0.93       450



Accuracy Score:
  0.9311111111111111
```

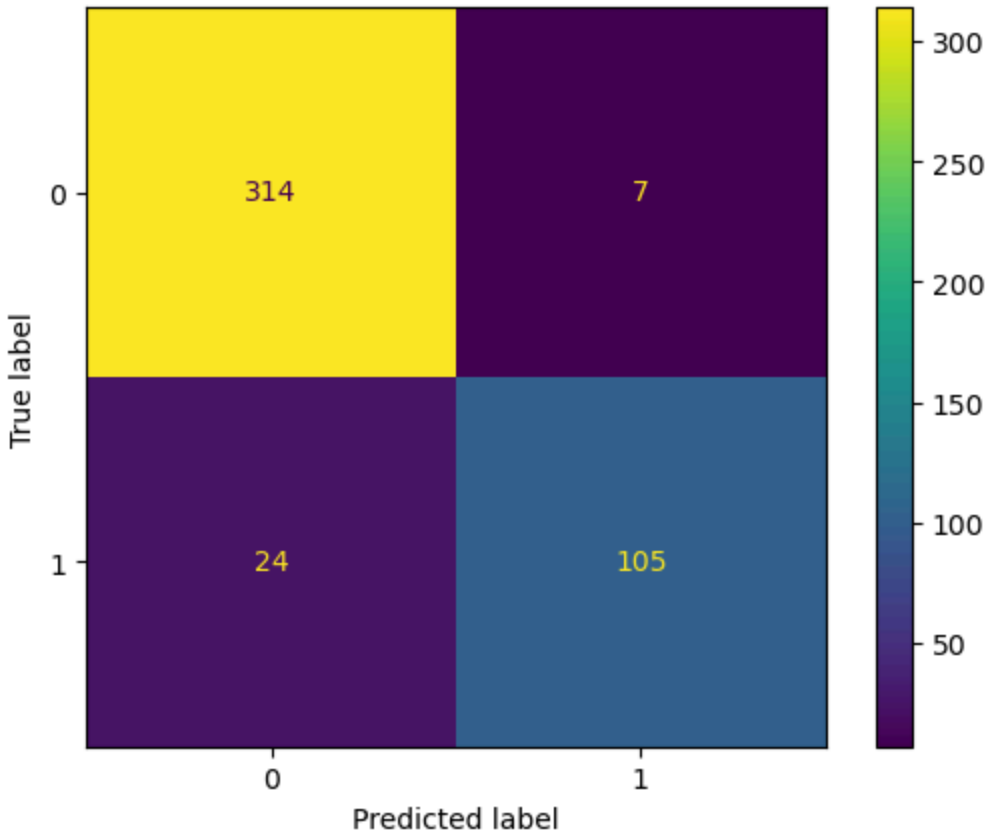
Display Confusion Matrix

In [353…

```
cm_rfc = confusion_matrix(y_test, rfc_pred, labels=rfc.classes_)
disp_rfc = ConfusionMatrixDisplay(confusion_matrix=cm_rfc,
                                  display_labels=rfc.classes_)
disp_rfc.plot()
```

Out[353…

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x2753371d400>
```

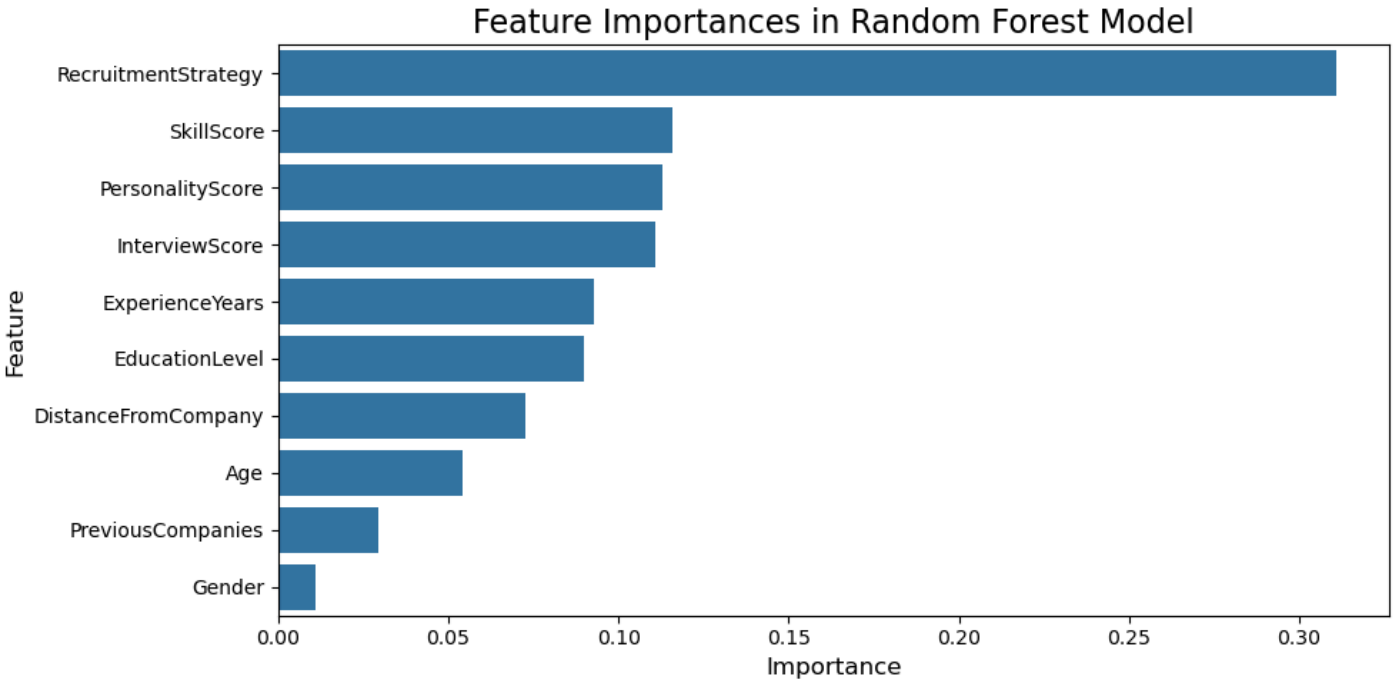


In [354…

```
importances = rfc.feature_importances_
indices = np.argsort(importances)[::-1]
feature_names = X.columns
```

```
feature_importance_df = pd.DataFrame({
    'Feature': feature_names,
    'Importance': importances
})

feature_importance_df = feature_importance_df.sort_values('Importance', ascending=False)
plt.figure(figsize=(10, 5))
sns.barplot(x='Importance', y='Feature', data=feature_importance_df)
plt.title('Feature Importances in Random Forest Model', fontsize=16)
plt.xlabel('Importance', fontsize=12)
plt.ylabel('Feature', fontsize=12)
plt.tight_layout()
```



In [ ]: