placemnt

November 6, 2024

[4]:
```
import pandas as pd
import matplotlib.pylab as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder,MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import␣
 ↪accuracy_score,classification_report,confusion_matrix,ConfusionMatrixDisplay
```

[5]:
```
df=pd.read_csv('./placedata v2.0 synthetic.csv')
df.head()
```

[5]:

	StudentID	CGPA	Internships	Projects	Workshops/Certifications	AptitudeTestScore	SoftSkillsRating	ExtracurricularActivities	PlacementTraining	SSC_Marks	HSC_Marks	PlacementStatus
0	1	7.5	1	1	1	65	4.4	No	No	61	79	NotPlaced
1	2	8.9	0	3	2	90	4.0	Yes	Yes	78	82	Placed
2	3	7.3	1	2	2	82	4.8	Yes	No	79	80	NotPlaced
3	4	7.5	1	1	2	85	4.4	Yes	Yes	81	80	Placed
4	5	8.3	1	2	2	86	4.5	Yes	Yes	74	88	Placed

[6]:
```
df.shape
```

[6]: (10000, 12)

[7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 12 columns):
 #   Column                      Non-Null Count  Dtype
---  ------                      --------------  -----
 0   StudentID                   10000 non-null  int64
 1   CGPA                        10000 non-null  float64
 2   Internships                 10000 non-null  int64
 3   Projects                    10000 non-null  int64
 4   Workshops/Certifications    10000 non-null  int64
 5   AptitudeTestScore           10000 non-null  int64
 6   SoftSkillsRating            10000 non-null  float64
 7   ExtracurricularActivities   10000 non-null  object
 8   PlacementTraining           10000 non-null  object
 9   SSC_Marks                   10000 non-null  int64
 10  HSC_Marks                   10000 non-null  int64
 11  PlacementStatus             10000 non-null  object
dtypes: float64(2), int64(7), object(3)
memory usage: 937.6+ KB
```

[8]:
```
df.describe(include='all')
```

[8]:

	StudentID	CGPA	Internships	Projects
count	10000.00000	10000.000000	10000.000000	10000.000000
unique	NaN	NaN	NaN	NaN
top	NaN	NaN	NaN	NaN
freq	NaN	NaN	NaN	NaN
mean	5000.50000	7.698010	1.049200	2.026600
std	2886.89568	0.640131	0.665901	0.867968
min	1.00000	6.500000	0.000000	0.000000
25%	2500.75000	7.400000	1.000000	1.000000
50%	5000.50000	7.700000	1.000000	2.000000
75%	7500.25000	8.200000	1.000000	3.000000
max	10000.00000	9.100000	2.000000	3.000000

	Workshops/Certifications	AptitudeTestScore	SoftSkillsRating
count	10000.000000	10000.000000	10000.000000
unique	NaN	NaN	NaN
top	NaN	NaN	NaN
freq	NaN	NaN	NaN
mean	1.013200	79.449900	4.323960
std	0.904272	8.159997	0.411622
min	0.000000	60.000000	3.000000

```
25%                    0.000000          73.000000          4.000000
50%                    1.000000          80.000000          4.400000
75%                    2.000000          87.000000          4.700000
max                    3.000000          90.000000          4.800000

       ExtracurricularActivities PlacementTraining     SSC_Marks  \
count                      10000             10000  10000.000000
unique                         2                 2           NaN
top                          Yes               Yes           NaN
freq                        5854              7318           NaN
mean                         NaN               NaN     69.159400
std                          NaN               NaN     10.430459
min                          NaN               NaN     55.000000
25%                          NaN               NaN     59.000000
50%                          NaN               NaN     70.000000
75%                          NaN               NaN     78.000000
max                          NaN               NaN     90.000000

           HSC_Marks PlacementStatus
count   10000.000000           10000
unique           NaN               2
top              NaN       NotPlaced
freq             NaN            5803
mean       74.501500             NaN
std         8.919527             NaN
min        57.000000             NaN
25%        67.000000             NaN
50%        73.000000             NaN
75%        83.000000             NaN
max        88.000000             NaN
```

[9]:
```
num_columns = ['CGPA', 'SoftSkillsRating', 'AptitudeTestScore', 'SSC_Marks',␣
 ↪'HSC_Marks']
cat_columns = ['Internships', 'Projects', 'Workshops/Certifications',␣
 ↪'ExtracurricularActivities','PlacementTraining']
```

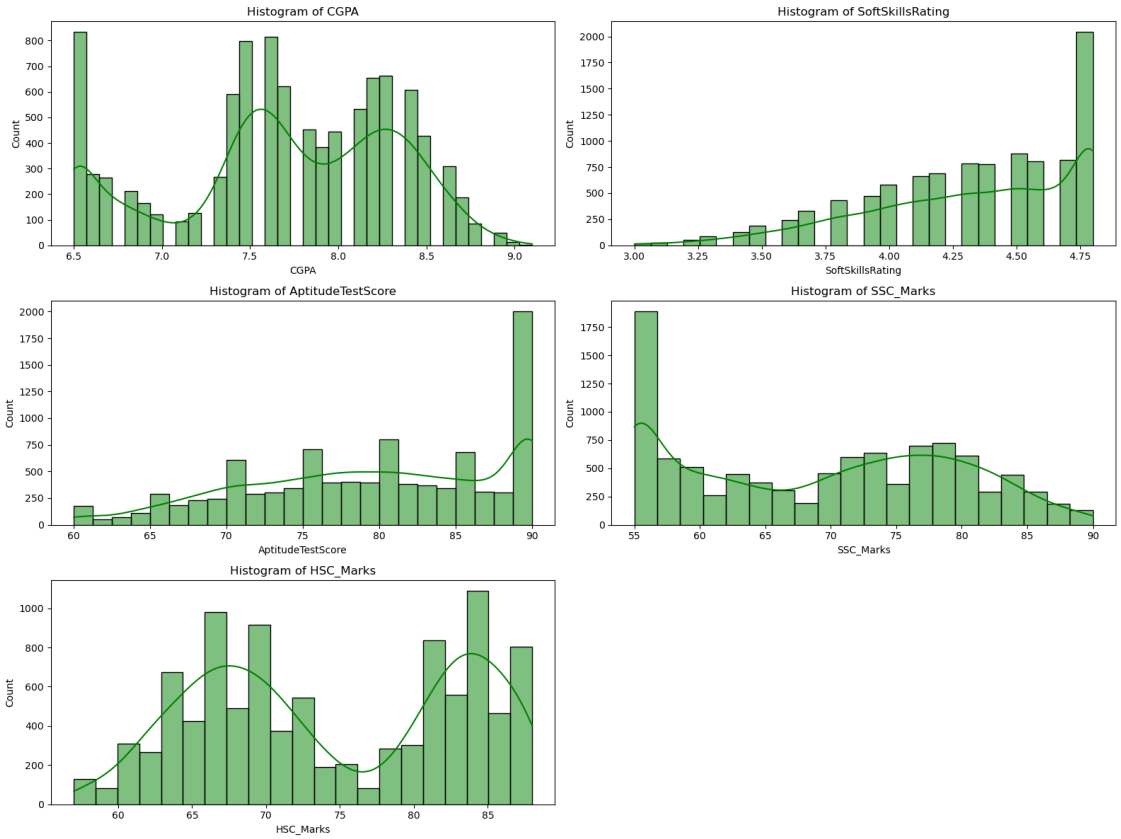
[10]:
```
for i in cat_columns:
  print(i,":->",df[i].unique())
```

```
Internships :-> [1 0 2]
Projects :-> [1 3 2 0]
Workshops/Certifications :-> [1 2 0 3]
ExtracurricularActivities :-> ['No' 'Yes']
PlacementTraining :-> ['No' 'Yes']
```

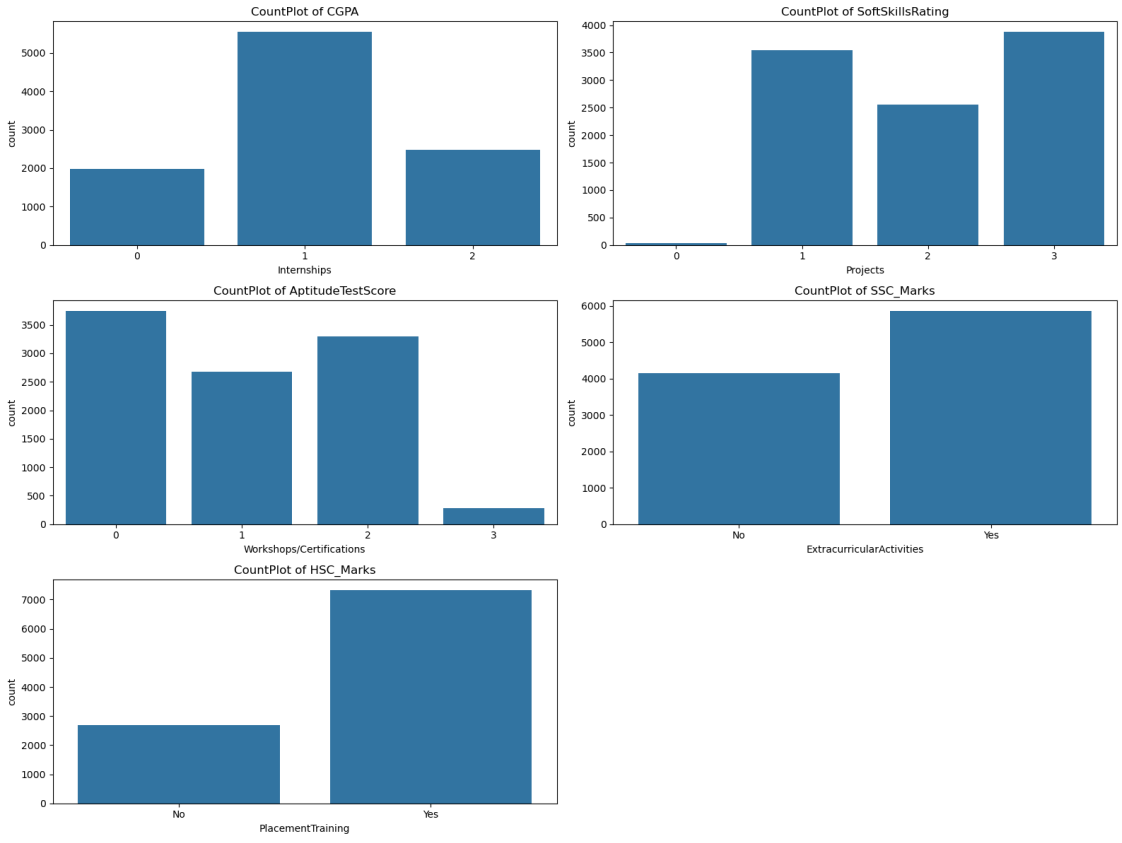
0.1 EDA

0.1.1 Uni-variate Analysis

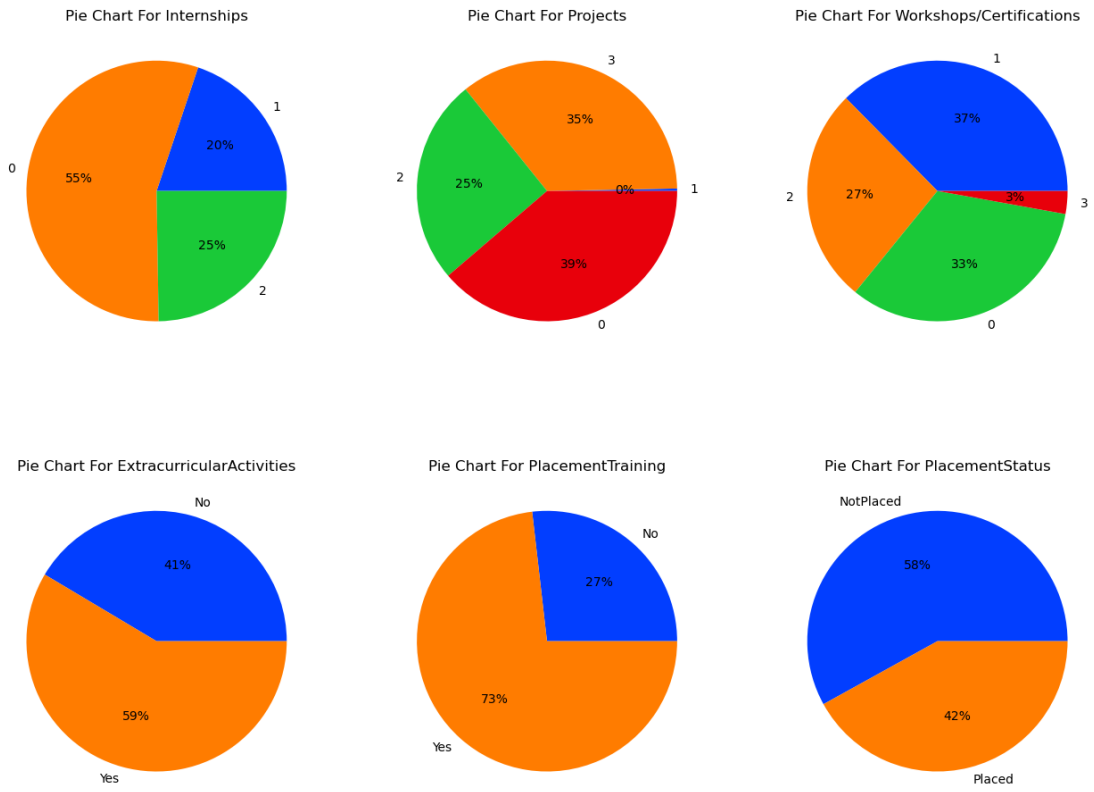
[11]:
```
fig, axis = plt.subplots(nrows=3, ncols=2, figsize=(16, 12))
index = 0
for row in range(2):
    for col in range(2):
        sns.histplot(x=df[num_columns[index]], data=df, ax=axis[row, col],␣
 ↪kde=True, color='green', edgecolor='black')
        axis[row, col].set_title(f'Histogram of {num_columns[index]}')
        index += 1

# Remove the plot in the 2nd row, 1st column
fig.delaxes(axis[2, 1])

# Plot for 'HSC_Marks'
sns.histplot(x=df['HSC_Marks'], data=df, ax=axis[2, 0], kde=True,␣
 ↪color='green', edgecolor='black')
axis[2, 0].set_title('Histogram of HSC_Marks')

plt.tight_layout()
plt.show()
```



[12]:
```
fig, axis = plt.subplots(nrows=3, ncols=2, figsize=(16, 12))
index = 0
for row in range(2):
    for col in range(2):
        sns.countplot(x=df[cat_columns[index]], data=df, ax=axis[row, col])
        axis[row, col].set_title(f'CountPlot of {num_columns[index]}')
        index += 1

# Remove the plot in the 2nd row, 1st column
fig.delaxes(axis[2, 1])

# Plot for 'HSC_Marks'
sns.countplot(x=df['PlacementTraining'], data=df, ax=axis[2, 0])
axis[2, 0].set_title('CountPlot of HSC_Marks')

plt.tight_layout()
plt.show()
```



[13]:
```
# Set the background color of the plot

fig, axis = plt.subplots(nrows=2, ncols=3, figsize=(16, 12))

# Define categorical columns
cat_columns = ['Internships', 'Projects', 'Workshops/Certifications',␣
 ↪'ExtracurricularActivities', 'PlacementTraining','PlacementStatus']

labels = []
# Loop through each categorical column
for column in cat_columns:
    # Get unique labels for the column
    colLabels = df[column].unique().tolist()
    # Store column name and labels in the dictionary
    labels.append(colLabels)

# Define Seaborn color palette to use
palette_color = sns.color_palette('bright')
index = 0
for row in range(2):
    for col in range(3):
        df.groupby(cat_columns[index]).size().plot(kind='pie',␣
 ↪labels=labels[index],
        autopct='%.0f%%',colors=palette_color,ax=axis[row,col])
        axis[row, col].set_title(f'Pie Chart For {cat_columns[index]}')
        index+=1

# Display the chart
plt.figure(facecolor='lightgray')
plt.show()
```

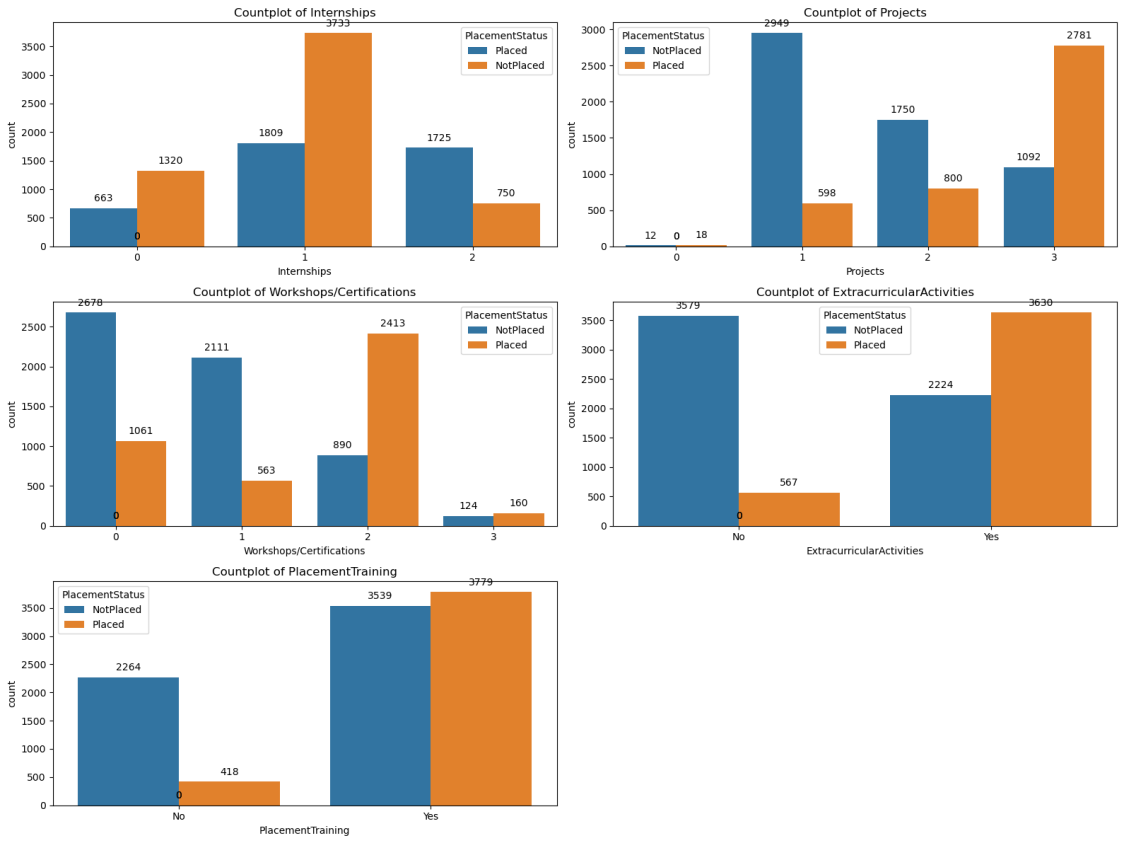



```
<Figure size 640x480 with 0 Axes>
```

0.1.2 Bi-variate Analysis

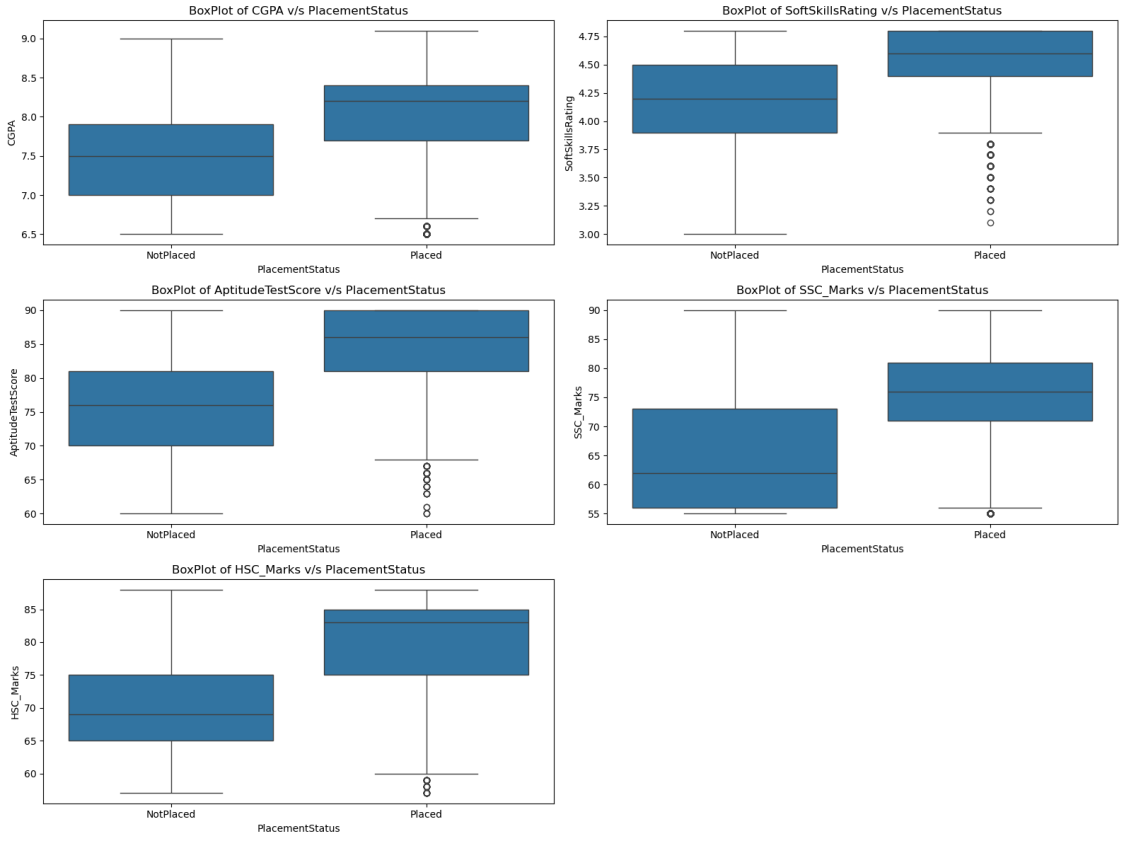
[14]:
```
fig, axis = plt.subplots(nrows=3, ncols=2, figsize=(16, 12))
index = 0
for row in range(2):
    for col in range(2):
        sns.countplot(x=df[cat_columns[index]], data=df,␣
 ↪hue=df["PlacementStatus"], ax=axis[row, col])
        axis[row, col].set_title(f'Countplot of {cat_columns[index]}')

        # Add count numbers on top of bars
        for p in axis[row, col].patches:
            axis[row, col].annotate(format(p.get_height(), '.0f'),
                                    (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                                    ha='center', va='center', xytext=(0, 10),
                                    textcoords='offset points')

        index += 1
```

```
# Remove the plot in the 2nd row, 1st column
fig.delaxes(axis[2, 1])

# Plot for 'PlacementTraining'
sns.countplot(x=df['PlacementTraining'], data=df, hue=df["PlacementStatus"],␣
 ↪ax=axis[2, 0])
axis[2, 0].set_title('Countplot of PlacementTraining')

# Add count numbers on top of bars
for p in axis[2, 0].patches:
    axis[2, 0].annotate(format(p.get_height(), '.0f'),
                        (p.get_x() + p.get_width() / 2., p.get_height()),
                        ha='center', va='center', xytext=(0, 10),
                        textcoords='offset points')

plt.tight_layout()
plt.show()
```



[15]:
```
fig, axis = plt.subplots(nrows=3, ncols=2, figsize=(16, 12))
index = 0
```

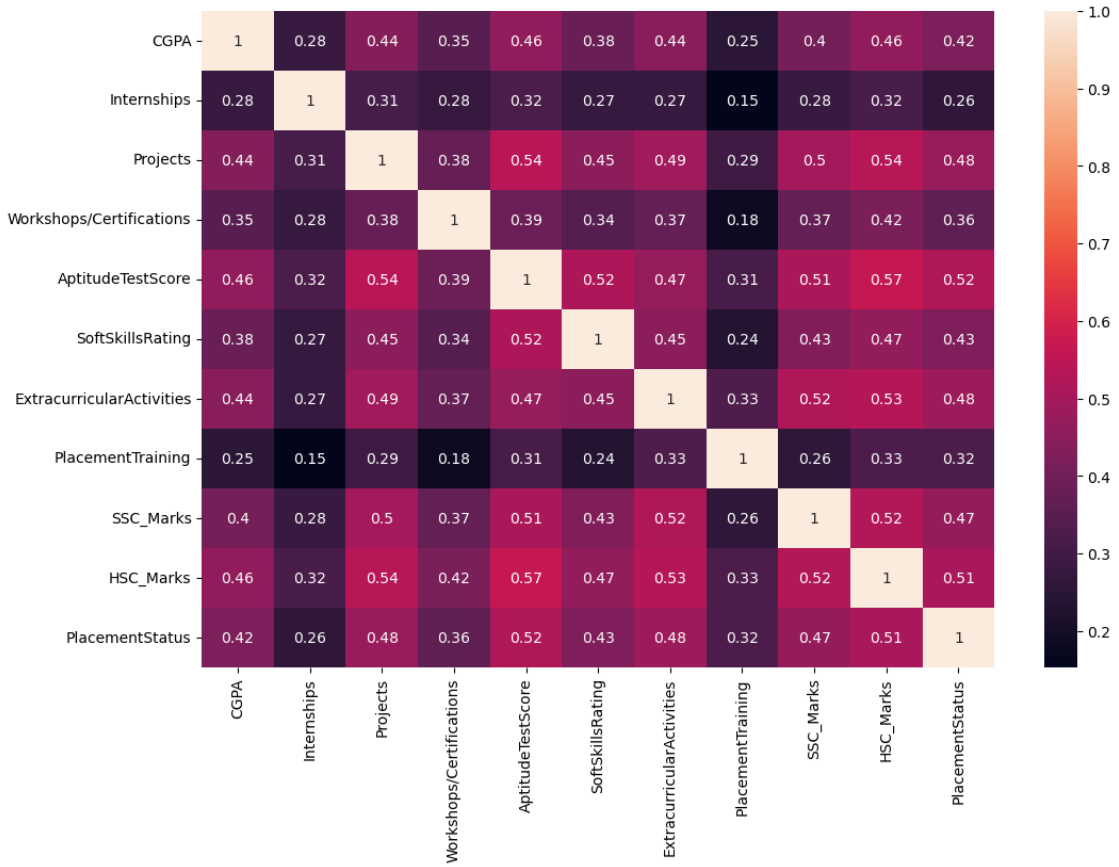
```
for row in range(2):
    for col in range(2):
        sns.boxplot(y=df[num_columns[index]], data=df, ax=axis[row,␣
 ↪col],x=df["PlacementStatus"])
        axis[row, col].set_title(f'BoxPlot of {num_columns[index]} v/s␣
 ↪PlacementStatus')
        index += 1

# Remove the plot in the 2nd row, 1st column
fig.delaxes(axis[2, 1])

# Plot for 'HSC_Marks'
sns.boxplot(y=df['HSC_Marks'], data=df, ax=axis[2, 0], x=df["PlacementStatus"])
axis[2, 0].set_title('BoxPlot of HSC_Marks v/s PlacementStatus')

plt.tight_layout()
plt.show()
```



0.1.3 Multi-variate Analysis

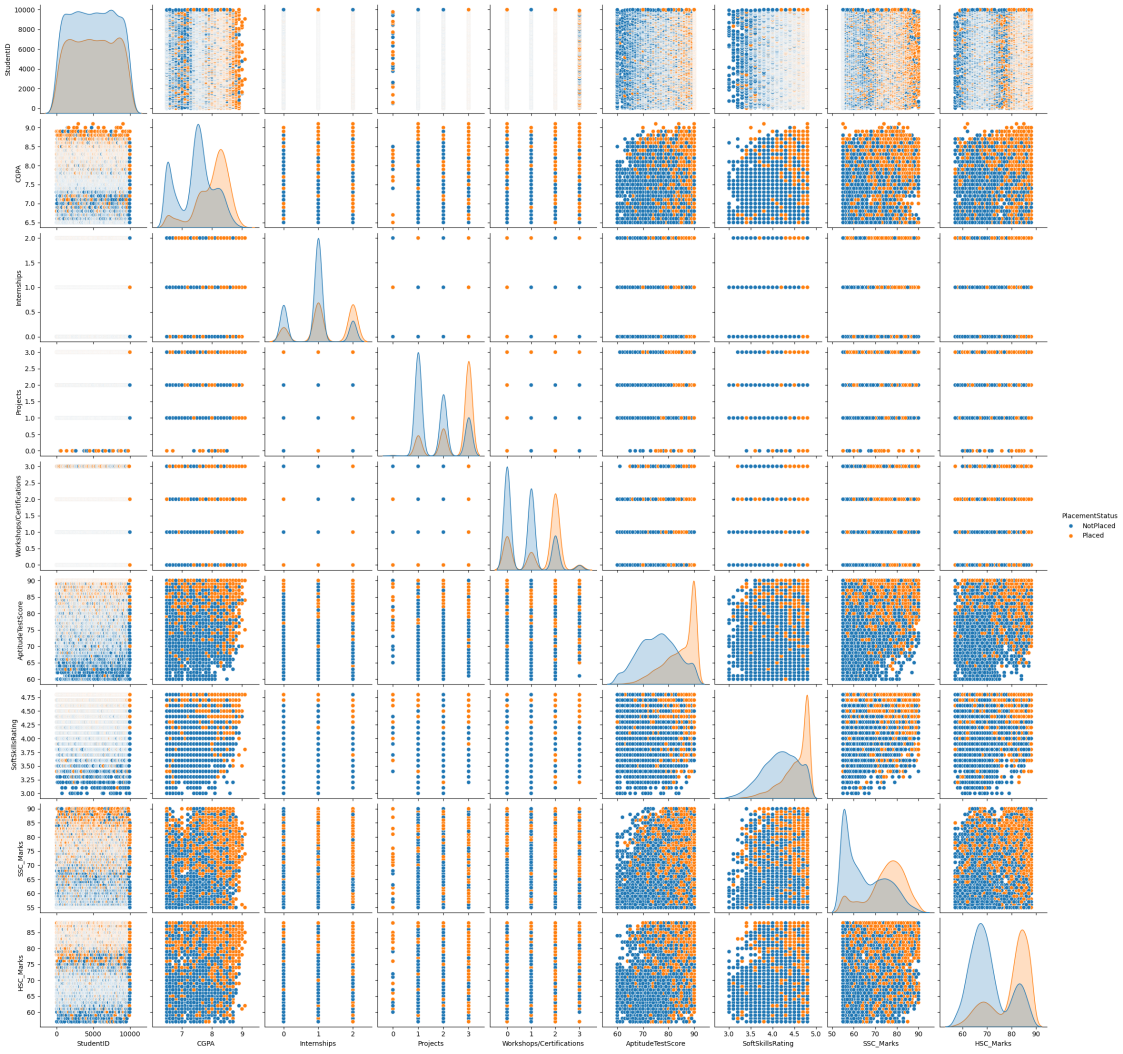
[53]:
```
df_corr = df.corr()
plt.figure(figsize=(12,8))
sns.heatmap(df_corr, annot=True)
plt.show()
```

```
The history saving thread hit an unexpected error (OperationalError('attempt to
write a readonly database')).History will not be written to the database.
```



[19]:
```
sns.pairplot(df,hue='PlacementStatus')
```

[19]: <seaborn.axisgrid.PairGrid at 0x7cc9a29425d0>



0.2 Data Preprocessing

[20]:
```
# Dropping Student as it is not needed
df=df.drop(columns='StudentID')
df.head(2)
```

[20]:

	CGPA	Internships	Projects	Workshops/Certifications	AptitudeTestScore	SoftSkillsRating	ExtracurricularActivities	PlacementTraining	SSC_Marks	HSC_Marks
0	7.5	1	1	1	65	4.4	No	No	61	
1	8.9	0	3	2	90	4.0	Yes	Yes	78	

```
   HSC_Marks PlacementStatus
0         79       NotPlaced
1         82          Placed
```

[21]:
```
from sklearn.preprocessing import LabelEncoder
labelencoder = LabelEncoder()
object_cols = df.select_dtypes(include=['object']).columns
for column in object_cols:
    df[column] = labelencoder.fit_transform(df[column])
    df[column]=labelencoder.fit_transform(df[column])

df.head(2)
```

[21]:
```
   CGPA  Internships  Projects  Workshops/Certifications  AptitudeTestScore  \
0   7.5            1         1                         1                 65
1   8.9            0         3                         2                 90

   SoftSkillsRating  ExtracurricularActivities  PlacementTraining  SSC_Marks  \
0               4.4                          0                  0         61
1               4.0                          1                  1         78

   HSC_Marks  PlacementStatus
0         79                0
1         82                1
```

[22]:
```
# Normalization of numerical columns
df_min = df.copy()
# Initialize the MinMaxScaler
scaler = MinMaxScaler()

# Fit and transform the numerical columns
df_min[num_columns] = scaler.fit_transform(df_min[num_columns])

# Display the normalized DataFrame
df_min.head(2)
```

[22]:
```
       CGPA  Internships  Projects  Workshops/Certifications  \
0  0.384615            1         1                         1
1  0.923077            0         3                         2

   AptitudeTestScore  SoftSkillsRating  ExtracurricularActivities  \
0           0.166667          0.777778                          0
1           1.000000          0.555556                          1

   PlacementTraining  SSC_Marks  HSC_Marks  PlacementStatus
0                  0   0.171429   0.709677                0
1                  1   0.657143   0.806452                1
```

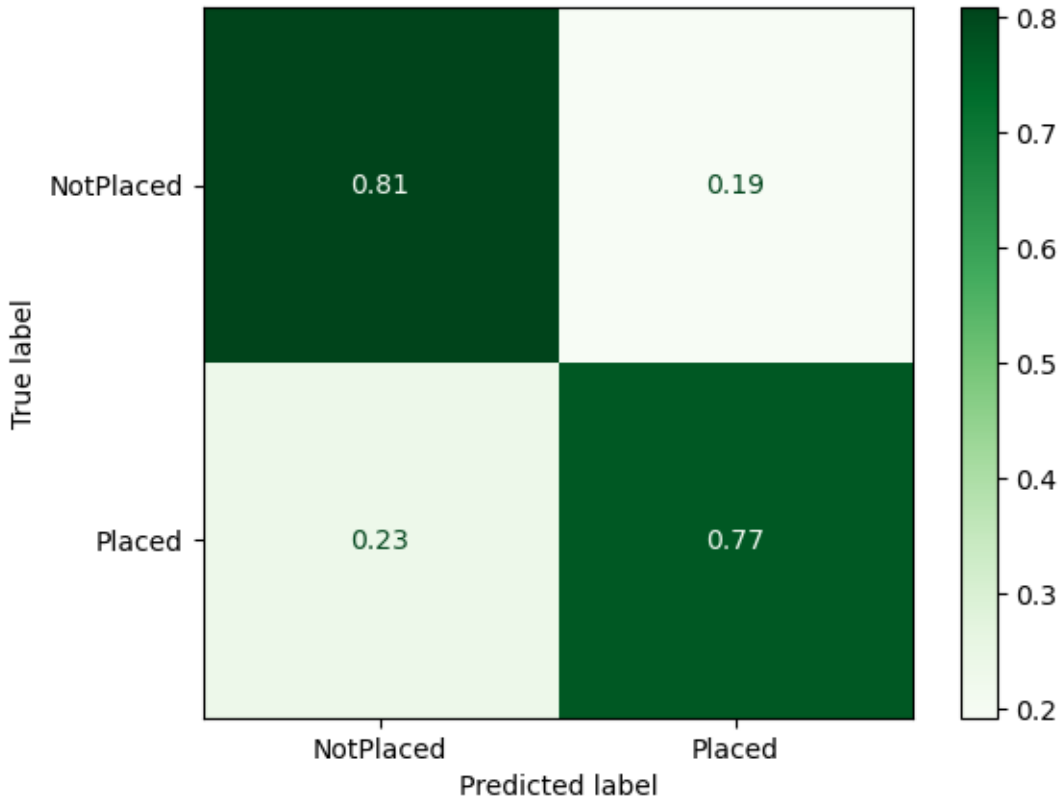
0.2.1 Models without Normalization

[23]:
```
# here X is the all the Data except the PlacementStatus and from which we have␣
 ↪to predict our result
features=df.drop(columns='PlacementStatus')
# y is the class label which we have to predict
predictionClass=df.PlacementStatus

# Splitting the data into training and testing data
X_train,X_test,y_train,y_test=train_test_split(features,predictionClass,test_size=0.
 ↪25,random_state=0)
```

[54]:
```
# Initialize Logistic Regression with specific parameters
lr = LogisticRegression(max_iter=50000, penalty="l2")

# Train the logistic regression model using training data
lr.fit(X_train, y_train)

# Make predictions on the test set using the trained model
prediction = lr.predict(X_test)

# Calculate and print the accuracy score of the model
logWT = accuracy_score(prediction, y_test)
print("Accuracy Score:", accuracy_score(prediction, y_test))

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
 ↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Greens')
```

```
Accuracy Score: 0.7924
              precision    recall  f1-score   support

   NotPlaced       0.83      0.81      0.82      1471
      Placed       0.74      0.77      0.75      1029

    accuracy                           0.79      2500
   macro avg       0.79      0.79      0.79      2500
weighted avg       0.79      0.79      0.79      2500
```

[54]: <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7cc98c926c00>

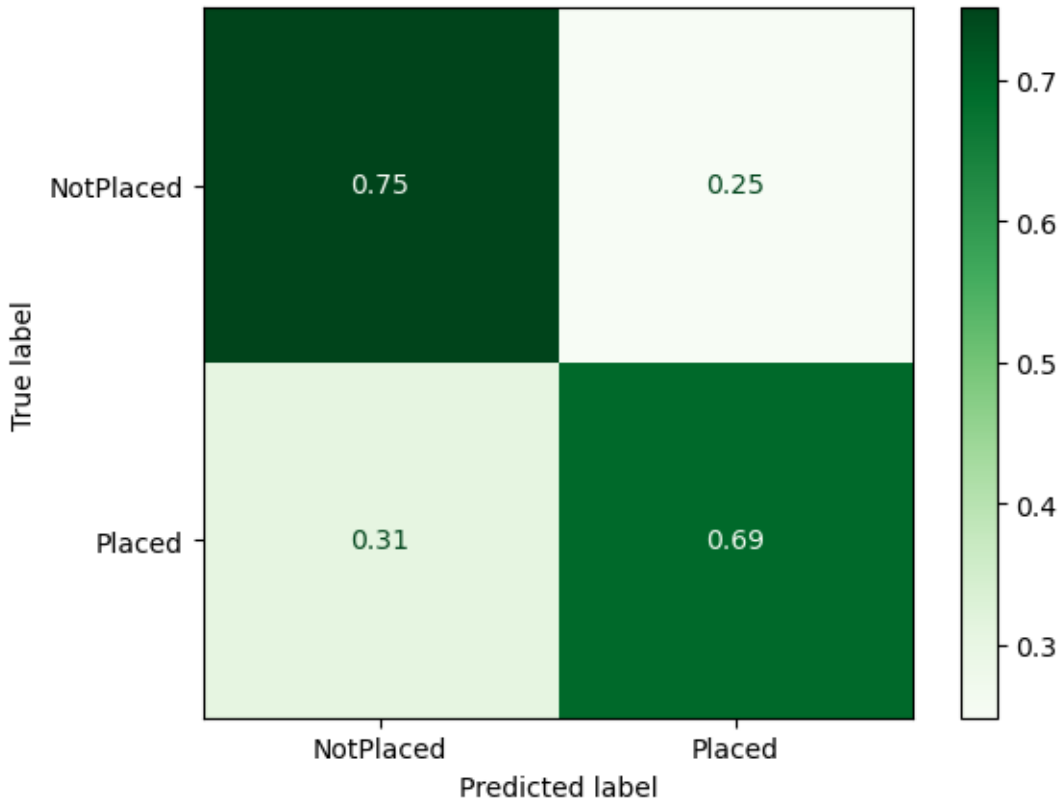


[25]:
```
# Initialize Decision Tree Classifier with specific parameters
dt = DecisionTreeClassifier(criterion='entropy', splitter='best')

# Train the decision tree model using training data
dt.fit(X_train, y_train)

# Make predictions on the test set using the trained decision tree model
prediction = dt.predict(X_test)

# Calculate and print the accuracy score of the model
decWT = accuracy_score(prediction, y_test)
print("Accuracy Score:",decWT)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
↪support)
```

```
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Greens')
```

```
Accuracy Score: 0.7276
              precision    recall  f1-score   support

   NotPlaced       0.78      0.75      0.76      1471
      Placed       0.66      0.69      0.68      1029

    accuracy                           0.73      2500
   macro avg       0.72      0.72      0.72      2500
weighted avg       0.73      0.73      0.73      2500
```

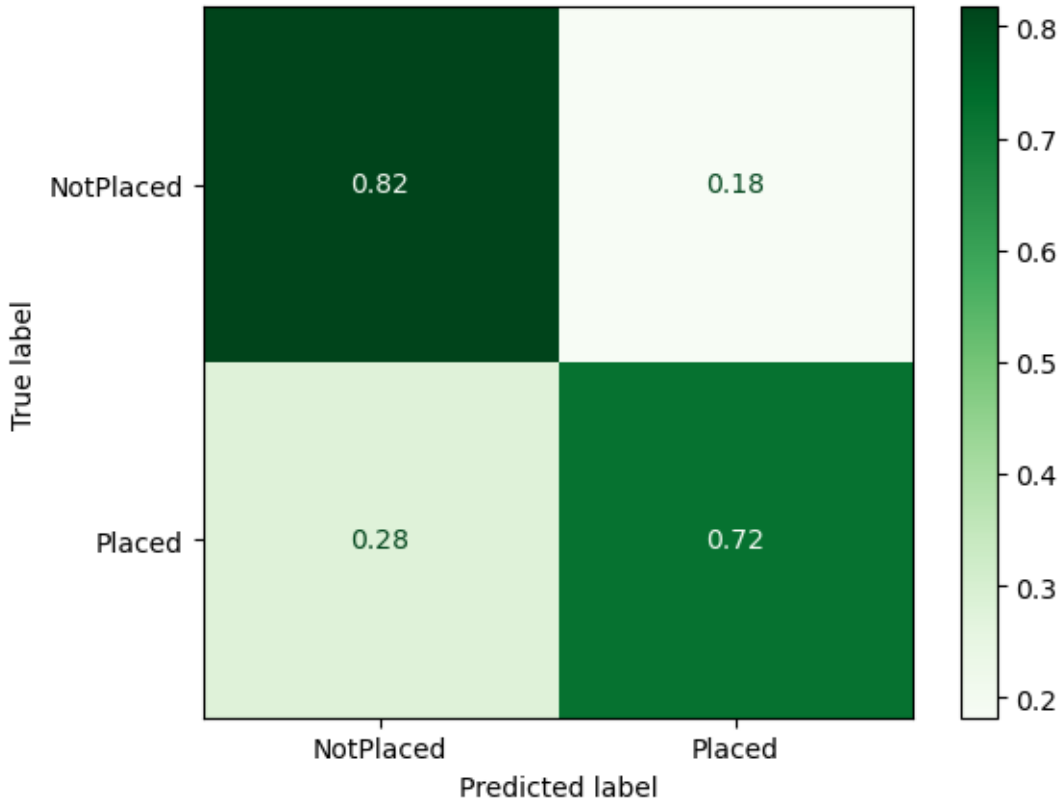
[25]: <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7cc98d2dc470>



[26]:
```
# Initialize K-Nearest Neighbors Classifier with specific parameters
knn = KNeighborsClassifier(n_neighbors=100, weights='distance')

# Train the KNN model using training data
knn.fit(X_train, y_train)

# Make predictions on the test set using the trained model
prediction = knn.predict(X_test)

# Calculate and print the accuracy score of the model
knnWT = accuracy_score(prediction, y_test)
print("Accuracy Score:",knnWT)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
 ↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Greens')
```

```
Accuracy Score: 0.778
              precision    recall  f1-score   support

   NotPlaced       0.81      0.82      0.81      1471
      Placed       0.73      0.72      0.73      1029

    accuracy                           0.78      2500
   macro avg       0.77      0.77      0.77      2500
weighted avg       0.78      0.78      0.78      2500
```

[26]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at
0x7cc98f30ef30>
```



0.3 Applying Models with Normalizations

[27]:
```
# here X is the all the Data except the PlacementStatus and from which we have␣
 ↪to predict our result
features=df_min.drop(columns='PlacementStatus')
# y is the class label which we have to predict
predictionClass=df.PlacementStatus
```

[28]:
```
# Splitting the data into training and testing data
X_train,X_test,y_train,y_test=train_test_split(features,predictionClass,test_size=0.
 ↪25,random_state=0)
```

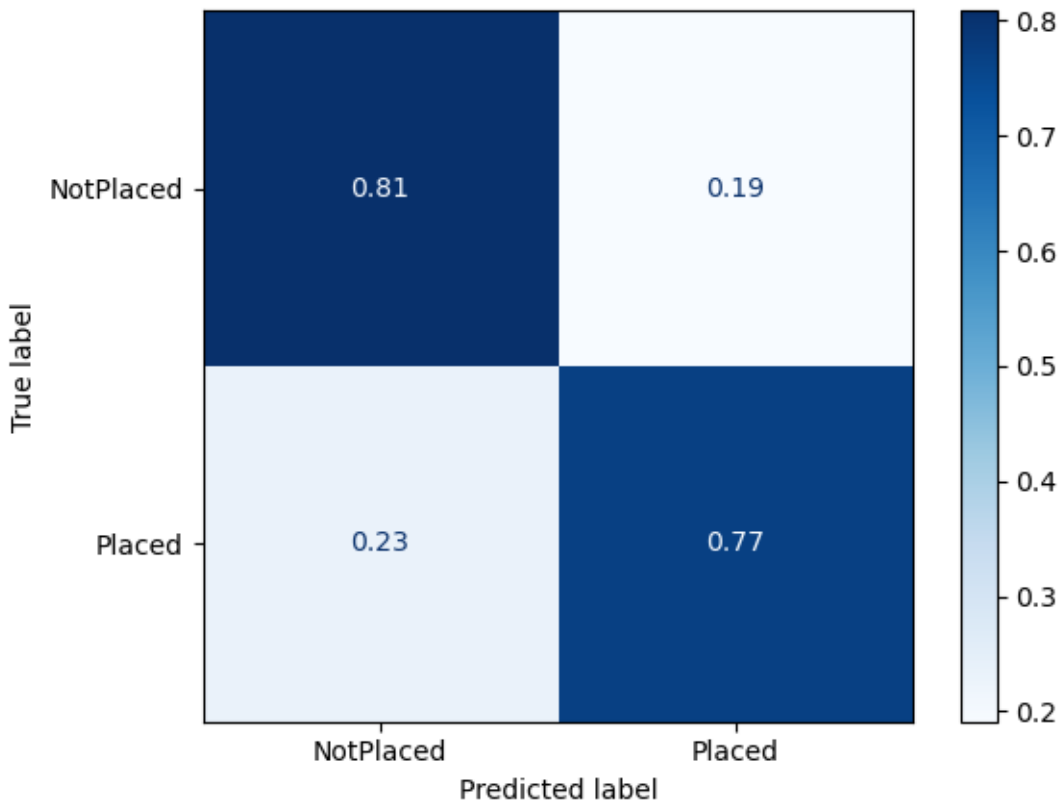
0.4 Logistics Regression

[29]:
```
# Initialize Logistic Regression with specific parameters
lr = LogisticRegression(max_iter=50000, penalty=None)

# Train the logistic regression model using training data
lr.fit(X_train, y_train)
```

```
# Make predictions on the test set using the trained model
prediction = lr.predict(X_test)

# Calculate and print the accuracy score of the model
logAccuracy = accuracy_score(prediction, y_test)
print("Accuracy Score:",logAccuracy)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
 ↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Blues')
```

```
Accuracy Score: 0.7924
              precision    recall  f1-score   support

   NotPlaced       0.83      0.81      0.82      1471
      Placed       0.74      0.77      0.75      1029

    accuracy                           0.79      2500
   macro avg       0.79      0.79      0.79      2500
weighted avg       0.79      0.79      0.79      2500
```

[29]: <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7cc98f5ac860>

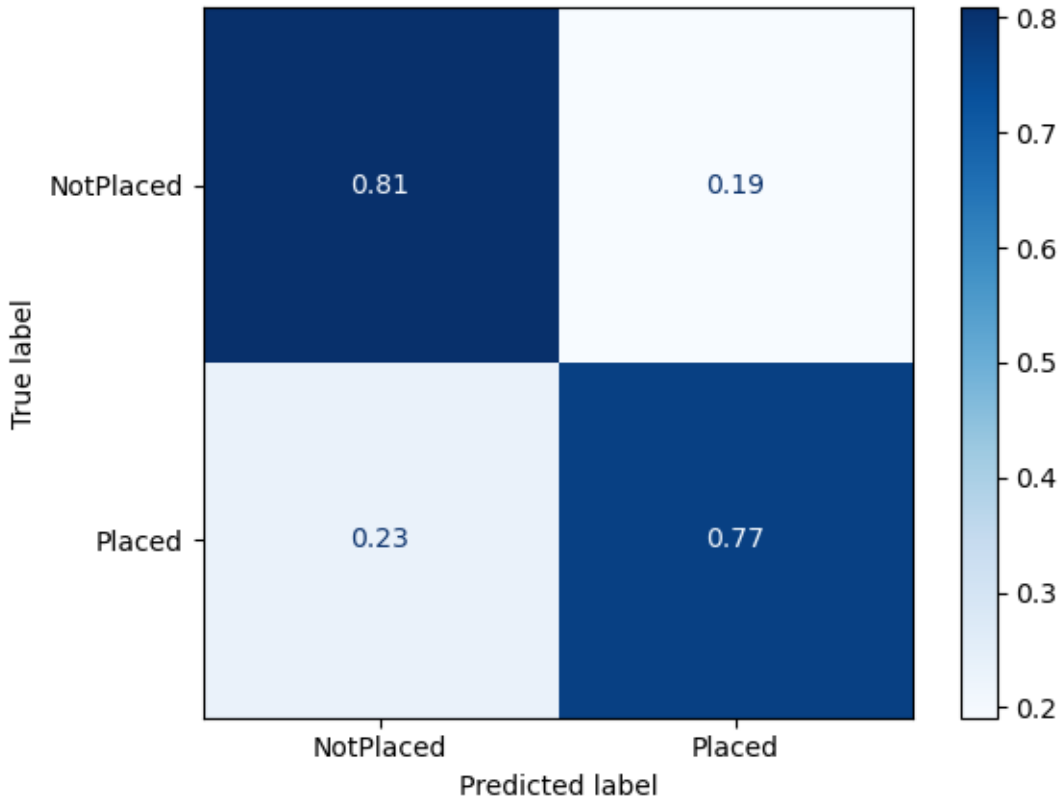


[30]:
```
# Use L2 regularization (Ridge)
lr_l2 = LogisticRegression(penalty='l1',solver='liblinear', max_iter=50000)

# Train the logistic regression model using training data
lr.fit(X_train, y_train)

# Make predictions on the test set using the trained model
prediction = lr.predict(X_test)

# Calculate and print the accuracy score of the model
logAccuracy = accuracy_score(prediction, y_test)
print("Accuracy Score:",logAccuracy)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
```

```
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Blues')
```

```
Accuracy Score: 0.7924
              precision    recall  f1-score   support

   NotPlaced       0.83      0.81      0.82      1471
      Placed       0.74      0.77      0.75      1029

    accuracy                           0.79      2500
   macro avg       0.79      0.79      0.79      2500
weighted avg       0.79      0.79      0.79      2500
```

[30]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at
0x7cc98d5bc680>
```

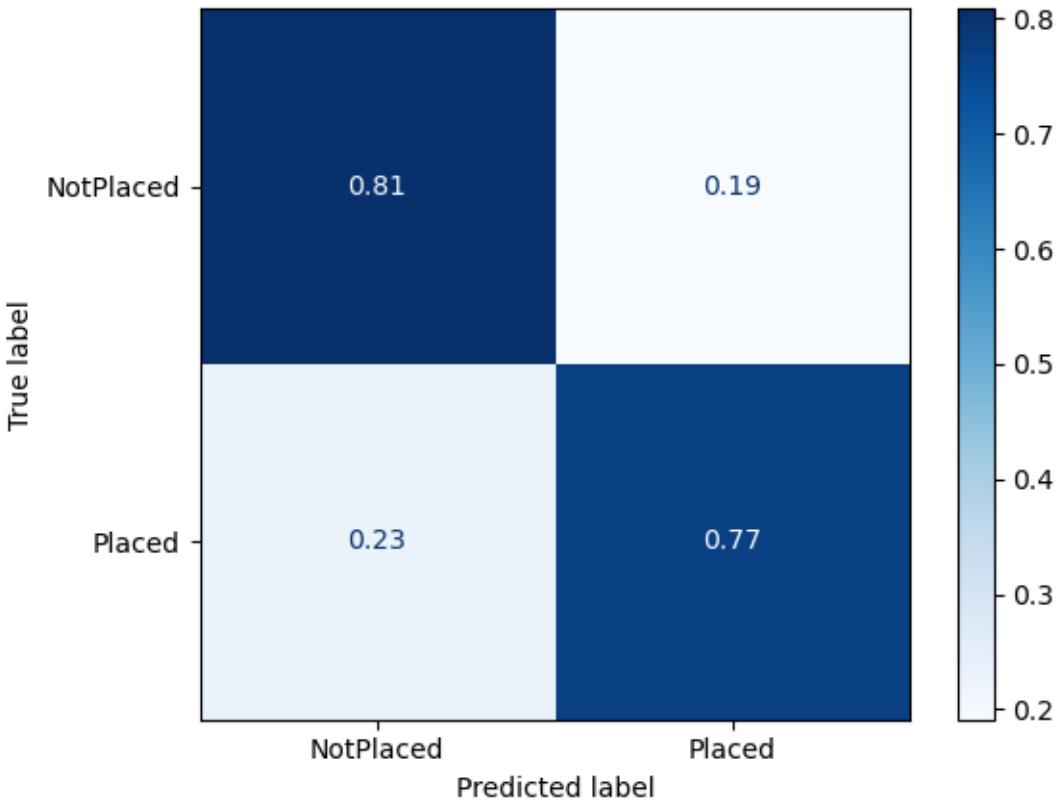


[31]:
```
# Use L2 regularization (Ridge)
lr_l2 = LogisticRegression(penalty='l2', max_iter=50000)
```

```
# Train the logistic regression model using training data
lr.fit(X_train, y_train)

# Make predictions on the test set using the trained model
prediction = lr.predict(X_test)

# Calculate and print the accuracy score of the model
logAccuracy = accuracy_score(prediction, y_test)
print("Accuracy Score:",logAccuracy)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
 ↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Blues')
```

```
Accuracy Score: 0.7924
              precision    recall  f1-score   support

   NotPlaced       0.83      0.81      0.82      1471
      Placed       0.74      0.77      0.75      1029

    accuracy                           0.79      2500
   macro avg       0.79      0.79      0.79      2500
weighted avg       0.79      0.79      0.79      2500
```

[31]: <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7cc98cfdf6e0>



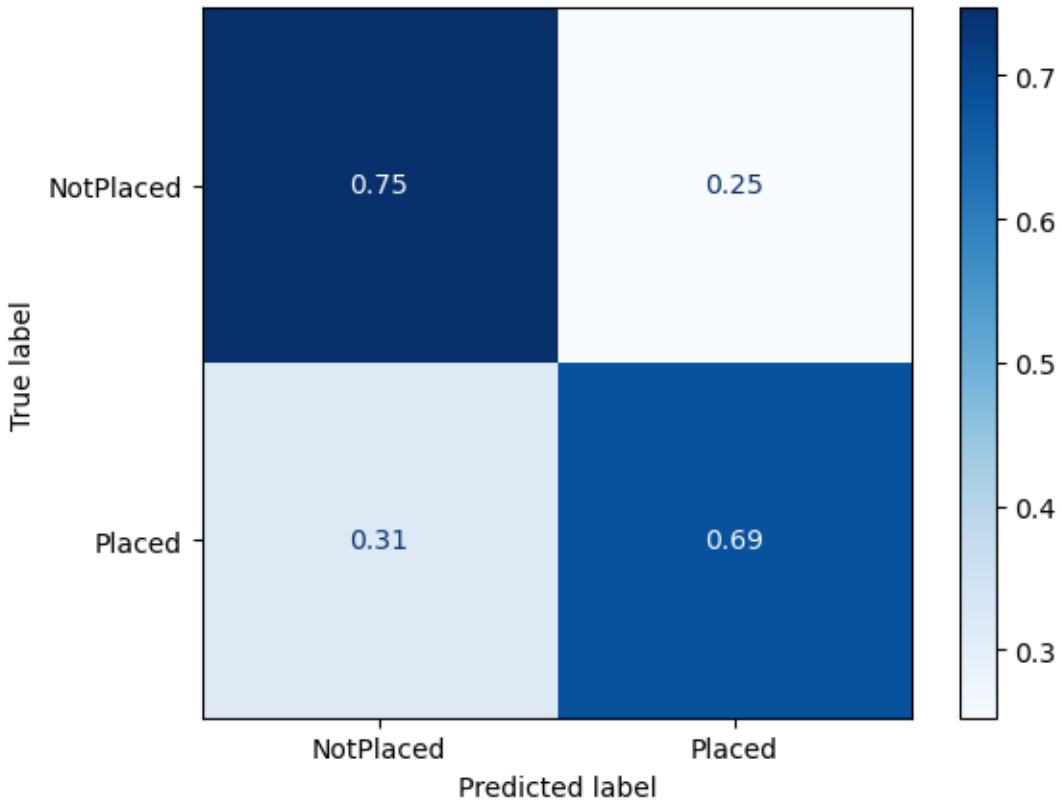
0.5 Decision Tree

[32]:
```
# Initialize Decision Tree Classifier with specific parameters
dt = DecisionTreeClassifier(criterion='entropy', splitter='best')

# Train the decision tree model using training data
dt.fit(X_train, y_train)

# Make predictions on the test set using the trained decision tree model
prediction = dt.predict(X_test)

# Calculate and print the accuracy score of the model
decTreeAccuracy = accuracy_score(prediction, y_test)
print("Accuracy Score:",decTreeAccuracy)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
↪support)
print(classification_report(y_test, prediction, target_names=target_names))
```

```
# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Blues')
```

```
Accuracy Score: 0.7216
              precision    recall  f1-score   support

   NotPlaced       0.77      0.75      0.76      1471
      Placed       0.65      0.69      0.67      1029

    accuracy                           0.72      2500
   macro avg       0.71      0.72      0.71      2500
weighted avg       0.72      0.72      0.72      2500
```

[32]: `<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7cc98da2a5a0>`

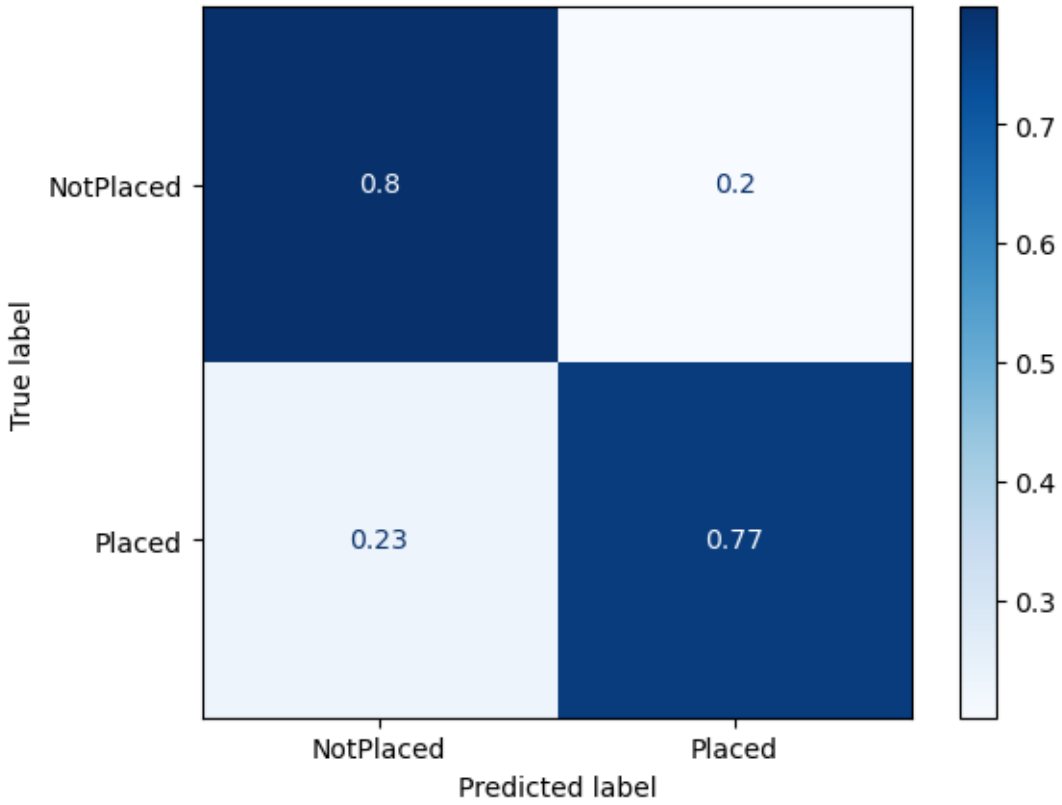


0.6 KNN

[33]:
```
# Initialize K-Nearest Neighbors Classifier with specific parameters
knn = KNeighborsClassifier(n_neighbors=100, weights='distance')

# Train the KNN model using training data
knn.fit(X_train, y_train)

# Make predictions on the test set using the trained model
prediction = knn.predict(X_test)

# Calculate and print the accuracy score of the model
knnAccuracy = accuracy_score(prediction, y_test)
print("Accuracy Score:",knnAccuracy)

# Define labels for the classification report
target_names = ['NotPlaced', 'Placed']

# Generate and print the classification report (precision, recall, f1-score,␣
 ↪support)
print(classification_report(y_test, prediction, target_names=target_names))

# Create a normalized confusion matrix based on the test predictions
# and plot it using ConfusionMatrixDisplay
cm = confusion_matrix(y_test, prediction, normalize='true')
ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=target_names).
 ↪plot(cmap='Blues')
```

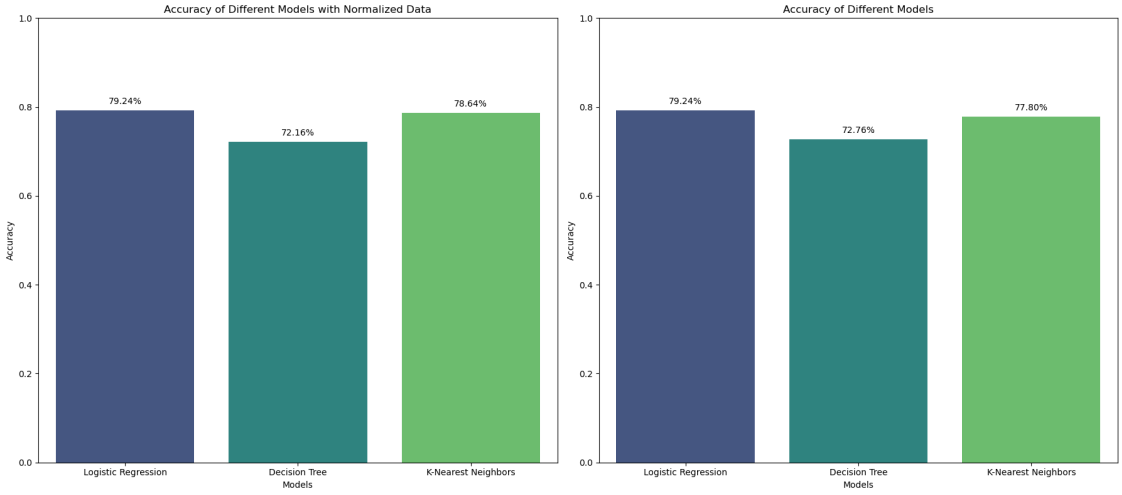
```
Accuracy Score: 0.7864
              precision    recall  f1-score   support

   NotPlaced       0.83      0.80      0.81      1471
      Placed       0.73      0.77      0.75      1029

    accuracy                           0.79      2500
   macro avg       0.78      0.78      0.78      2500
weighted avg       0.79      0.79      0.79      2500
```

[33]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at
0x7cc98d31a030>
```



[55]:
```
# Data for the first plot (with normalized data)
models = ["Logistic Regression", "Decision Tree", "K-Nearest Neighbors"]
accuracy = [logAccuracy, decTreeAccuracy, knnAccuracy]

plt.figure(figsize=(18, 8))
plt.subplot(1, 2, 1)  # Corrected typo: use 1 instead of  (unicode character)
sns.barplot(x=models, y=accuracy, palette='viridis')
plt.xlabel('Models')
plt.ylabel('Accuracy')
plt.title('Accuracy of Different Models with Normalized Data')
plt.ylim(0, 1)  # Set y-axis limits to 0 and 1

# Add percentages above the bars
for i, acc in enumerate(accuracy):
    plt.text(i, acc + 0.01, f'{acc:.2%}', ha='center', va='bottom')

# Data for the second plot (without normalization)
accuracy = [logWT, decWT, knnWT]

plt.subplot(1, 2, 2)  # Subplot with 1 row, 2 columns, and index 2 (right plot)
sns.barplot(x=models, y=accuracy, palette='viridis')
```

```
plt.xlabel('Models')
plt.ylabel('Accuracy')
plt.title('Accuracy of Different Models')
plt.ylim(0, 1)  # Set y-axis limits to 0 and 1

# Add percentages above the bars
for i, acc in enumerate(accuracy):
    plt.text(i, acc + 0.01, f'{acc:.2%}', ha='center', va='bottom')

plt.tight_layout()
plt.show()
```



0.6.1 Predicating data

[47]:
```
#Defining a function to predict on the given student data
def predictForStudents(students, model):
  students = students.drop(columns='StudentID')

  students['ExtracurricularActivities'] = students['ExtracurricularActivities'].
 ↪map({'Yes' : 1, 'No' : 0})
  students['PlacementTraining'] = students['PlacementTraining'].map({'Yes' : 1,␣
 ↪'No' : 0})

  prediction = model.predict(students)
  for index, d in enumerate(prediction):
    result = 'No' if d==0 else 'Yes'
    print('Student',(index+1),':',result)
```

[48]:
```
#Defining students data which are to be predicted
data = [
    {'StudentID' : 2,
     'CGPA' : 8.9,
      'Internships' : 0,
      'Projects' : 3,
      'Workshops/Certifications' : 2,
      'AptitudeTestScore' : 90,
      'SoftSkillsRating' : 4.0,
      'ExtracurricularActivities' : 'Yes',
      'PlacementTraining' : 'Yes',
      'SSC_Marks' : 78,
      'HSC_Marks' : 82},
    {'StudentID' : 84,
     'CGPA' : 9.0,
      'Internships' : 2,
      'Projects' : 3,
      'Workshops/Certifications' : 1,
      'AptitudeTestScore' : 25,
      'SoftSkillsRating' : 8.0,
      'ExtracurricularActivities' : 'Yes',
      'PlacementTraining' : 'Yes',
      'SSC_Marks' : 78,
      'HSC_Marks' : 69},
]

data = pd.DataFrame(data)
data
```

[48]:

	StudentID	CGPA	Internships	Projects	Workshops/Certifications	AptitudeTestScore	SoftSkillsRating	ExtracurricularActivities	PlacementTraining	SSC_Marks	HSC_Marks
0	2	8.9	0	3	2	90	4.0	Yes	Yes	78	82
1	84	9.0	2	3	1	25	8.0	Yes	Yes	78	69

[49]:
```
#Getting prediction using Logistic Regression
predictForStudents(data, lr)
```

```
Student 1 : Yes
Student 2 : Yes
```

[50]:
```
#Getting prediction using Decision Tree Classifier
predictForStudents(data, dt)
```

```
Student 1 : Yes
Student 2 : Yes
```

[51]:
```
#Getting prediction using KNeighbour
predictForStudents(data, knn)
```

```
Student 1 : Yes
Student 2 : Yes
```

[ ]:
```

```