```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
data=pd.read_csv('/content/diabetes.csv')
```

```
data.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigre
0	6	148	72	35	0	33.6	
1	1	85	66	29	0	26.6	
2	8	183	64	0	0	23.3	
3	1	89	66	23	94	28.1	
4	0	137	40	35	168	43.1	

```
data.columns
```

```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

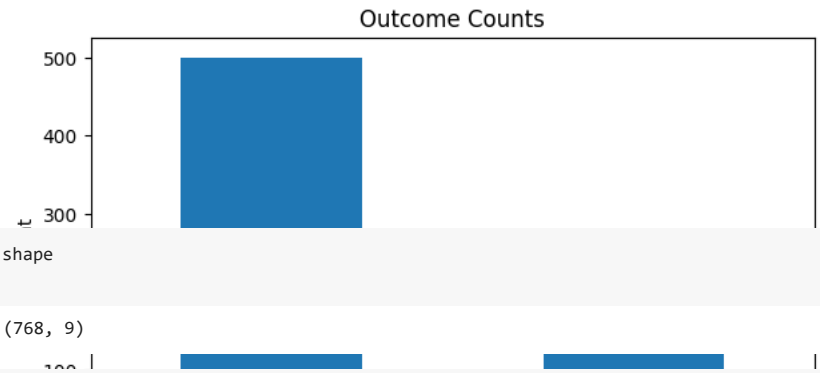
```
data.isna().sum()
```

```
Pregnancies                 0
Glucose                     0
BloodPressure               0
SkinThickness               0
Insulin                     0
BMI                         0
DiabetesPedigreeFunction    0
Age                         0
Outcome                     0
dtype: int64
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

```
data['Outcome'].value_counts().plot(kind='bar',figsize=(7,4))
plt.xlabel('Outcome')
plt.ylabel('Count')
plt.title('Outcome Counts')
plt.show()
```



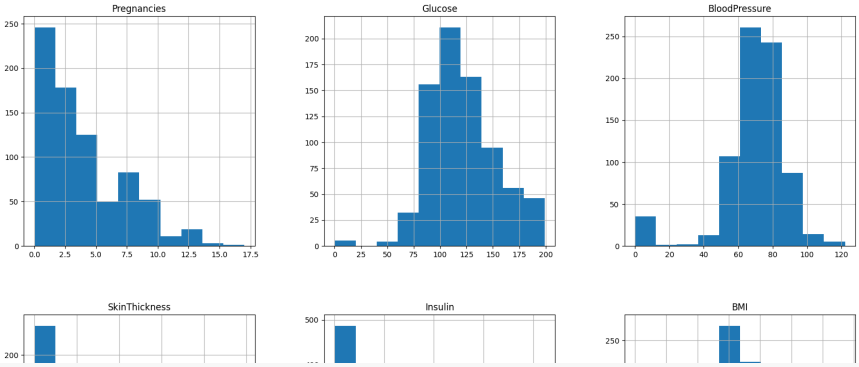

```
data.shape
```

```
(768, 9)
```

```
data.describe().transpose().round(2)
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	768.0	3.85	3.37	0.00	1.00	3.00	6.00	17.00
Glucose	768.0	120.89	31.97	0.00	99.00	117.00	140.25	199.00
BloodPressure	768.0	69.11	19.36	0.00	62.00	72.00	80.00	122.00
SkinThickness	768.0	20.54	15.95	0.00	0.00	23.00	32.00	99.00
Insulin	768.0	79.80	115.24	0.00	0.00	30.50	127.25	846.00
BMI	768.0	31.99	7.88	0.00	27.30	32.00	36.60	67.10
DiabetesPedigreeFunction	768.0	0.47	0.33	0.08	0.24	0.37	0.63	2.42
Age	768.0	33.24	11.76	21.00	24.00	29.00	41.00	81.00
Outcome	768.0	0.35	0.48	0.00	0.00	0.00	1.00	1.00

```
data.hist(figsize=(20,20))
plt.show()
```



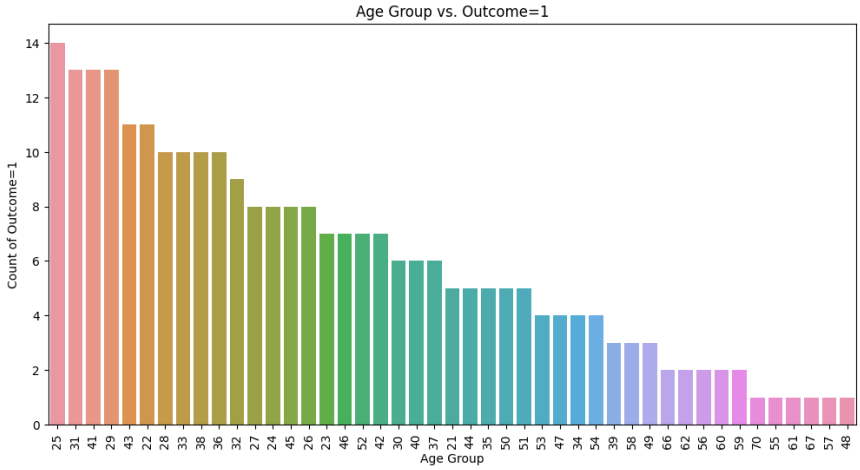

```
columns_to_replace_Zero = ['Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI']

for column in columns_to_replace_Zero:
    mean_value = data[data[column] != 0][column].mean()
    data[column] = data[column].replace(0, mean_value)
```

```
data.describe().transpose().round(2)
```

	count	mean	std	min	25%	50%	75%	max
Pregnancies	768.0	3.85	3.37	0.00	1.00	3.00	6.00	17.00
Glucose	768.0	121.69	30.44	44.00	99.75	117.00	140.25	199.00
BloodPressure	768.0	72.41	12.10	24.00	64.00	72.20	80.00	122.00
SkinThickness	768.0	29.15	8.79	7.00	25.00	29.15	32.00	99.00
Insulin	768.0	155.55	85.02	14.00	121.50	155.55	155.55	846.00
BMI	768.0	32.46	6.88	18.20	27.50	32.40	36.60	67.10
DiabetesPedigreeFunction	768.0	0.47	0.33	0.08	0.24	0.37	0.63	2.42
Age	768.0	33.24	11.76	21.00	24.00	29.00	41.00	81.00
Outcome	768.0	0.35	0.48	0.00	0.00	0.00	1.00	1.00

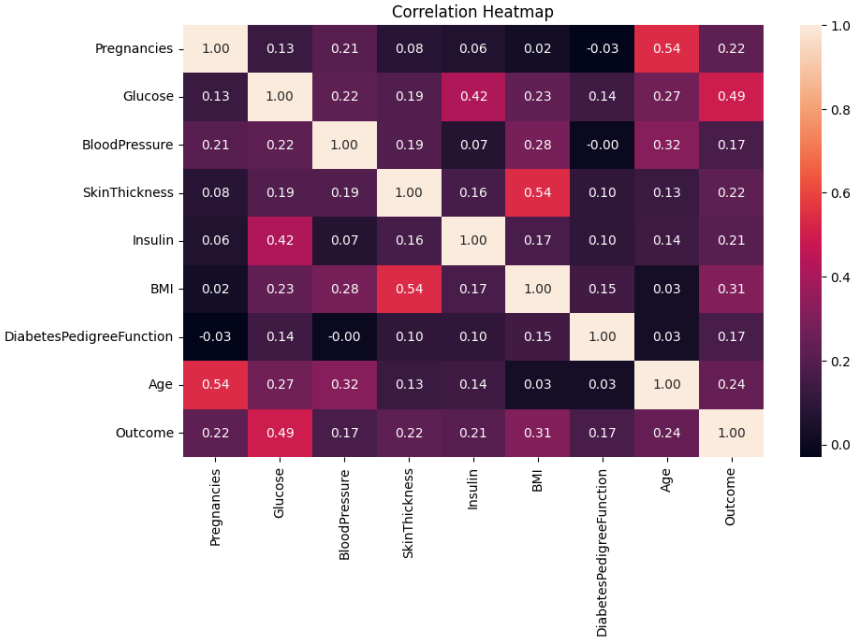
```
plt.figure(figsize=(12, 6))
sns.countplot(x='Age', data=data[data['Outcome'] == 1], order=data[data['Outcome'] == 1]['Age'].value_counts().index)
plt.title('Age Group vs. Outcome=1')
plt.xlabel('Age Group')
plt.ylabel('Count of Outcome=1')
plt.xticks(rotation=90)  # Rotate x-axis labels for better readability
plt.show()
```



```
correlation_matrix = data.corr().round(2)
correlation_matrix
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin
Pregnancies	1.00	0.13	0.21	0.08	0.06
Glucose	0.13	1.00	0.22	0.19	0.42
BloodPressure	0.21	0.22	1.00	0.19	0.07
SkinThickness	0.08	0.19	0.19	1.00	0.16
Insulin	0.06	0.42	0.07	0.16	1.00
BMI	0.02	0.23	0.28	0.54	0.17
DiabetesPedigreeFunction	-0.03	0.14	-0.00	0.10	0.10
Age	0.54	0.27	0.32	0.13	0.14
Outcome	0.22	0.49	0.17	0.22	0.21

```
plt.figure(figsize=(10, 6))
sns.heatmap(correlation_matrix, annot=True, fmt=".2f")
plt.title("Correlation Heatmap")
plt.show()
```




```
from sklearn.utils import resample
majority_class = data[data['Outcome'] == 0]
minority_class = data[data['Outcome'] == 1]
minority_upsampled = resample(minority_class, replace=True, n_samples=len(majority_class), random_state=42)
```

```
augmented_data = pd.concat([majority_class, minority_upsampled])
data=augmented_data
```

```
data.shape
```

```
(1000, 9)
```

```
X = data[['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age']].values
y = data['Outcome'].values
```

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
X = scaler.fit_transform(X)
```

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20, random_state=52)
```

```
from sklearn.ensemble import RandomForestClassifier
model=RandomForestClassifier(n_estimators=110, random_state=42,criterion='entropy')
model.fit(X_train,y_train)
```

```
RandomForestClassifier
RandomForestClassifier(criterion='entropy', n_estimators=110, random_state=42)
```

```
from sklearn.metrics import accuracy_score, precision_score, classification_report, confusion_matrix
## Predict data using test data set
y_pred = model.predict(X_test)
test_accuracy = accuracy_score(y_test, y_pred)
```

```
train_predictions = model.predict(X_train)
train_accuracy = accuracy_score(y_train, train_predictions)

print(f"Test Accuracy: {test_accuracy:.2f}")
print(f"Train Accuracy: {train_accuracy:.2f}")
```

```
Test Accuracy: 0.90
Train Accuracy: 1.00
```

```
conf_matrix = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:")
print(conf_matrix)
```

```
Confusion Matrix:
[[89 15]
 [ 5 91]]
```

```
pre_score = precision_score(y_test, y_pred)
print(f"Precission Data Score: {pre_score:.2f}")
```

```
Precission Data Score: 0.86
```

```
class_report = classification_report(y_test, y_pred)
print(class_report)
```

```
              precision    recall  f1-score   support

           0       0.95      0.86      0.90       104
           1       0.86      0.95      0.90        96

    accuracy                           0.90       200
   macro avg       0.90      0.90      0.90       200
weighted avg       0.90      0.90      0.90       200
```

```
import joblib
model_filename = 'model.pkl'
joblib.dump(model, model_filename)
```