```
import warnings
warnings.filterwarnings('ignore')
import numpy as np
import pandas as pd
import seaborn as sns
import scipy.stats as stats
import matplotlib.pyplot as plt
%matplotlib inline
```

```
data=pd.read_csv("heart.csv")
data.head()
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal
0	52	1	0	125	212	0	1	168	0	1.0	2	2	3
1	53	1	0	140	203	1	0	155	1	3.1	0	0	3
2	70	1	0	145	174	0	1	125	1	2.6	0	0	3
3	61	1	0	148	203	0	1	161	0	0.0	2	1	3
4	62	0	0	138	294	1	1	106	0	1.9	1	3	2

```
data.info()
data.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1025 entries, 0 to 1024
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       1025 non-null   int64  
 1   sex       1025 non-null   int64  
 2   cp        1025 non-null   int64  
 3   trestbps  1025 non-null   int64  
 4   chol      1025 non-null   int64  
 5   fbs       1025 non-null   int64  
 6   restecg   1025 non-null   int64  
 7   thalach   1025 non-null   int64  
 8   exang     1025 non-null   int64  
 9   oldpeak   1025 non-null   float64
 10  slope     1025 non-null   int64  
 11  ca        1025 non-null   int64  
 12  thal      1025 non-null   int64  
 13  target    1025 non-null   int64  
dtypes: float64(1), int64(13)
memory usage: 112.2 KB
```

	age	sex	cp	trestbps	chol	fbs	res
count	1025.000000	1025.000000	1025.000000	1025.000000	1025.00000	1025.000000	1025.00
mean	54.434146	0.695610	0.942439	131.611707	246.00000	0.149268	0.52
std	9.072290	0.460373	1.029641	17.516718	51.59251	0.356527	0.52
min	29.000000	0.000000	0.000000	94.000000	126.00000	0.000000	0.00
25%	48.000000	0.000000	0.000000	120.000000	211.00000	0.000000	0.00
50%	56.000000	1.000000	1.000000	130.000000	240.00000	0.000000	1.00
75%	61.000000	1.000000	2.000000	140.000000	275.00000	0.000000	1.00
max	77.000000	1.000000	3.000000	200.000000	564.00000	1.000000	2.00

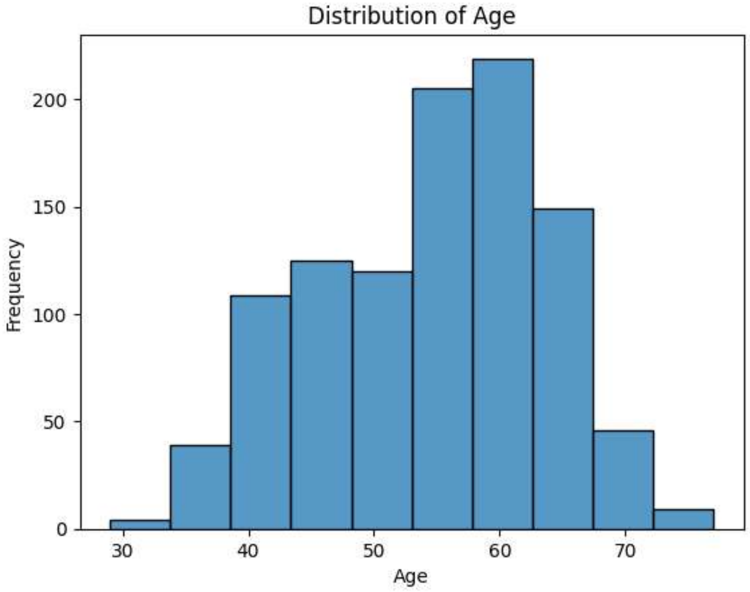
```
# Identify missing values
print(data.isnull().sum())
```

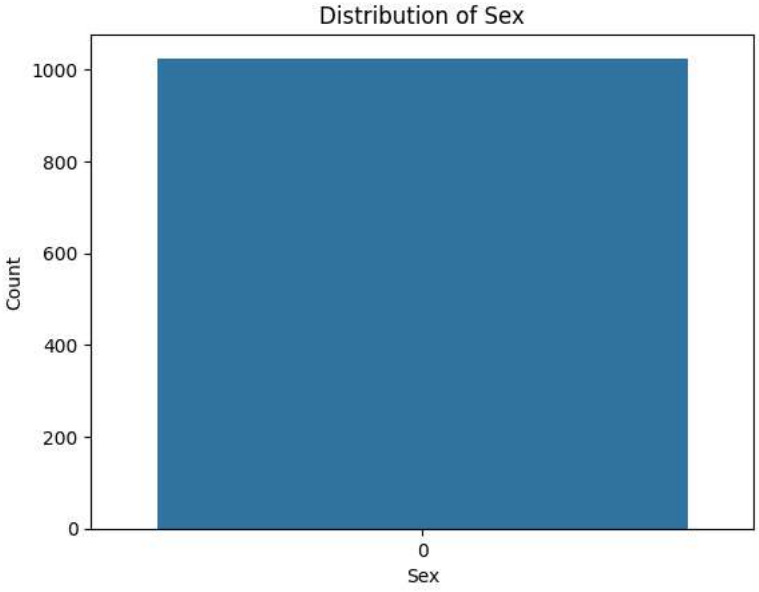
```
age         0
sex         0
cp          0
trestbps    0
chol        0
fbs         0
```

```
    restecg     0
    thalach     0
    exang       0
    oldpeak     0
    slope       0
    ca          0
    thal        0
    target      0
    dtype: int64
```

```
# Plot a histogram for numeric variables
sns.histplot(data['age'], bins=10)
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Distribution of Age')
plt.show()

# Create bar plots for categorical variables
sns.countplot(data['sex'])
plt.xlabel('Sex')
plt.ylabel('Count')
plt.title('Distribution of Sex')
plt.show()
```

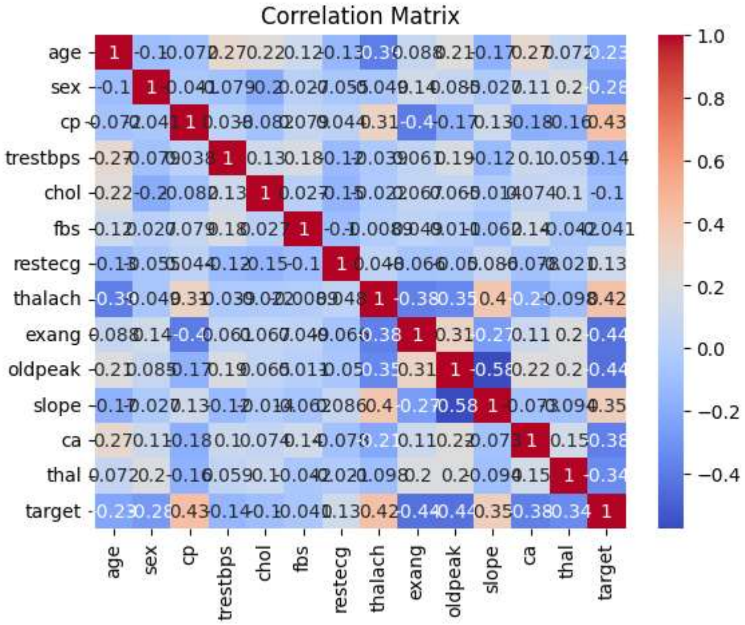


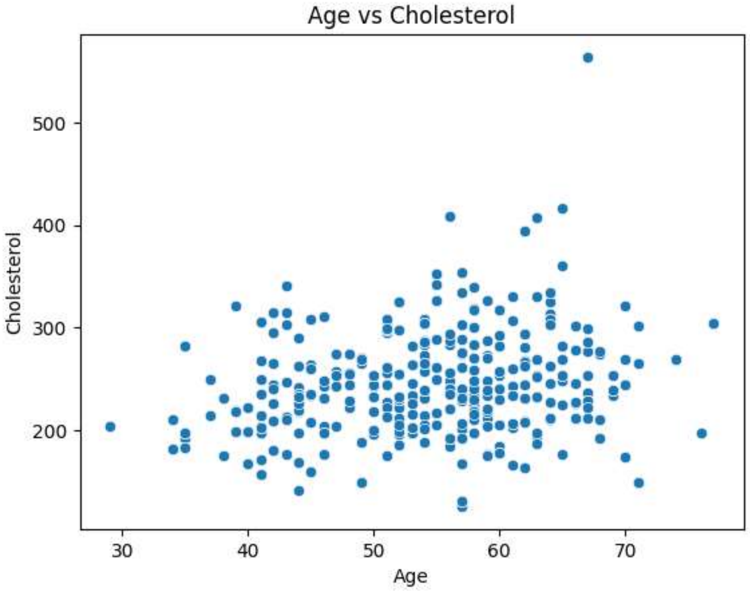


```
# Plot a correlation matrix
sns.heatmap(data.corr(), annot=True, cmap='coolwarm')
```

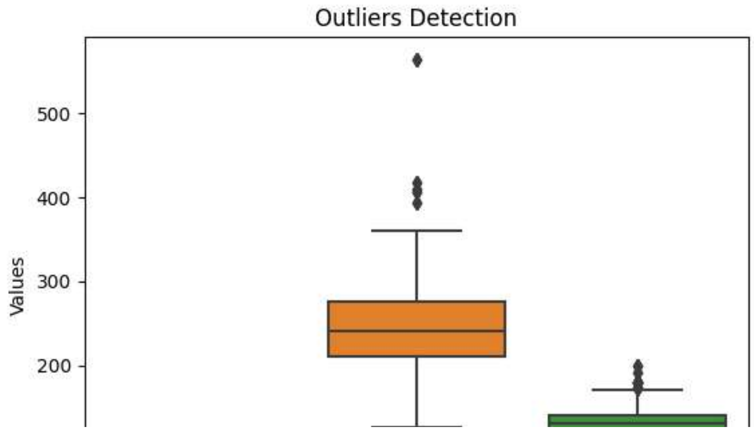
```
plt.title('Correlation Matrix')
plt.show()

# Plot scatter plots to examine relationships between variables
sns.scatterplot(data=data, x='age', y='chol')
plt.xlabel('Age')
plt.ylabel('Cholesterol')
plt.title('Age vs Cholesterol')
plt.show()
```





```
# Create box plots to visualize outliers in numeric variables
sns.boxplot(data=data[['age', 'chol', 'trestbps']])
plt.xlabel('Variables')
plt.ylabel('Values')
plt.title('Outliers Detection')
plt.show()
```



```
cholesterol_with_heart_disease = data[data['thal'] == 1]['chol']
cholesterol_without_heart_disease = data[data['thal'] == 0]['chol']

# Perform independent t-test
t_statistic, p_value = stats.ttest_ind(cholesterol_with_heart_disease, cholesterol_without_heart_disease)

# Print the t-statistic and p-value
print('T-statistic:', t_statistic)
print('P-value:', p_value)
```

```
T-statistic: 1.1818024879918922
P-value: 0.2413410679739629
```

```
# Define significance level
alpha = 0.05

# Compare p-value to the significance level
if p_value < alpha:
    print('The difference in cholesterol levels between the groups is statistically significant.')
else:
    print('There is no statistically significant difference in cholesterol levels between the groups.')
```

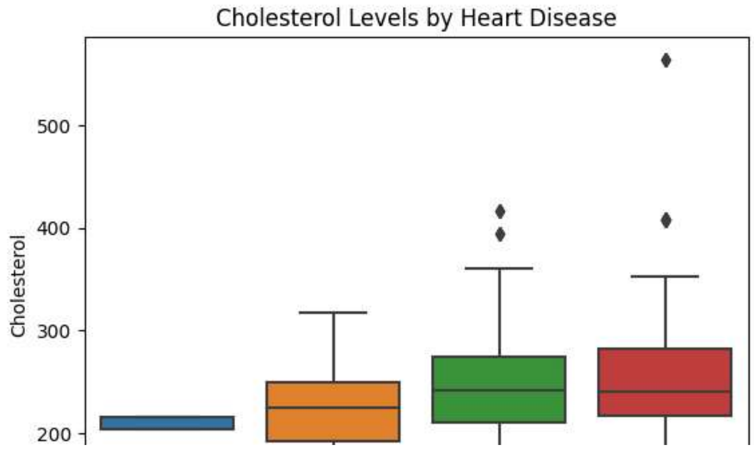
```
There is no statistically significant difference in cholesterol levels between the groups.
```

```
# Calculate confidence intervals
ci_with_heart_disease = stats.t.interval(0.95, len(cholesterol_with_heart_disease)-1, loc=np.mean(cholesterol_with_heart_disease), scale=stat
ci_without_heart_disease = stats.t.interval(0.95, len(cholesterol_without_heart_disease)-1, loc=np.mean(cholesterol_without_heart_disease), s

# Print confidence intervals
print('Confidence Interval (with heart disease):', ci_with_heart_disease)
print('Confidence Interval (without heart disease):', ci_without_heart_disease)
```

```
Confidence Interval (with heart disease): (217.94979268680842, 239.92520731319158)
Confidence Interval (without heart disease): (203.21064699001266, 215.07506729570161)
```

```
# visualize the cholesterol levels
sns.boxplot(x=data['thal'], y=data['chol'])
plt.xlabel('Heart Disease')
plt.ylabel('Cholesterol')
plt.title('Cholesterol Levels by Heart Disease')
plt.xticks([0, 1], ['No Heart Disease', 'With Heart Disease'])
plt.show()
```



```
#Summary of Findings:

# Hypothesis Test:
#Hypothesis: There is no significant difference in cholesterol levels between patients with and without heart disease.

#Confidence Intervals:
# Confidence intervals were calculated for the cholesterol levels of patients with and without heart disease.
# A narrower interval indicates greater precision.which was confidence level without heart desease
```

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