```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, accuracy_score
```

```
df = pd.read_csv('/content/archive (3).zip')
```

```
df.head()
```

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Thallium	Heart Disease
0	70	1	4	130	322	0	2	109	0	2.4	2	3	3	Presence
1	67	0	3	115	564	0	2	160	0	1.6	2	0	7	Absence
2	57	1	2	124	261	0	0	141	0	0.3	1	0	7	Presence
3	64	1	4	128	263	0	0	105	1	0.2	2	1	7	Absence

Next steps: Generate code with df View recommended plots New interactive sheet

```
df.tail()
```

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Thallium	Heart Disease
265	52	1	3	172	199	1	0	162	0	0.5	1	0	7	Absence
266	44	1	2	120	263	0	0	173	0	0.0	1	0	7	Absence
267	56	0	2	140	294	0	2	153	0	1.3	2	0	3	Absence
268	57	1	4	140	192	0	0	148	0	0.4	2	0	6	Absence

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 270 entries, 0 to 269
Data columns (total 14 columns):
 #   Column                   Non-Null Count  Dtype  
---  ------                   --------------  -----  
 0   Age                      270 non-null    int64  
 1   Sex                      270 non-null    int64  
 2   Chest pain type          270 non-null    int64  
 3   BP                       270 non-null    int64  
 4   Cholesterol              270 non-null    int64  
 5   FBS over 120             270 non-null    int64  
 6   EKG results              270 non-null    int64  
 7   Max HR                   270 non-null    int64  
 8   Exercise angina          270 non-null    int64  
 9   ST depression            270 non-null    float64
 10  Slope of ST              270 non-null    int64  
 11  Number of vessels fluro  270 non-null    int64  
 12  Thallium                 270 non-null    int64  
 13  Heart Disease            270 non-null    object 
dtypes: float64(1), int64(12), object(1)
memory usage: 29.7+ KB
```

```
df.isnull().sum()
```

	0
Age	0
Sex	0
Chest pain type	0
BP	0
Cholesterol	0
FBS over 120	0
EKG results	0
Max HR	0
Exercise angina	0
ST depression	0
Slope of ST	0
Number of vessels fluro	0
Thallium	0
Heart Disease	0

dtype: int64

```
label_encoder = LabelEncoder()
df['Heart Disease'] = label_encoder.fit_transform(df['Heart Disease'])
```

```
X = df.drop('Heart Disease', axis=1)
y = df['Heart Disease']
```

```
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)
```

```
model = RandomForestClassifier(random_state=42)
```

```
model.fit(X_train, y_train)
```

```
▾ RandomForestClassifier
RandomForestClassifier(random_state=42)
```

```
y_pred = model.predict(X_test)
```

```
accuracy = accuracy_score(y_test, y_pred)
report = classification_report(y_test, y_pred, target_names=label_encoder.classes_)
```

```
print(f"Accuracy: {accuracy:.2f}")
```

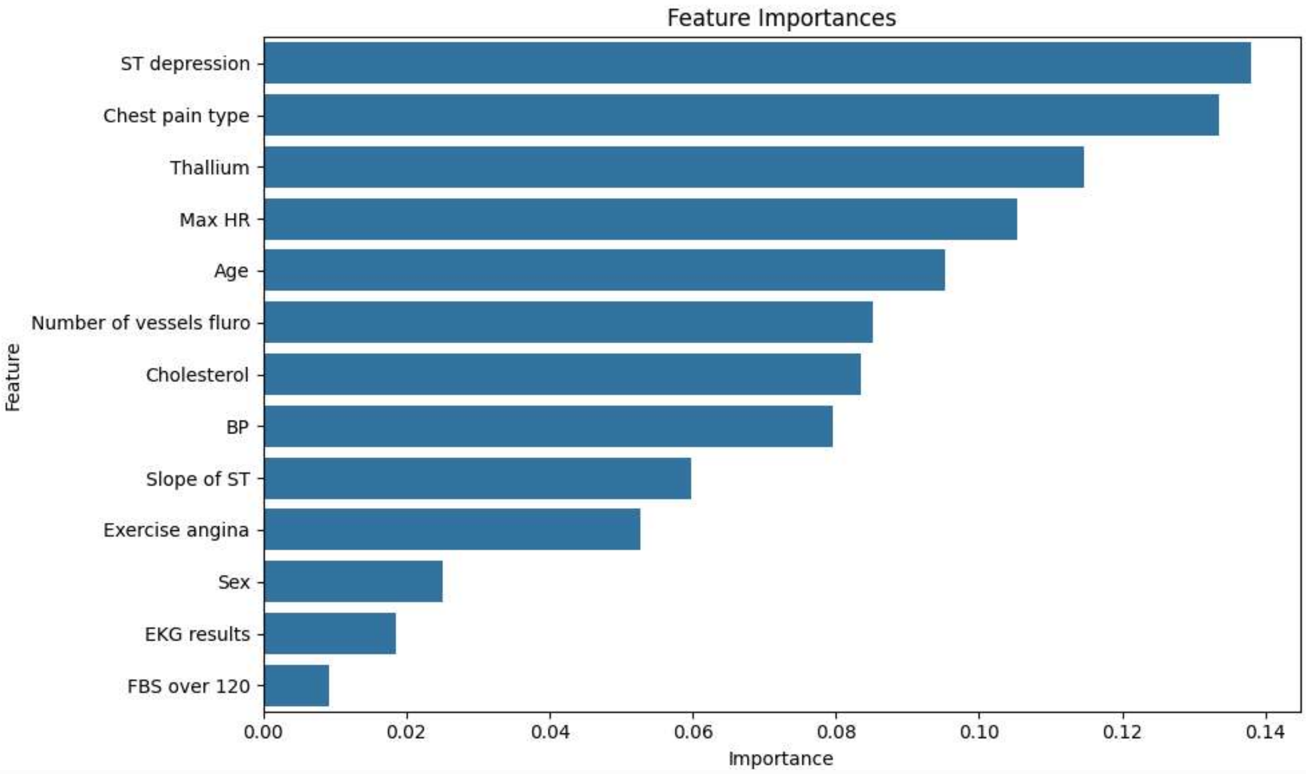
```
Accuracy: 0.80
```

```
print("Classification Report:")

print(report)
```

```
Classification Report:
              precision    recall  f1-score   support

     Absence       0.81      0.88      0.84        33
    Presence       0.78      0.67      0.72        21

    accuracy                           0.80        54
   macro avg       0.79      0.77      0.78        54
weighted avg       0.79      0.80      0.79        54
```

```
importances = model.feature_importances_
```

```
features = X.columns
indices = importances.argsort()[::-1]


plt.figure(figsize=(10, 6))
sns.barplot(x=importances[indices], y=features[indices])
plt.title("Feature Importances")
plt.xlabel("Importance")
plt.ylabel("Feature")
plt.tight_layout()
plt.show()
```



```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from xgboost import XGBClassifier
from sklearn.metrics import classification_report, accuracy_score


df = pd.read_csv('/content/archive (3).zip')


df['Heart Disease'] = df['Heart Disease'].map({'Presence': 1, 'Absence': 0})


label_encoder = LabelEncoder()
df['Heart Disease'] = label_encoder.fit_transform(df['Heart Disease'])


X = df.drop('Heart Disease', axis=1)
y = df['Heart Disease']


scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)


X = df.drop('Heart Disease', axis=1)
y = df['Heart Disease']


X_train, X_test, y_train, y_test = train_test_split(
    X_scaled, y, test_size=0.2, random_state=42
)
```

```
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)


# Drop rows where the target is NaN
df = df.dropna(subset=['Heart Disease'])

# Proceed with feature/target split
X = df.drop('Heart Disease', axis=1)
y = df['Heart Disease']

# (Continue with StandardScaler, train_test_split, etc.)
```

```
print(df['Heart Disease'].isna().sum())
```

```
0
```

```
print(df['Heart Disease'].isna().sum())
```

```
0
```

```
df = df.fillna(df.mean(numeric_only=True))
```

```
log_reg = LogisticRegression()
```

```
log_reg.fit(X_train, y_train)
```

```
/usr/local/lib/python3.11/dist-packages/sklearn/linear_model/_logistic.py:465: ConvergenceWarning: 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(
```

▾ LogisticRegression ⓘ ?

```
LogisticRegression()
```

```
log_preds = log_reg.predict(X_test)
```

```
print("=== Logistic Regression Results ===")
print("Accuracy:", accuracy_score(y_test, log_preds))
print(classification_report(y_test, log_preds))
```

```
=== Logistic Regression Results ===
Accuracy: 0.9074074074074074
              precision    recall  f1-score   support

           0       0.89      0.97      0.93        33
           1       0.94      0.81      0.87        21

    accuracy                           0.91        54
   macro avg       0.92      0.89      0.90        54
weighted avg       0.91      0.91      0.91        54
```

```
xgb = XGBClassifier(use_label_encoder=False, eval_metric='logloss')
xgb.fit(X_train, y_train)
```

```
/usr/local/lib/python3.11/dist-packages/xgboost/core.py:158: UserWarning: [14:29:40] WARNING: /workspace/src/learner.cc:740:
Parameters: { "use_label_encoder" } are not used.

  warnings.warn(smsg, UserWarning)
```

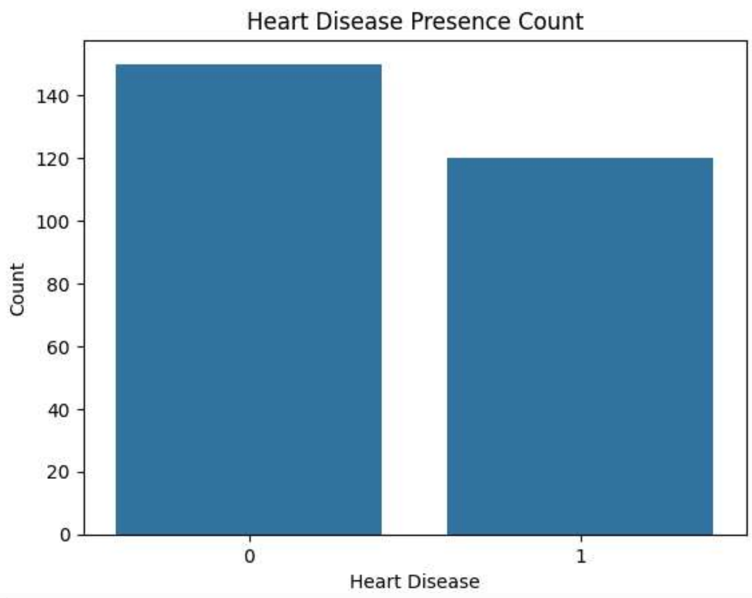
```
▾                               XGBClassifier                              ⓘ

XGBClassifier(base_score=None, booster=None, callbacks=None,
              colsample_bylevel=None, colsample_bynode=None,
              colsample_bytree=None, device=None, early_stopping_rounds=None,
              enable_categorical=False, eval_metric='logloss',
              feature_types=None, gamma=None, grow_policy=None,
              importance_type=None, interaction_constraints=None,
              learning_rate=None, max_bin=None, max_cat_threshold=None,
              max_cat_to_onehot=None, max_delta_step=None, max_depth=None,
              max_leaves=None, min_child_weight=None, missing=nan,
              monotone_constraints=None, multi_strategy=None, n_estimators=None,
              n_jobs=None, num_parallel_tree=None, random_state=None, ...)
```

```
xgb_preds = xgb.predict(X_test)
```

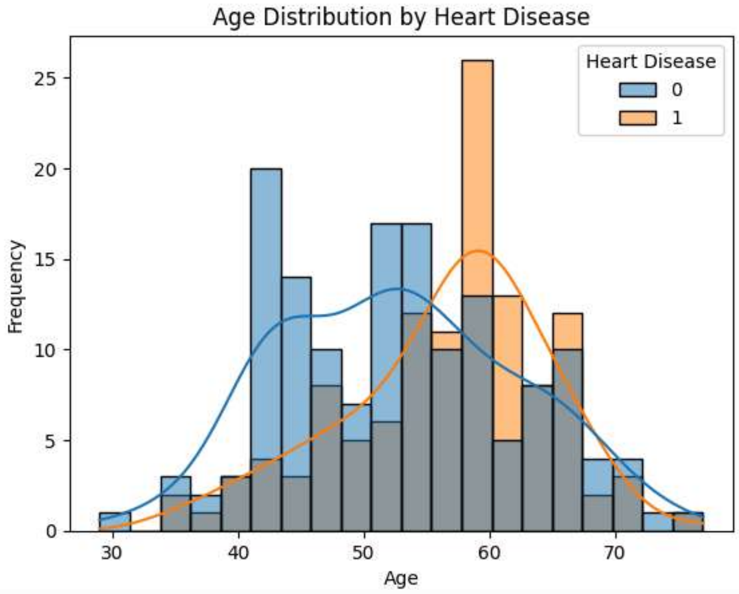
```
print("=== XGBoost Results ===")
print("Accuracy:", accuracy_score(y_test, xgb_preds))
print(classification_report(y_test, xgb_preds))
```

```
=== XGBoost Results ===
Accuracy: 0.8148148148148148
              precision    recall  f1-score   support

           0       0.83      0.88      0.85        33
           1       0.79      0.71      0.75        21

    accuracy                           0.81        54
   macro avg       0.81      0.80      0.80        54
weighted avg       0.81      0.81      0.81        54
```

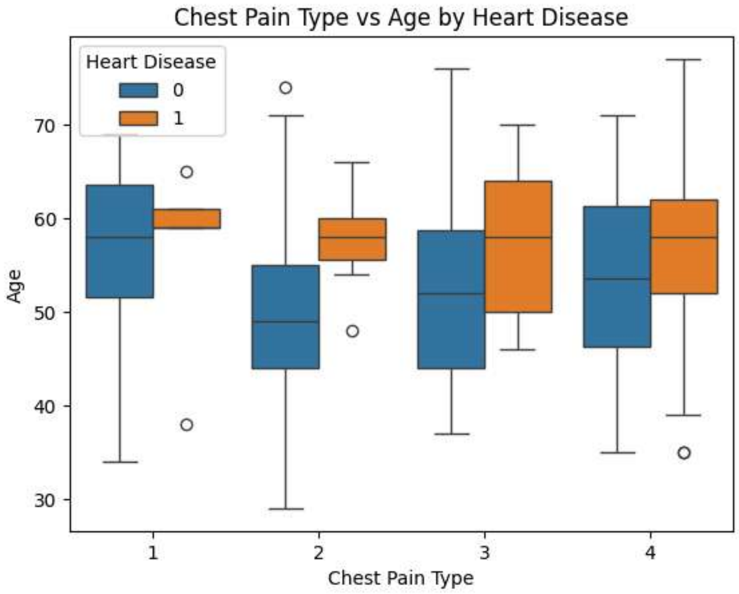
```
import seaborn as sns
import matplotlib.pyplot as plt

sns.countplot(data=df, x='Heart Disease')
plt.title('Heart Disease Presence Count')
plt.xlabel('Heart Disease')
plt.ylabel('Count')
plt.show()
```



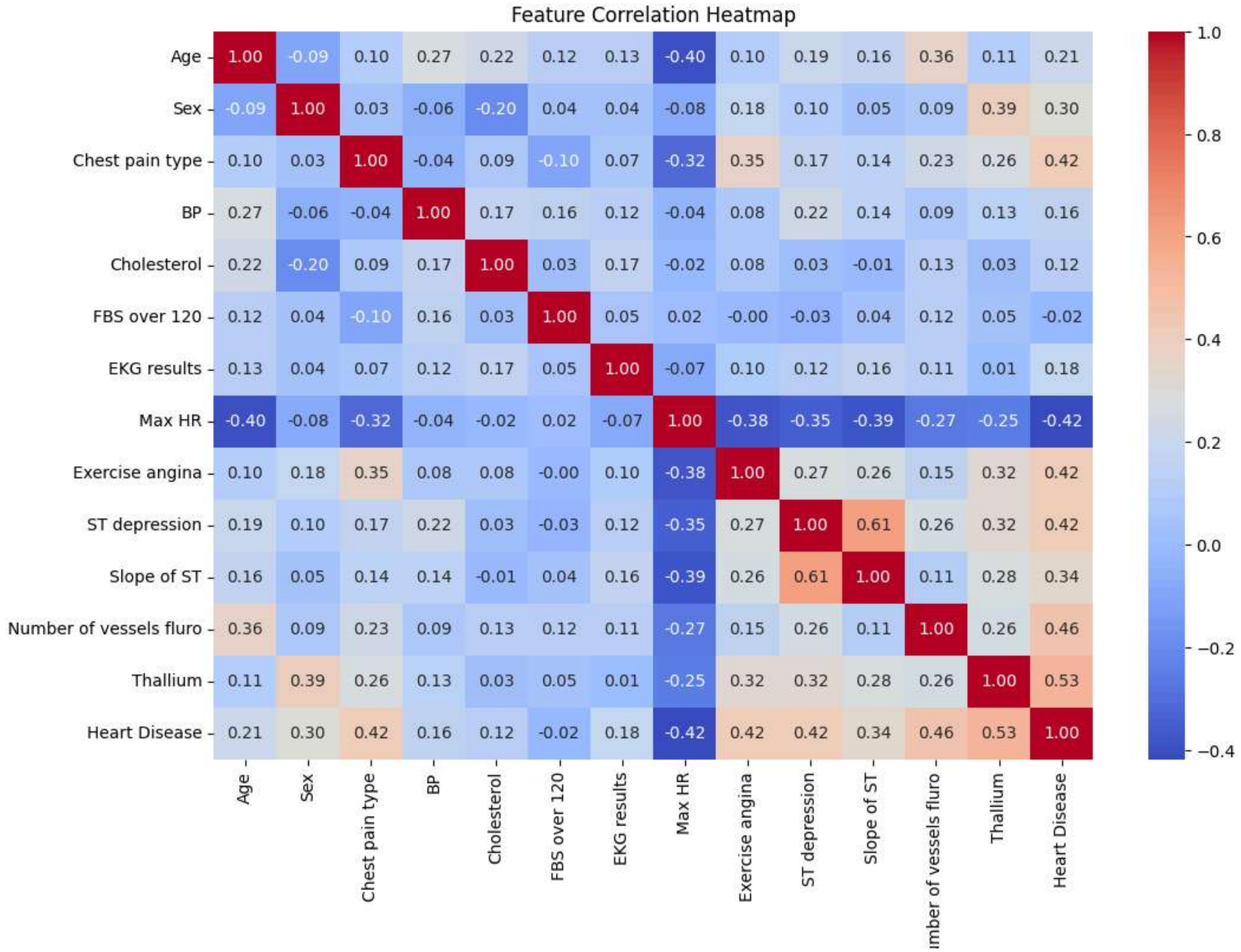
```
sns.histplot(data=df, x='Age', hue='Heart Disease', kde=True, bins=20)
plt.title('Age Distribution by Heart Disease')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.show()
```



```
sns.boxplot(data=df, x='Chest pain type', y='Age', hue='Heart Disease')
plt.title('Chest Pain Type vs Age by Heart Disease')
plt.xlabel('Chest Pain Type')
plt.ylabel('Age')
plt.show()
```



```
plt.figure(figsize=(12, 8))
corr = df.corr(numeric_only=True)
sns.heatmap(corr, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Feature Correlation Heatmap')
plt.show()
```



	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	imber of vessels fluro	Thallium	Heart Disease
Age	1.00	-0.09	0.10	0.27	0.22	0.12	0.13	-0.40	0.10	0.19	0.16	0.36	0.11	0.21
Sex	-0.09	1.00	0.03	-0.06	-0.20	0.04	0.04	-0.08	0.18	0.10	0.05	0.09	0.39	0.30
Chest pain type	0.10	0.03	1.00	-0.04	0.09	-0.10	0.07	-0.32	0.35	0.17	0.14	0.23	0.26	0.42
BP	0.27	-0.06	-0.04	1.00	0.17	0.16	0.12	-0.04	0.08	0.22	0.14	0.09	0.13	0.16
Cholesterol	0.22	-0.20	0.09	0.17	1.00	0.03	0.17	-0.02	0.08	0.03	-0.01	0.13	0.03	0.12
FBS over 120	0.12	0.04	-0.10	0.16	0.03	1.00	0.05	0.02	-0.00	-0.03	0.04	0.12	0.05	-0.02
EKG results	0.13	0.04	0.07	0.12	0.17	0.05	1.00	-0.07	0.10	0.12	0.16	0.11	0.01	0.18
Max HR	-0.40	-0.08	-0.32	-0.04	-0.02	0.02	-0.07	1.00	-0.38	-0.35	-0.39	-0.27	-0.25	-0.42
Exercise angina	0.10	0.18	0.35	0.08	0.08	-0.00	0.10	-0.38	1.00	0.27	0.26	0.15	0.32	0.42
ST depression	0.19	0.10	0.17	0.22	0.03	-0.03	0.12	-0.35	0.27	1.00	0.61	0.26	0.32	0.42
Slope of ST	0.16	0.05	0.14	0.14	-0.01	0.04	0.16	-0.39	0.26	0.61	1.00	0.11	0.28	0.34
Number of vessels fluro	0.36	0.09	0.23	0.09	0.13	0.12	0.11	-0.27	0.15	0.26	0.11	1.00	0.26	0.46
Thallium	0.11	0.39	0.26	0.13	0.03	0.05	0.01	-0.25	0.32	0.32	0.28	0.26	1.00	0.53
Heart Disease	0.21	0.30	0.42	0.16	0.12	-0.02	0.18	-0.42	0.42	0.42	0.34	0.46	0.53	1.00