

## ▼ Pima Indian Diabetes Dataset

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

from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split

from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVC

from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay, accuracy_score, precision_score, recall_sc
```

```
df = pd.read_csv('/content/pima-indians-diabetes.csv')
```

```
df.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome	grid icon
0	6	148	72	35	0	33.6		0.627	50	1
1	1	85	66	29	0	26.6		0.351	31	0
2	8	183	64	0	0	23.3		0.672	32	1
3	1	89	66	23	94	28.1		0.167	21	0
4	0	137	40	35	168	43.1		2.288	33	1

Next steps: [Generate code with df](#) [New interactive sheet](#)

```
df.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
```

```
df.isna().sum()
```

	0
Pregnancies	0
Glucose	0
BloodPressure	0
SkinThickness	0
Insulin	0
BMI	0
DiabetesPedigreeFunction	0
Age	0
Outcome	0

```
dtype: int64
```

- No missing values

```
df.duplicated().sum()
```

```
np.int64(0)
```

- No duplicate values

```
for col in df.columns:  
    plt.figure(figsize=(8, 4))  
    sns.boxplot(df[col])  
    plt.title(col)  
    plt.show()
```

```
for col in df.columns:  
    q1 = df[col].quantile(0.25)  
    q3 = df[col].quantile(0.75)  
    iqr = q3 - q1  
    lower = q1 - 1.5*iqr  
    upper = q3 + 1.5*iqr  
  
    df[col] = df[col].clip(lower=lower, upper=upper)
```

- Handled Outliers

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

## ▼ Standardization

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

## ▼ Splitting train-test

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

## ▼ Model Development

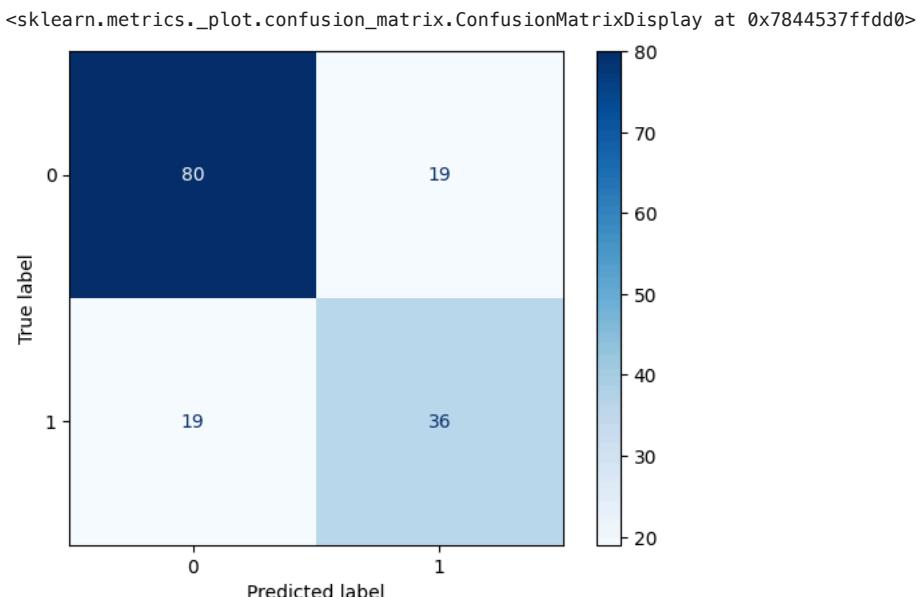
### ▼ Logistic Regression

```
model = LogisticRegression(max_iter=1000)  
model.fit(X_train, y_train)
```

```
▼ LogisticRegression ① (?)  
LogisticRegression(max_iter=1000)
```

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

```
cm = confusion_matrix(y_test, y_pred_log)  
disp = ConfusionMatrixDisplay(confusion_matrix=cm)  
disp.plot(cmap='Blues')
```



## ▼ KNN Classification

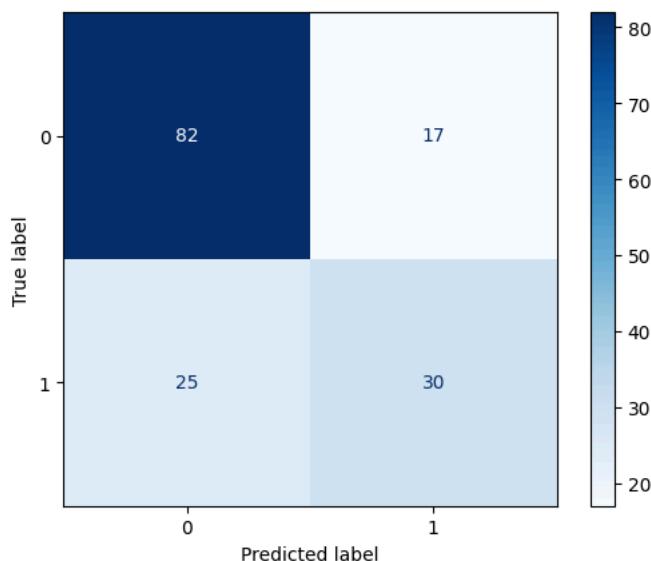
```
knn = KNeighborsClassifier(n_neighbors=5, metric='minkowski')
knn.fit(X_train, y_train)
```

▼ KNeighborsClassifier ⓘ ?  
KNeighborsClassifier()

```
y_pred_knn = knn.predict(X_test)
```

```
cm = confusion_matrix(y_test, y_pred_knn)
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot(cmap='Blues')
```

<sklearn.metrics.\_plot.confusion\_matrix.ConfusionMatrixDisplay at 0x784455988920>



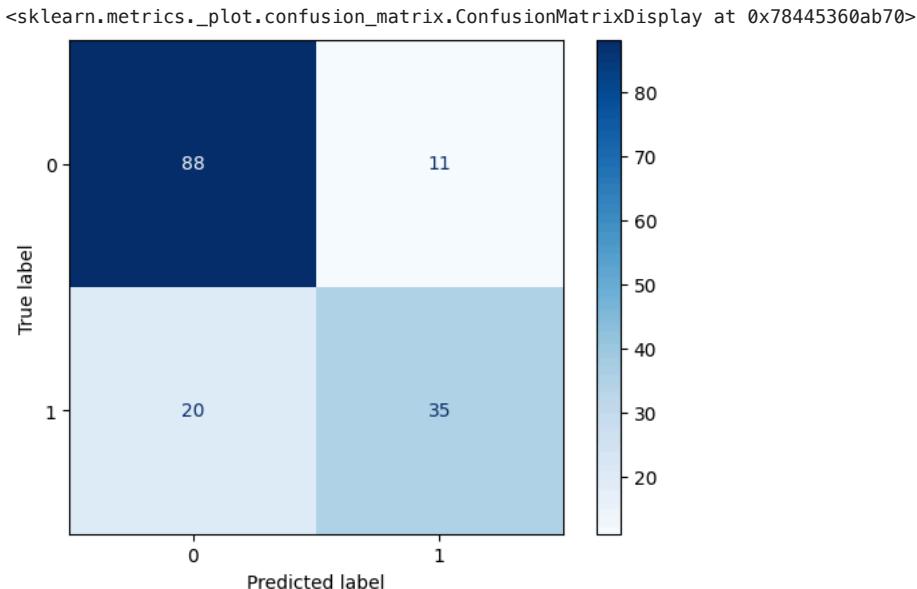
## ▼ Decision Tree Classification

```
tree = DecisionTreeClassifier(max_depth=5, criterion='gini')
tree.fit(X_train, y_train)
```

▼ DecisionTreeClassifier ⓘ ?  
DecisionTreeClassifier(max\_depth=5)

```
y_pred_tree = tree.predict(X_test)
```

```
cm = confusion_matrix(y_test, y_pred_tree)
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot(cmap='Blues')
```



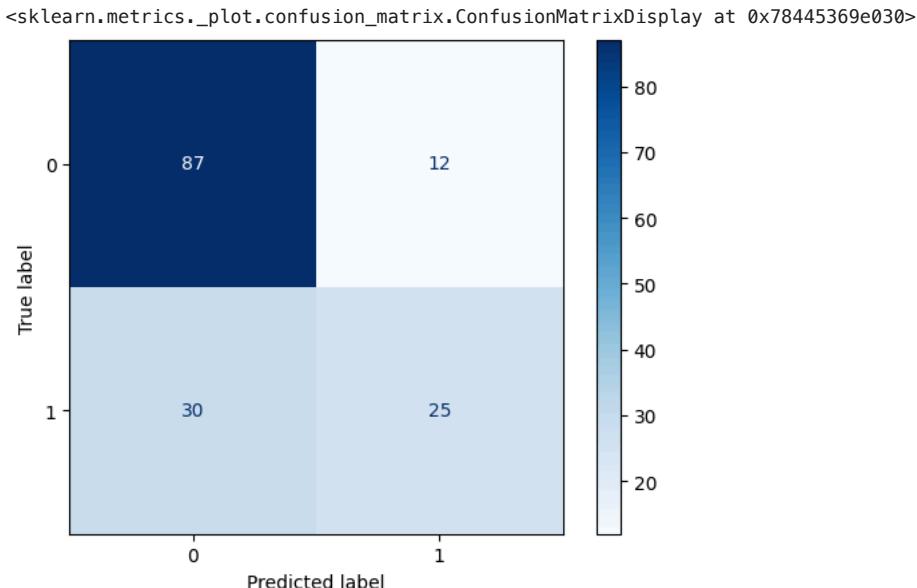
## ▼ SVM Classification

```
svm = SVC(kernel='poly', C=1.9, gamma='scale')
svm.fit(X_train, y_train)
```

```
SVC(C=1.9, kernel='poly')
```

```
y_pred_svm = svm.predict(X_test)
```

```
cm = confusion_matrix(y_test, y_pred_svm)
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot(cmap='Blues')
```



## ▼ Evaluation

## ▼ Logistic Regression

```
acc = accuracy_score(y_test, y_pred_log)
pre = precision_score(y_test, y_pred_log, average='macro')
```

```
print('Accuracy: ', acc)
print('Precision: ', pre)
print('Recall: ', rec)
print('F1 score: ', f1)

Accuracy: 0.7532467532467533
Precision: 0.7313131313131314
Recall: 0.7313131313131314
F1 score: 0.7313131313131314
```

## ▼ KNN Classification

```
acc = accuracy_score(y_test, y_pred_knn)
pre = precision_score(y_test, y_pred_knn, average='macro')
rec = recall_score(y_test, y_pred_knn, average='macro')
f1 = f1_score(y_test, y_pred_knn, average='macro')
```

```
print('Accuracy: ', acc)
print('Precision: ', pre)
print('Recall: ', rec)
print('F1 score: ', f1)

Accuracy: 0.7272727272727273
Precision: 0.7023265062636708
Recall: 0.6868686868686869
F1 score: 0.692175899486008
```

## ▼ Decision Tree Classification

```
acc = accuracy_score(y_test, y_pred_tree)
pre = precision_score(y_test, y_pred_tree, average='macro')
rec = recall_score(y_test, y_pred_tree, average='macro')
f1 = f1_score(y_test, y_pred_tree, average='macro')
```

```
print('Accuracy: ', acc)
print('Precision: ', pre)
print('Recall: ', rec)
print('F1 score: ', f1)

Accuracy: 0.7987012987012987
Precision: 0.787842190016103
Recall: 0.7626262626262625
F1 score: 0.7716554264122064
```

## ▼ SVM Classification

```
acc = accuracy_score(y_test, y_pred_svm)
pre = precision_score(y_test, y_pred_svm, average='macro')
rec = recall_score(y_test, y_pred_svm, average='macro')
f1 = f1_score(y_test, y_pred_svm, average='macro')
```

```
print('Accuracy: ', acc)
print('Precision: ', pre)
print('Recall: ', rec)
print('F1 score: ', f1)

Accuracy: 0.7272727272727273
Precision: 0.7096327096327096
Recall: 0.6666666666666666
F1 score: 0.6745169082125604
```

## ▼ Summary

- Comparitively Decision Tree model is showing more accuracy in predicting the disease
- (F1 score): The model maintains a balanced performance (neither overly cautious nor overly aggressive).

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