In [2]:
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.ensemble import RandomForestClassifier
import joblib
```

In [3]:
```
data = pd.DataFrame({
    'age': [25, 30, 45, 35, 40, 50, 23, 37],
    'income': [4000, 6000, 10000, 8000, 12000, 14000, 3500, 9000],
    'gender': ['male', 'female', 'male', 'female', 'male', 'female', 'male', 'female'],
    'purchased': [0, 1, 1, 0, 1, 1, 0, 1]  # Target
})
```

In [5]:
```
data.head()
```

Out[5]:

	age	income	gender	purchased
0	25	4000	male	0
1	30	6000	female	1
2	45	10000	male	1
3	35	8000	female	0
4	40	12000	male	1

In [6]:
```
data.shape
```

Out[6]:
```
(8, 4)
```

In [7]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8 entries, 0 to 7
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype 
---  ------     --------------  ----- 
 0   age        8 non-null      int64 
 1   income     8 non-null      int64 
 2   gender     8 non-null      object
 3   purchased  8 non-null      int64 
dtypes: int64(3), object(1)
memory usage: 388.0+ bytes
```

In [8]:
```
data.describe()
```

Out[8]:

	age	income	purchased
count	8.000000	8.000000	8.000000
mean	35.625000	8312.500000	0.625000
std	9.410291	3712.310601	0.517549
min	23.000000	3500.000000	0.000000
25%	28.750000	5500.000000	0.000000
50%	36.000000	8500.000000	1.000000
75%	41.250000	10500.000000	1.000000
max	50.000000	14000.000000	1.000000

ENCODING

In [9]:
```
label_encoder = LabelEncoder()
data['gender'] = label_encoder.fit_transform(data['gender'])  # male=1, female=0
```

In [10]:
```
data
```

Out[10]:

	age	income	gender	purchased
0	25	4000	1	0
1	30	6000	0	1
2	45	10000	1	1
3	35	8000	0	0
4	40	12000	1	1
5	50	14000	0	1
6	23	3500	1	0
7	37	9000	0	1

SPLIT

In [11]:
```
X = data[['age', 'income', 'gender']]
y = data['purchased']
```

In [12]:
```
X
```

Out[12]:

	age	income	gender
0	25	4000	1
1	30	6000	0
2	45	10000	1
3	35	8000	0
4	40	12000	1
5	50	14000	0
6	23	3500	1
7	37	9000	0

In [14]:
```
y
```

Out[14]:
```
0    0
1    1
2    1
3    0
4    1
5    1
6    0
7    1
Name: purchased, dtype: int64
```

SCALING

In [15]:
```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

In [17]:
```
X_scaled.shape
```

Out[17]:
```
(8, 3)
```

SAVE SCALER AND ENCODER

In [19]:
```
joblib.dump(scaler, 'scaler.pkl')
joblib.dump(label_encoder, 'label_encoder.pkl')
```

Out[19]:
```
['label_encoder.pkl']
```

SPLIT BEFORE TRAIN AND TEST

In [30]:
```
X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.4, random_state=42)
```

In [37]:
```
X_train.shape
```

Out[37]:
```
(4, 3)
```

In [38]:
```
X_test.shape
```

Out[38]:
```
(4, 3)
```

In [41]:
```
y_train.value_counts()
```

Out[41]:
```
purchased
1    2
0    2
Name: count, dtype: int64
```

In [42]:
```
y_test.value_counts()
```

Out[42]:
```
purchased
1    3
0    1
Name: count, dtype: int64
```

In [ ]:
```

```

In [ ]:
```

```

BUILD AND TRAIN MODEL

In [32]:
```
model = RandomForestClassifier(random_state=42)
model.fit(X_train, y_train)
```

Out[32]:
```
RandomForestClassifier(random_state=42)
```

MAKE PREDICTION

In [33]:
```
y_pred = model.predict(X_test)
```

In [34]:
```
y_pred
```

Out[34]:
```
array([0, 1, 0, 0])
```

EVELUATION

In [43]:
```
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay

# 6. Evaluasi prestasi model
from sklearn.metrics import accuracy_score, classification_report

# Kira ketepatan
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)

# Laporan klasifikasi
print("Classification Report:")
print(classification_report(y_test, y_pred))

# Confusion Matrix
cm = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:")
print(cm)

# Paparkan Confusion Matrix
disp = ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=model.classes_)
disp.plot(cmap="viridis")  # Anda boleh tukar 'viridis' kepada skema warna lain
```

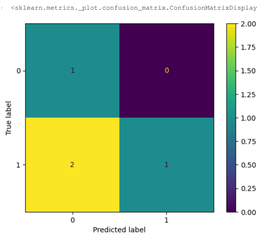
```
Accuracy: 0.5
Classification Report:
              precision    recall  f1-score   support

           0       0.33      1.00      0.50         1
           1       1.00      0.33      0.50         3

    accuracy                           0.50         4
   macro avg       0.67      0.67      0.50         4
weighted avg       0.83      0.50      0.50         4

Confusion Matrix:
[[1 0]
 [2 1]]
```

Out[43]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x12e37334ec0>
```



SAVE MODEL

In [45]:
```
joblib.dump(model, 'model.pkl')
```

Out[45]: ['model.pkl']

In [ ]: