In [26]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.tree import DecisionTreeRegressor  # Menggunakan DecisionTreeRe
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.metrics import accuracy_score
```

In [11]:
```
train_data = pd.read_excel('[Dataset]_Train_(Keryawan).xlsx')
test_data = pd.read_excel('[Dataset]_Test_(Karyawan).xlsx')
```

In [12]:
```
print("Training Data:")
print(train_data.head())
print("\nTest Data:")
print(test_data.head())
```

```
Training Data:
  Employee_ID Gender   Age  Education_Level Relationship_Status     Hometo
wn  \
0   EID_23371      F  42.0                4            Married     Frankl
in
1   EID_18000      M  24.0                3             Single  Springfie
ld
2    EID_3891      F  58.0                3            Married      Clint
on
3   EID_17492      F  26.0                3             Single      Leban
on
4   EID_22534      F  31.0                1            Married  Springfie
ld

                      Unit Decision_skill_possess  Time_of_service  \
0                       IT             Conceptual              4.0
1                Logistics             Analytical              5.0
2                  Quality             Conceptual             27.0
3  Human Resource Management             Behavioral              4.0
4                Logistics             Conceptual              5.0

   Time_since_promotion  ...  Compensation_and_Benefits  Work_Life_balance
\
0                     4  ...                      type2               3.0
1                     4  ...                      type2               4.0
2                     3  ...                      type2               1.0
3                     3  ...                      type2               1.0
4                     4  ...                      type3               3.0

   VAR1    VAR2    VAR3  VAR4  VAR5  VAR6  VAR7  Attrition_rate
0     4  0.7516  1.8688   2.0     4     5     3          0.1841
1     3 -0.9612 -0.4537   2.0     3     5     3          0.0670
2     4 -0.9612 -0.4537   3.0     3     8     3          0.0851
3     3 -1.8176 -0.4537   NaN     3     7     3          0.0668
4     1  0.7516 -0.4537   2.0     2     8     2          0.1827

[5 rows x 24 columns]

Test Data:
  Employee_ID Gender   Age  Education_Level Relationship_Status     Hometo
wn  \
0   EID_22713      F  32.0                5             Single  Springfie
ld
1    EID_9658      M  65.0                2             Single      Leban
on
2   EID_22203      M  52.0                3            Married  Springfie
ld
3    EID_7652      M  50.0                5             Single   Washingt
on
4    EID_6516      F  44.0                3            Married     Frankl
in

        Unit Decision_skill_possess  Time_of_service  Time_since_promotion
\
0        R&D             Conceptual              7.0                     4
1         IT              Directive             41.0                     2
2      Sales              Directive             21.0                     3
3  Marketing             Analytical             11.0                     4
4        R&D             Conceptual             12.0                     4

   ...  Pay_Scale  Compensation_and_Benefits  Work_Life_balance  VAR1    V
```

```
AR2  \
0  ...        4.0                      type2                1.0     3 -0.9
612
1  ...        1.0                      type2                1.0     4 -0.9
612
2  ...        8.0                      type3                1.0     4 -0.1
048
3  ...        2.0                      type0                4.0     3 -0.1
048
4  ...        2.0                      type2                4.0     4  1.6
081

     VAR3  VAR4  VAR5  VAR6  VAR7
0 -0.4537   2.0     1     8     4
1  0.7075   1.0     2     8     2
2  0.7075   2.0     1     9     3
3  0.7075   2.0     2     8     3
4  0.7075   2.0     2     7     4

[5 rows x 23 columns]
```

In [13]:
```
train_data.dropna(inplace=True)
test_data.dropna(inplace=True)
```

In [15]:
```
print(train_data.columns)
print(test_data.columns)
```

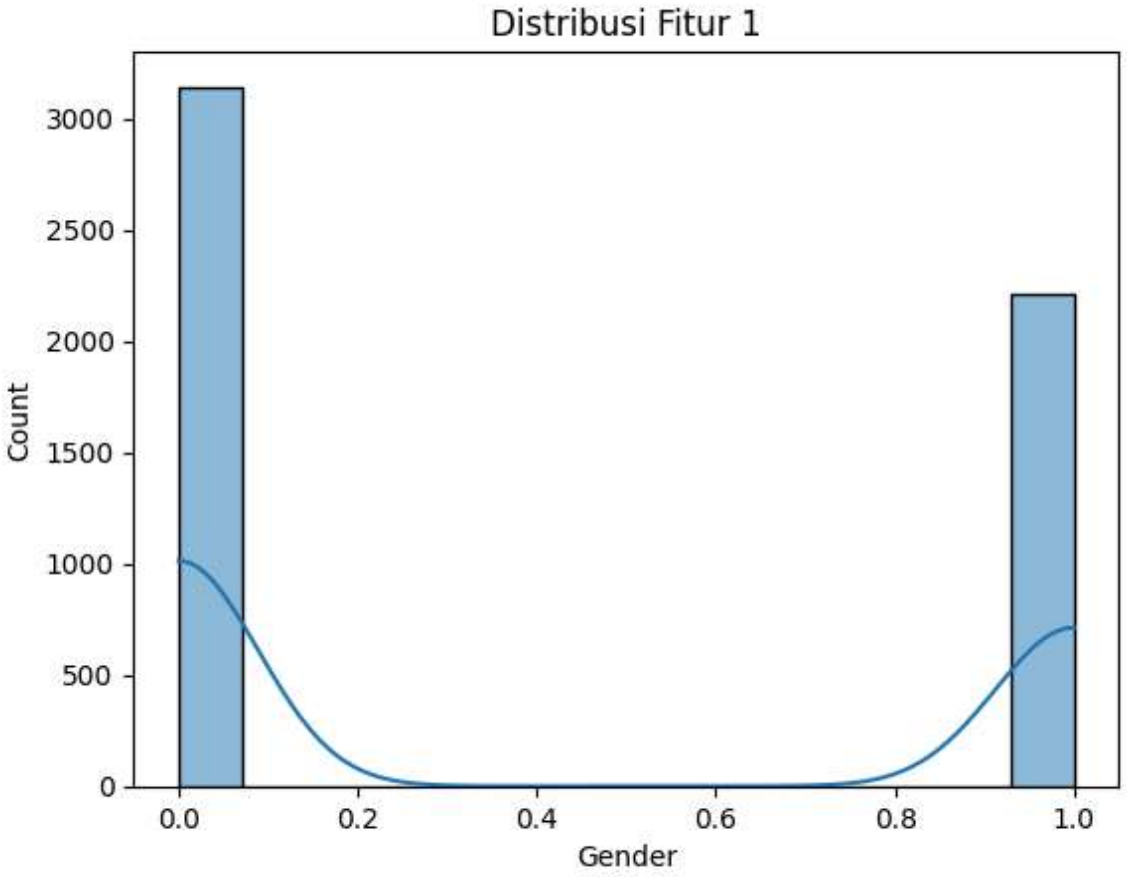
```
Index(['Employee_ID', 'Gender', 'Age', 'Education_Level',
       'Relationship_Status', 'Hometown', 'Unit', 'Decision_skill_posses
s',
       'Time_of_service', 'Time_since_promotion', 'growth_rate', 'Travel_R
ate',
       'Post_Level', 'Pay_Scale', 'Compensation_and_Benefits',
       'Work_Life_balance', 'VAR1', 'VAR2', 'VAR3', 'VAR4', 'VAR5', 'VAR
6',
       'VAR7', 'Attrition_rate'],
      dtype='object')
Index(['Employee_ID', 'Gender', 'Age', 'Education_Level',
       'Relationship_Status', 'Hometown', 'Unit', 'Decision_skill_posses
s',
       'Time_of_service', 'Time_since_promotion', 'growth_rate', 'Travel_R
ate',
       'Post_Level', 'Pay_Scale', 'Compensation_and_Benefits',
       'Work_Life_balance', 'VAR1', 'VAR2', 'VAR3', 'VAR4', 'VAR5', 'VAR
6',
       'VAR7'],
      dtype='object')
```

In [20]:
```
train_data = train_data.drop(columns=['Employee_ID'])
test_data = test_data.drop(columns=['Employee_ID'])
```

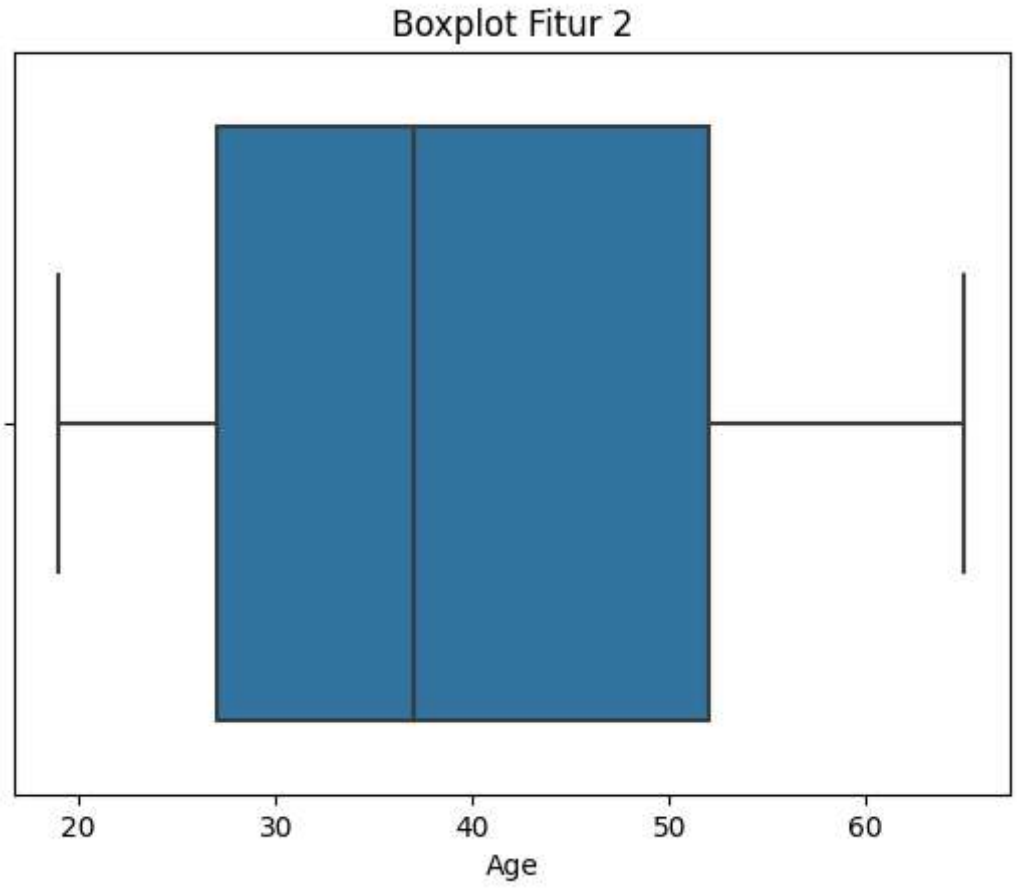
In [21]:
```
label_encoders = {}
for column in train_data.select_dtypes(include=['object']).columns:
    le = LabelEncoder()
    train_data[column] = le.fit_transform(train_data[column])
    if column in test_data.columns:
        test_data[column] = le.transform(test_data[column])
    label_encoders[column] = le
```

In [22]:
```
scaler = StandardScaler()
X_train = scaler.fit_transform(train_data.drop(columns=['Attrition_rate']))
X_test = scaler.transform(test_data)
y_train = train_data['Attrition_rate']
```

In [23]:
```
sns.histplot(train_data.iloc[:, 0], kde=True)
plt.title('Distribusi Fitur 1')
plt.show()
```



In [24]:
```
sns.boxplot(x=train_data.iloc[:, 1])
plt.title('Boxplot Fitur 2')
plt.show()
```



In [29]:
```
y_train_class = (train_data['Attrition_rate'] > 0.5).astype(int)
```

Out[29]:
```
DecisionTreeClassifier
```

In [31]:
```
model = DecisionTreeClassifier(random_state=42)
model.fit(X_train, y_train_class)
```

Out[31]:
```
DecisionTreeClassifier
```

In [32]:
```
y_pred_class = model.predict(X_test)
```

In [33]:
```
accuracy = accuracy_score(y_train_class[:len(y_pred_class)], y_pred_class)
print(f"Accuracy: {accuracy}")
```

```
Accuracy: 0.8371391641533822
```

In [35]:
```
cm = confusion_matrix(y_train_class[:len(y_pred_class)], y_pred_class)
print("Confusion Matrix:\n", cm)
```

```
Confusion Matrix:
 [[1920  232]
 [ 146   23]]
```

In [36]:
```
accuracy = accuracy_score(y_train_class[:len(y_pred_class)], y_pred_class)
print(f"Accuracy: {accuracy}")
```

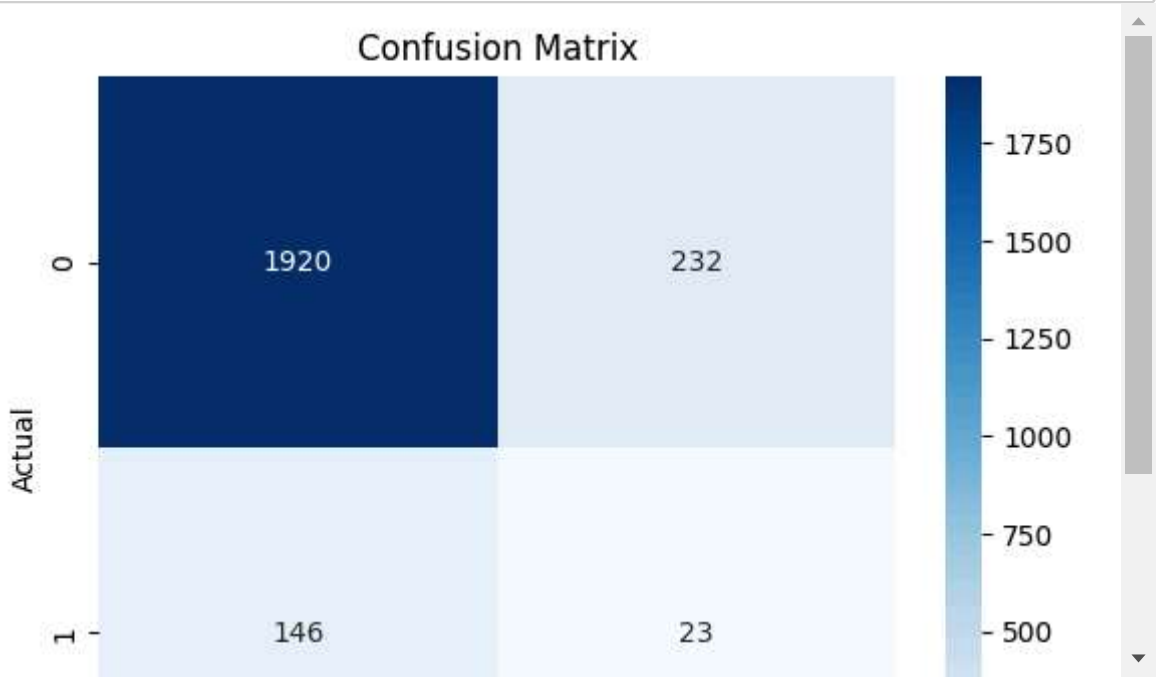
```
Accuracy: 0.8371391641533822
```

In [39]:
```
accuracy = accuracy_score(y_train_class[:len(y_pred_class)], y_pred_class)
precision = precision_score(y_train_class[:len(y_pred_class)], y_pred_class,
recall = recall_score(y_train_class[:len(y_pred_class)], y_pred_class, avera
```

In [40]:
```
print(f"Accuracy: {accuracy}")
print(f"Precision: {precision}")
print(f"Recall: {recall}")
```

```
Accuracy: 0.8371391641533822
Precision: 0.8682316643334852
Recall: 0.8371391641533822
```

In [41]:
```
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()
```



In [ ]:
```
```