EX. NO: 10

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K-NN classifier to predict signal quality based on distance from the transmitter, signal strength, and frequency

AIM:

To classify signal quality based on various parameters such as distance from the transmitter, signal strength, and frequency.

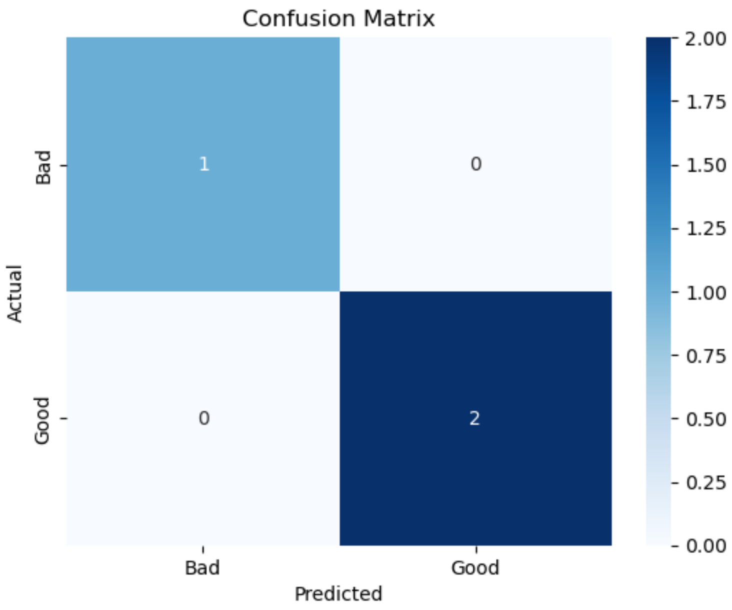
PROGRAM:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
import seaborn as sns

# Example dataset: Distance (meters), Signal Strength (dBm), Frequency (MHz) vs. Signal Quality
data = {
    'Distance': [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 2, 3, 4, 5, 6],
    'Signal_Strength': [-30, -35, -40, -45, -50, -55, -60, -65, -70, -75, -33, -38, -43, -48, -53],
    'Frequency': [850, 850, 850, 850, 850, 1900, 1900, 1900, 1900, 1900, 850, 850, 1900, 1900, 1900],
    'Signal_Quality': ['Good', 'Good', 'Good', 'Good', 'Bad', 'Bad', 'Bad', 'Bad', 'Bad', 'Bad', 'Good', 'Good', 'Bad', 'Bad', 'Bad']
}

# Convert the data into a DataFrame
df = pd.DataFrame(data)

# Separate features and target variable
X = df[['Distance', 'Signal_Strength', 'Frequency']].values  # Features
y = df['Signal_Quality'].values  # Target

# Encode the target variable
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y = le.fit_transform(y)  # 'Good' -> 1, 'Bad' -> 0
```

```
# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Standardize the features
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)

# Create and train the k-NN classifier
k = 3  # Number of neighbors
model = KNeighborsClassifier(n_neighbors=k)
model.fit(X_train, y_train)

# Make predictions
y_pred = model.predict(X_test)

# Evaluate the model
accuracy = accuracy_score(y_test, y_pred)
report = classification_report(y_test, y_pred, target_names=['Bad', 'Good'])

print(f'Accuracy: {accuracy:.2f}')
print('Classification Report:')
print(report)

# Confusion Matrix
conf_matrix = confusion_matrix(y_test, y_pred)
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues', xticklabels=['Bad', 'Good'], yticklabels=['Bad', 'Good'])
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()
```

OUTPUT :

```
Accuracy: 1.00
Classification Report:
              precision    recall  f1-score   support

         Bad       1.00      1.00      1.00         1
        Good       1.00      1.00      1.00         2

    accuracy                           1.00         3
   macro avg       1.00      1.00      1.00         3
weighted avg       1.00      1.00      1.00         3
```



RESULT:

Hence the signal quality is classified based on various parameters using K-NN classifier.