Python Programming for Machine Learning

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Sl.No	Date	Name of the experiment	Signature
1.	16/2/2024	Calculating values of random data using NumPy for mathematical formulas 1)Euclidean distance between two points 2) Dot Product of two Vectors 3)Solving a System of Linear Equations	
2.	23/2/2024	Write a simple Python code to generate random values and then compute their sigmoid and tanh (hyperbolic tangent) values using NumPy. Plot the values.	
3.	2/3/2024	simple Python program using pandas that creates a DataFrame, performs some basic operations, and prints the result.	
4.	23/3/2024	Store and Load Excel / CSV files.	
5.	28/3/2024	Data Visualization	
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9.	3/5/2024	Decision tree classifier to predict signal quality based on transmitter, signal strength, and frequency	
10.	11/5/2024	k-NN classifier to predict signal quality based on distance from the transmitter, signal strength, and frequency	
11.	17/5/2024	Study of Artificial Neural Network (ANN) and Simple Program in ANN	
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Ex.no 1 **Calculating values of random data using NumPy for mathematical formulas** **220801141**
Date: 16.2.2024

Aim:

Calculating values of random data using NumPy for mathematical formulas
1)Euclidean distance between two points 2) Dot Product of two Vectors 3)Solving a System of Linear Equations

Program:

```
#euclidean distance between 2 points
point1=np.array([3,2])
point2=np.array([1,1])
d=(((point1[0]-point2[0])**2)+((point1[1]-point2[1])**2))
 print(math.sqrt(d))

#dot product
def dot(x,y):
    dot_prod=x.dot(y)
    print(dot_prod)
dot(point1, point2)

#Linear equation
a np.array([[4,3], [5, 9]])
b=np.array([2,1])
print(np.linalg.solve(a,b))
```

Output:

In [31]:
```
#euclidean distance between 2 points
point1=np.array([3,2])
point2=np.array([1,1])
d=(((point1[0]-point2[0])**2)+((point1[1]-point2[1])**2))
print(math.sqrt(d))
```

```
2.23606797749979
```

In [36]:
```
#euclidean
def euclidean(x,y):
    dist=np.sum((x-y)**2)
    print(math.sqrt(dist))
euclidean(point1,point2)
```

```
2.23606797749979
```

In [38]:
```
#dot product
def dot(x,y):
    dot_prod=x.dot(y)
    print(dot_prod)
dot(point1,point2)
```

```
5
```

In [41]:
```
#Linear equation
a = np.array([[4, 3], [5, 9]])
b =np.array([2,1])
print(np.linalg.solve(a,b))
```

```
[ 0.71428571 -0.28571429]
```

Result:

Thus the program has been done and executed and output has been verified successfully.

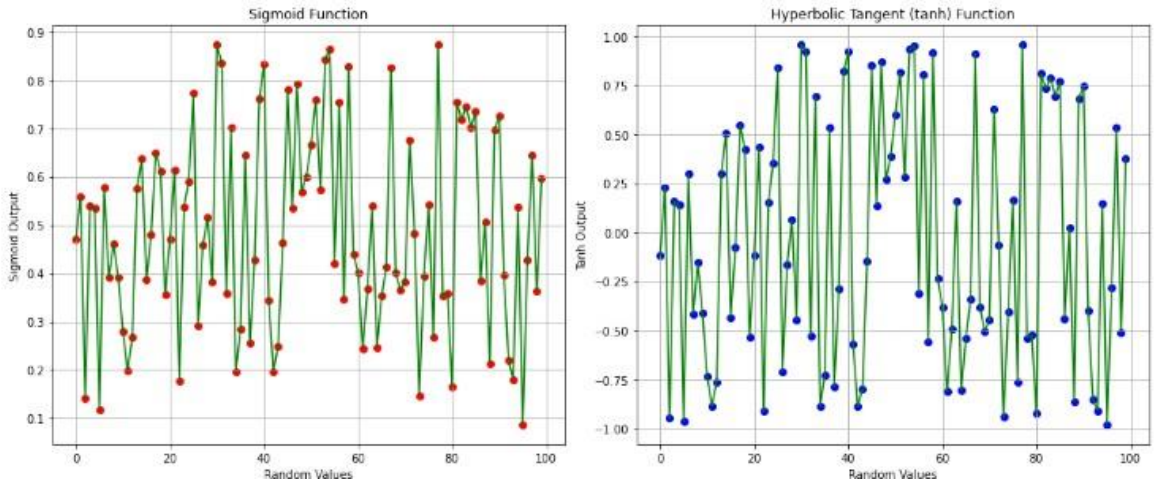
Ex.no 2 **Sigmoid and Tanh** **220801141**
Date: 23/2/2024

Aim:
Write a simple Python code to generate random values and then compute their sigmoid and tanh (hyperbolic tangent) values using NumPy. Plot the values.

Program:
```
def sigmoid(x):
    return 1 / (1 + np.exp(-x))

def tanh(x):
    return np.tanh(x)

random_values=np.random.randn(100)
sigmoid_values=sigmoid(random_values)
tanh_values=tanh(random_values)

#plotting
indices=np.arange(len(random_values))
plt.figure(figsize=(14, 6))
plt.subplot(1,2,1)
plt.scatter(indices, sigmoid_values, color='r', label='Sigmoid')
plt.plot(indices,sigmoid_values,'g',linestyle='-')
plt.title('Sigmoid Function')
plt.xlabel('Random Values')
plt.ylabel('Sigmoid Output')
plt.grid()
plt.subplot(1,2,2)
plt.scatter(indices, tanh_values, color='b', label='Tanh')
plt.plot(indices,tanh_values,'g',linestyle='-')
plt.title('Hyperbolic Tangent (tanh) Function')
plt.xlabel('Random Values')
plt.ylabel('Tanh Output')
plt.grid()
plt.tight_layout()
plt.show()
```

Output:

```
]: def sigmoid(x):
       return 1 / (1 + np.exp(-x))
   def tanh(x):
       return np.tanh(x)
   random_values=np.random.randn(100)
   sigmoid_values=sigmoid(random_values)
   tanh_values=tanh(random_values)
   #plotting
   indices=np.arange(len(random_values))


   plt.figure(figsize=(14, 6))
   plt.subplot(1,2,1)
   plt.scatter(indices, sigmoid_values, color='r', label='Sigmoid')
   plt.plot(indices,sigmoid_values,'g',linestyle='-')
   plt.title('Sigmoid Function')
   plt.xlabel('Random Values')
   plt.ylabel('Sigmoid Output')
   plt.grid()

   plt.subplot(1,2,2)
   plt.scatter(indices, tanh_values, color='b', label='Tanh')
   plt.plot(indices,tanh_values,'g',linestyle='-')
   plt.title('Hyperbolic Tangent (tanh) Function')
   plt.xlabel('Random Values')
   plt.ylabel('Tanh Output')
   plt.grid()

   plt.tight_layout()
   plt.show()
```



Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no 3 **Simple Program using Pandas** **220801141**
Date: 2/3/2024

Aim:

Simple Python program using pandas that creates a DataFrame, performs some basic operations, and prints the result.

Steps:

1. Imports the pandas library as pd.
2. Creates two lists: data containing fruit names and prices containing their corresponding prices.
3. Zips these lists together and creates a DataFrame named fruits_df with columns named ‘Fruit’ and ‘Price’
4. Uses info() to get information about the DataFrame, including data types and number of entries.
5. Prints the entire Data Frame using to_string().
6. Calculates descriptive statistics (mean, standard deviation, etc.) for the ‘Price’ column and prints the results.

Program Code:

```
import pandas as pd

# Create a list of data
data = ["Apple", "Banana", "Cherry", "Orange", "Grape"]
prices = [1.25, 0.79, 2.00, 1.50, 0.99]

# Create a DataFrame
fruits_df = pd.DataFrame(list(zip(data, prices)), columns=['Fruit', 'Price'])

# Get basic information about the DataFrame
print(fruits_df.info())

# Print the DataFrame
print(fruits_df.to_string())

# Get descriptive statistics of the 'Price' column
print(fruits_df['Price'].describe())
```

Output:

```
[2] import pandas as pd
```

```
# Create a list of data
data = ["Apple", "Banana", "Cherry", "Orange", "Grape"]
prices = [1.25, 0.79, 2.00, 1.50, 0.99]
```

```
[7] # Create a DataFrame
fruits_df = pd.DataFrame(list(zip(data, prices)), columns = ['Fruit', 'Price'])
fruits_df
```

	Fruit	Price
0	Apple	1.25
1	Banana	0.79
2	Cherry	2.00
3	Orange	1.50
4	Grape	0.99

```
[8]  # Get basic information about the DataFrame
     print(fruits_df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Fruit   5 non-null      object
 1   Price   5 non-null      float64
dtypes: float64(1), object(1)
memory usage: 208.0+ bytes
None
```

```
[9]  # Get descriptive statistics of the 'Price' column
     print(fruits_df['Price'].describe())
```

```
count    5.000000
mean     1.306000
std      0.471307
min      0.790000
25%      0.990000
50%      1.250000
75%      1.500000
max      2.000000
Name: Price, dtype: float64
```

Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no 4 **Store and Load Excel / CSV files.** **220801141**
Date: 23/3/2024

Aim:

To store (save) and load data from Excel and CSV files using pandas.

Steps:

To Store:

- import pandas as pd.
- Create a sample DataFrame df.
- Use the to_csv function to save the DataFrame to a CSV file.
- 'people.csv' is the filename.
- index=True (default) saves the row index as a column. Set it to False to skip it.

To Load:

- Import pandas as pd.
- Use read_csv to load data from a CSV file.
- Use read_excel to load data from an Excel file. By default, it reads the first sheet.
- Specify the sheet name with the sheet_name argument for loading data from a specific
- Sheet.

Program Code:

To store:

```
import pandas as pd

# Sample data
data = {"Name": ["Alice", "Bob", "Charlie"], "Age": [25, 30, 22]}
df = pd.DataFrame(data)

# Save to CSV file (with index)
df.to_csv("people.csv", index=True)

# Save to CSV file (without index)
df.to_csv("people_no_index.csv", index=False)
```

To Load:

```
# Load CSV data (assuming it has a header row)
df_csv = pd.read_csv('people.csv')
print(df_csv)
```

Output:

```
[10] import pandas as pd

     # Sample data
     data = {"Name": ["Alice", "Bob", "Charlie"], "Age": [25, 30, 22]}
     df = pd.DataFrame(data)

     # Save to CSV file (with index)
     df.to_csv("people.csv", index=True)

     # Save to CSV file (without index)
     df.to_csv("people_no_index.csv", index=False)
```

```
# Load CSV data (assuming it has a header row)
df_csv = pd.read_csv("people.csv")
print(df_csv)
```

```
   Unnamed: 0     Name  Age
0           0    Alice   25
1           1      Bob   30
2           2  Charlie   22
```

Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no:5 **Data Visualization** **220801141**
Date: 28/3/2024

Aim:

To visualize the given data using the matplotlib library in python

Algorithm:

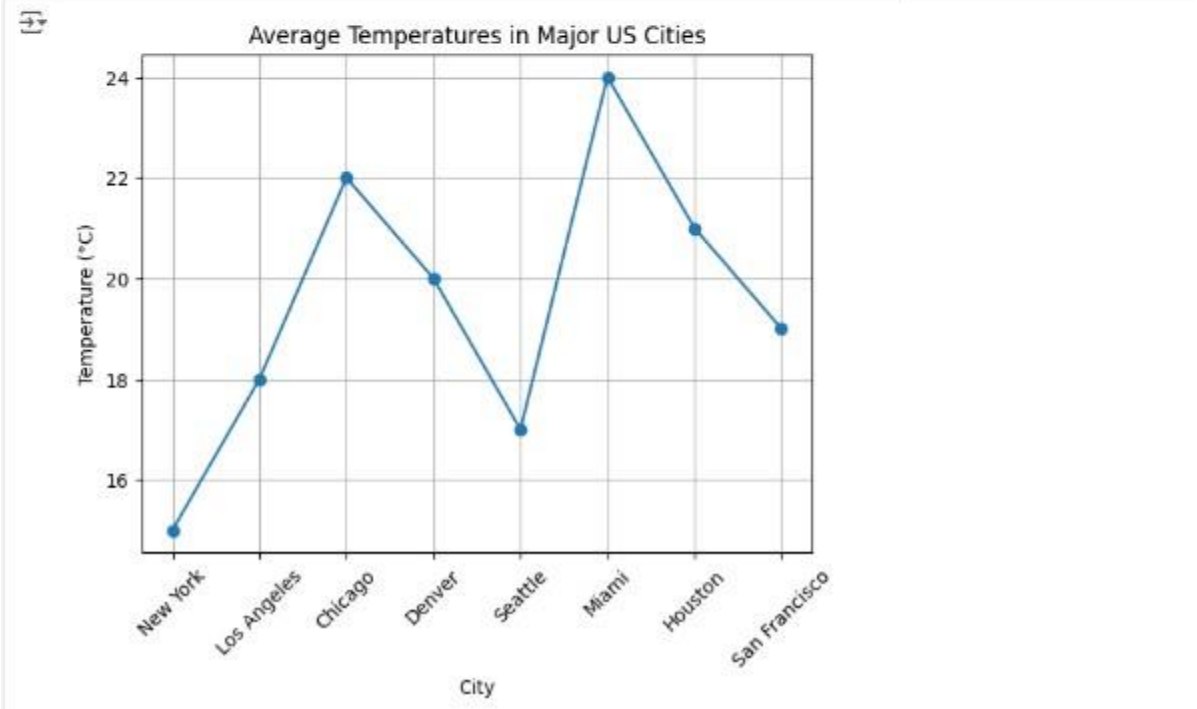
- Import the matplotlib.pyplot library for plotting.
- Prepare Data
- Use the plt.plot() function to create a line plot with cities on the x-axis and temperatures on the y-axis.
- Customize the plot by adding markers and setting the line style
- Add Labels and Title
- Use plt.show() to display the plot.

Program:

```
import matplotlib.pyplot as plt
import pandas as pd  # Optional for data manipulation

# Sample data (replace with your data or use pandas to read a CSV)
temperatures = [15, 18, 22, 20, 17, 24, 21, 19]
cities = ["New York", "Los Angeles", "Chicago", "Denver", "Seattle", "Miami",
"Houston", "San Francisco"]

# Line plot
plt.plot(cities, temperatures, marker='o', linestyle='-')  # Customize
markers and line style
# Labels and title
plt.xlabel("City")
plt.ylabel("Temperature (°C)")
plt.title("Average Temperatures in Major US Cities")

# Display the plot
plt.xticks(rotation=45)  # Rotate city names for better readability
(optional)
plt.grid(True)  # Add gridlines (optional)
plt.show()
```

Output:

```
import matplotlib.pyplot as plt
import pandas as pd  # Optional for data manipulation


# Sample data (replace with your data or use pandas to read a CSV)
temperatures = [15, 18, 22, 20, 17, 24, 21, 19]
cities = ["New York", "Los Angeles", "Chicago", "Denver", "Seattle", "Miami", "Houston", "San Francisco"]


# Line plot
plt.plot(cities, temperatures, marker='o', linestyle='-')  # Customize markers and line style


# Labels and title
plt.xlabel("City")
plt.ylabel("Temperature (°C)")
plt.title("Average Temperatures in Major US Cities")


# Display the plot
plt.xticks(rotation=45)  # Rotate city names for better readability (optional)
plt.grid(True)  # Add gridlines (optional)
plt.show()
```



Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no: 7 **Time Series** **220801141**
Date: 12/4/2024

Aim:

To write a python program to analyze time series data with the help of pandas and matplotlib.

Algorithm:

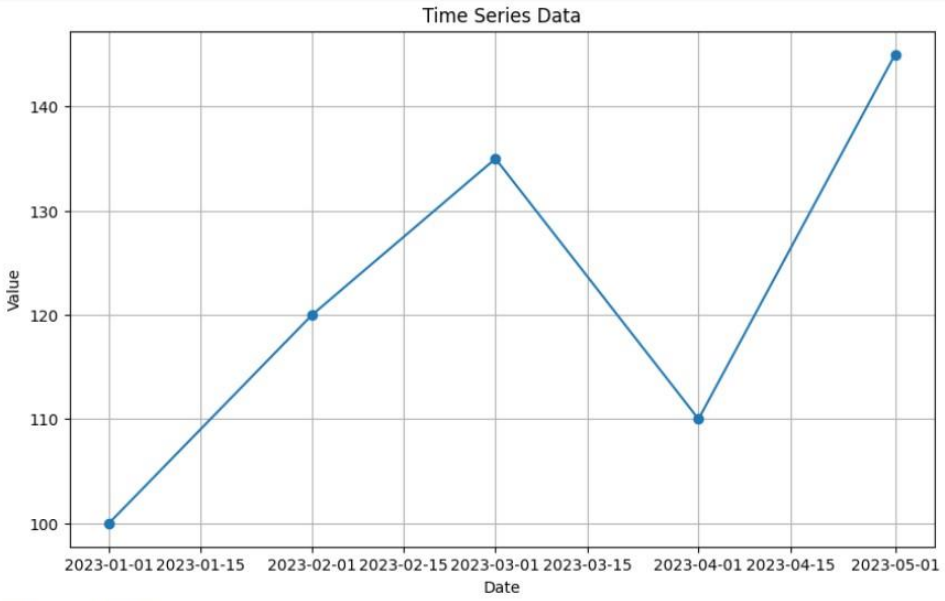
- Import the pandas library for data manipulation
- Import the matplotlib.pyplot library for plotting.
- Create a dictionary data containing the date strings and corresponding values.
- Create a DataFrame df from the dictionary.
- Plot the Time Series:
- Add Labels and Title:
- Use plt.show() to display the plot.
- Calculate Daily Change (Optional):

Program:

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

data = {
    "Date": pd.to_datetime(["2023-01-01", "2023-02-01", "2023-03-01", "2023-04-01",
"2023-05-01"]),
    "Value": [100, 120, 135, 110, 145]
}

# Create DataFrame with Date as index
df = pd.DataFrame(data).set_index("Date")

# Plot the time series
plt.figure(figsize=(10, 6))  # Adjust figure size for better viewing
plt.plot(df["Value"], marker='o', linestyle='-')
plt.xlabel("Date")
plt.ylabel("Value")
plt.title("Time Series Data")
plt.grid(True)
plt.show()

# Calculate daily change (optional)
df["Daily Change"] = df["Value"].diff()  # Calculate difference between consecutive
values

print(df["Daily Change"].describe())
```

Output:

```python
import pandas as pd
import matplotlib.pyplot as plt

# Sample time series data (replace with your actual data)
data = {
    "Date": pd.to_datetime(["2023-01-01", "2023-02-01", "2023-03-01", "2023-04-01", "2023-05-01"]),
    "Value": [100, 120, 135, 110, 145]
}

# Create DataFrame with Date as index
df = pd.DataFrame(data).set_index("Date")

# Plot the time series
plt.figure(figsize=(10, 6))  # Adjust figure size for better viewing
plt.plot(df["Value"], marker='o', linestyle='-')
plt.xlabel("Date")
plt.ylabel("Value")
plt.title("Time Series Data")
plt.grid(True)
plt.show()

# Calculate daily change (optional)
df["Daily Change"] = df["Value"].diff()  # Calculate difference between consecutive values

# Print descriptive statistics of daily change (optional)
print(df["Daily Change"].describe())
```




```
count     4.000000
mean     11.250000
std      25.617377
min     -25.000000
25%       5.000000
50%      17.500000
75%      23.750000
max      35.000000
Name: Daily Change, dtype: float64
```

Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no: 8 **Linear regression model to predict the signal strength** **220801141**

Date: 26/4/2024

Aim:

To develop a linear regression model to predict the signal strength based on the distance.

Problem Statement:

We have a dataset that records the signal strength (in dBm) at various distances (in meters) from a transmitter. The goal is to develop a linear regression model to predict the signal strength based on the distance.

Algorithm:

- Import the necessary libraries
- Prepare the dataset
- Split the dataset into training and testing sets a. Use train_test_split from sklearn.model_selection to split X and y into training and testing sets
- Initialize the linear regression model
- Train the model on the training data.
- Make predictions on the testing data
- Evaluate the model
- Plot the results

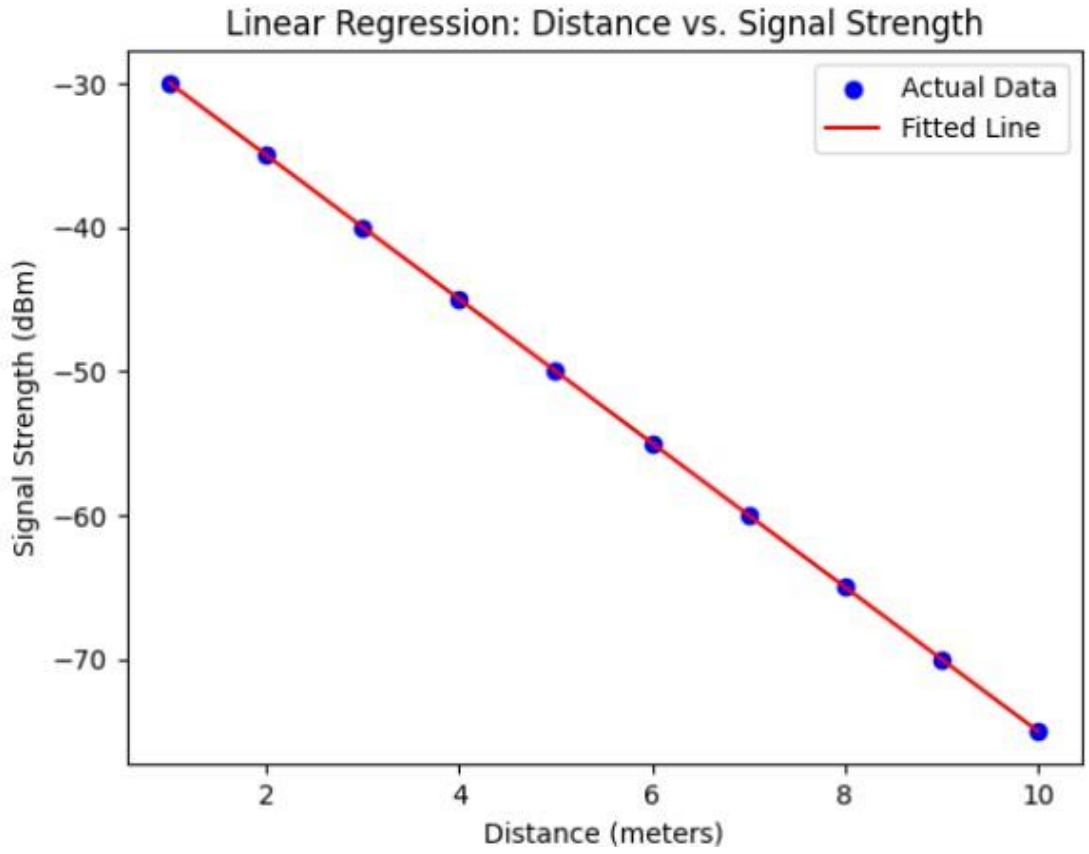
Program:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score

# Example dataset: Distance (meters) vs. Signal Strength (dBm)
data = {
    'Distance': [1, 2, 3, 4, 5, 6, 7, 8, 9, 10],
    'Signal_Strength': [-30, -35, -40, -45, -50, -55, -60, -65, -70, -75]
}

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

# Separate features and target variable
X = df[['Distance']].values  # Feature: Distance
```

```
y = df['Signal_Strength'].values  # Target: Signal Strength

# 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)

# Create and train the linear regression model
model = LinearRegression()
model.fit(X_train, y_train)

# Make predictions
y_pred = model.predict(X_test)

# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print(f'Mean Squared Error: {mse:.2f}')
print(f'R^2 Score: {r2:.2f}')

# Visualize the results
plt.scatter(X, y, color='blue', label='Actual Data')
plt.plot(X, model.predict(X), color='red', label='Fitted Line')
plt.xlabel('Distance (meters)')
plt.ylabel('Signal Strength (dBm)')
plt.title('Linear Regression: Distance vs. Signal Strength')
plt.legend()
plt.show()
```

Output:

```
Mean Squared Error: 0.00
R^2 Score: 1.00
```



Result:

Thus the program has been done and executed and output has been verified successfully.

Ex.no: 9 **Decision tree classifier to predict signal quality based on transmitter, signal strength, and frequency 220801156**

Date: 3/5/2024

Aim:

Create a simple dataset to classify signal quality based on various parameters such as distance from the transmitter, signal strength, and frequency.

Problem Statement:

Dataset that records various parameters affecting the signal quality (Good or Bad). The goal is to develop a decision tree classifier to predict signal quality based on these parameters.

Algorithm:

1. Dataset:
    - We create a simple dataset with distance from the transmitter, signal strength, frequency, and corresponding signal qua lity (Good or Bad). The dataset is stored in a dictionary and then converted into a pandas DataFrame.
2. Data Prepa ration:
    - Separate the dataset into features (X) and the target variable (y).
    - Encode the target variable Signal_Quality from categorical values ('Good', 'Bad') to numerical values using LabelEncoder.
3. Model Training:
    - Split the data into training and testing sets using train_test_split.
    - Create an instance of DecisionTreeClassifier and train the model on the training data using the fit method.
4. Prediction and Evaluation:
    - Use the trained model to make predictions on the test data.
    - Calculate the accuracy score and generate a classification report to evaluate the model's performance.
5. Visualization:
    - Visualize the decision tree using plot_tree to understand how the model makes decisions based on the input features.

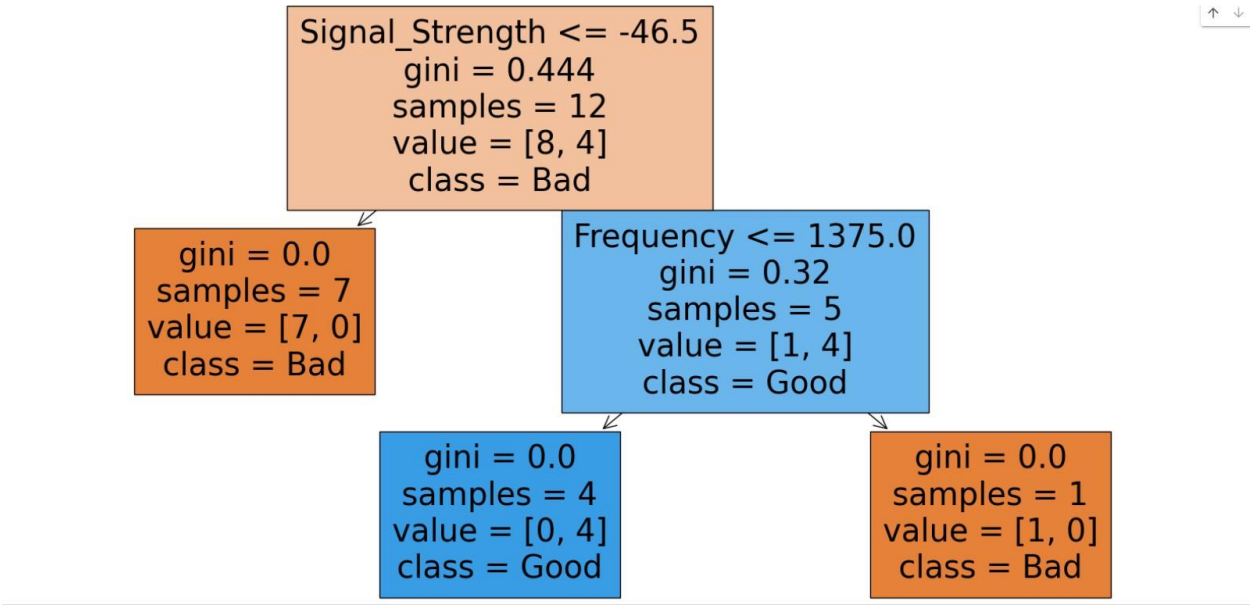
Program:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier, plot_tree
from sklearn.metrics import accuracy_score, classification_report

# 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)

# Create and train the decision tree classifier
model = DecisionTreeClassifier(random_state=42)
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)

# Visualize the decision tree
plt.figure(figsize=(20,10))
plot_tree(model, feature_names=['Distance', 'Signal_Strength', 'Frequency'],
class_names=['Bad', 'Good'], filled=True)
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:

Thus the program has been done and executed and output has been verified successfully.

Ex.no: 10 **k-NN classifier to predict signal quality based on distance from the transmitter, signal strength, and frequency**

Date: 11/5/2024 **220801141**

Aim:

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

Prerequisite:

pip install numpy pandas scikit-learn matplotlib

Problem Statement

A dataset that records various parameters affecting the signal quality (Good or Bad). The goal is to develop a k-NN classifier to predict signal quality based on these parameters.

Algorithm:

- Import the necessary libraries
- Prepare the dataset
- Split the dataset into training and testing sets a. Use train_test_split from sklearn.model_selection to split X and y into training and testing sets
- Initialize the KNN model
- Train the model on the training data.
- Make predictions on the testing data
- Evaluate the model
- Plot the results

Program:

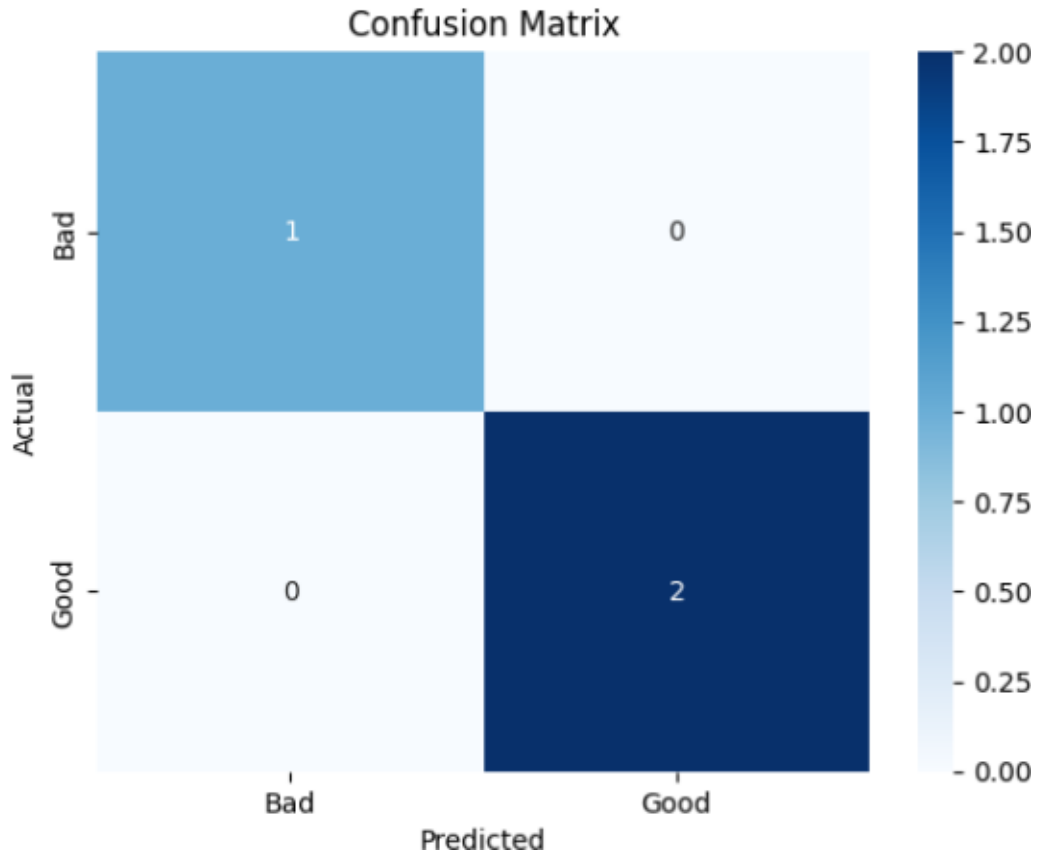
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix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

Thus the program has been done and executed and output has been verified successfully.

Ex.no: 11 Study of Artificial Neural Network (ANN) and Simple Program in ANN 220801141

Date: 17/5/2024

Aim:

To study Artificial Neural Network (ANN) using a simple program in ANN

Prerequisite:

pip install numpy scikit-learn

Algorithm:

- Import the necessary libraries
- Prepare the dataset
- Split the dataset into training and testing sets a. Use train_test_split from sklearn.model_selection to split X and y into training and testing sets
- Initialize the neural network model
- Train the model on the training data.
- Make predictions on the testing data
- Evaluate the model
- Plot the results

Program:

```
import numpy as np
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.neural_network import MLPClassifier
from sklearn.metrics import classification_report, accuracy_score

iris = datasets.load_iris()
X  =  iris.data
y = iris.target

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
random_state=42)

scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)

# We'll use a Multi-layer Perceptron classifier
mlp = MLPClassifier(hidden_layer_sizes=(10,), max_iter=1000, random_state=42)
mlp.fit(X_train, y_train)
```

```
y_pred = mlp.predict(X_test)

print("Classification Report:")
print(classification_report(y_test, y_pred))
print("Accuracy:", accuracy_score(y_test, y_pred))
```

Output:

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

                 0       1.00      1.00      1.00        19
                 1       1.00      1.00      1.00        13
                 2       1.00      1.00      1.00        13

     accuracy                           1.00        45
    macro avg            1.00      1.00      1.00        45
weighted avg             1.00      1.00      1.00        45

Accuracy: 1.0
```

Result:

Thus the program has been done and executed and output has been verified successfully.

Ex. No: 12 **Study Of Support Vector Machine and and Simple Program in SVM** **220801141**

Date: 24/5/2024

Aim:

To demonstrate the application of SVM for classification, showcasing its strengths in handling high-dimensional spaces and providing a clear understanding of its working mechanism.

Prerequisite:

pip install scikit-learn

Algorithm:

- Import the necessary libraries
- Prepare the dataset
- Split the dataset into training and testing sets a. Use train_test_split from sklearn.model_selection to split X and y into training and testing sets
- Initialize SVC model
- Train the model on the training data.
- Make predictions on the testing data
- Evaluate the model
-

Program:

```
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score

iris = datasets.load_iris()
X  =  iris.data
y = iris.target

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
random_state=42)

clf = SVC(kernel=’linear’, C=1)
clf.fit(X_train, y_train)

y_pred = clf.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(‘Accuracy: {accuracy:.2f}’)
```

Output:

```
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score

iris = datasets.load_iris()
X = iris.data
y = iris.target

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)

clf = SVC(kernel='linear', C=1)

clf.fit(X_train, y_train)

y_pred = clf.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(f'Accuracy: {accuracy:.2f}')
```

```
Accuracy: 1.00
```

Result:

Thus the program has been done and executed and output has been verified successfully.