EX:No.9 **221501048**

15/04/25

DEVELOP NEURAL NETWORK-BASED TIME SERIES FORCASTING MODEL.

AIM:

To implement program for Develop neural network-based time series forecasting model.

ALGORITHM:

OBJECTIVE:

Smooth the electric production data to reduce noise, highlight trends, and prepare for forecasting.

BACKGROUND:

1.Time series data has short-term fluctuations.

2.Moving average reduces noise and clarifies trends.

3.Smoothed data improves forecast accuracy and interpretability.

SCOPE OF THE PROGRAM:

1.Load and clean dataset

2.Convert date column to datetime

3.Aggregate data monthly and yearly

4.Apply 3-month and 12-month moving averages

5.Plot original vs smoothed data

ALGORITHM:

1.Import libraries

2.Load dataset

3.Preprocess and set datetime index

4.Resample data (monthly, yearly)

5.Apply 3-month & 12-month smoothing

6.Visualize results

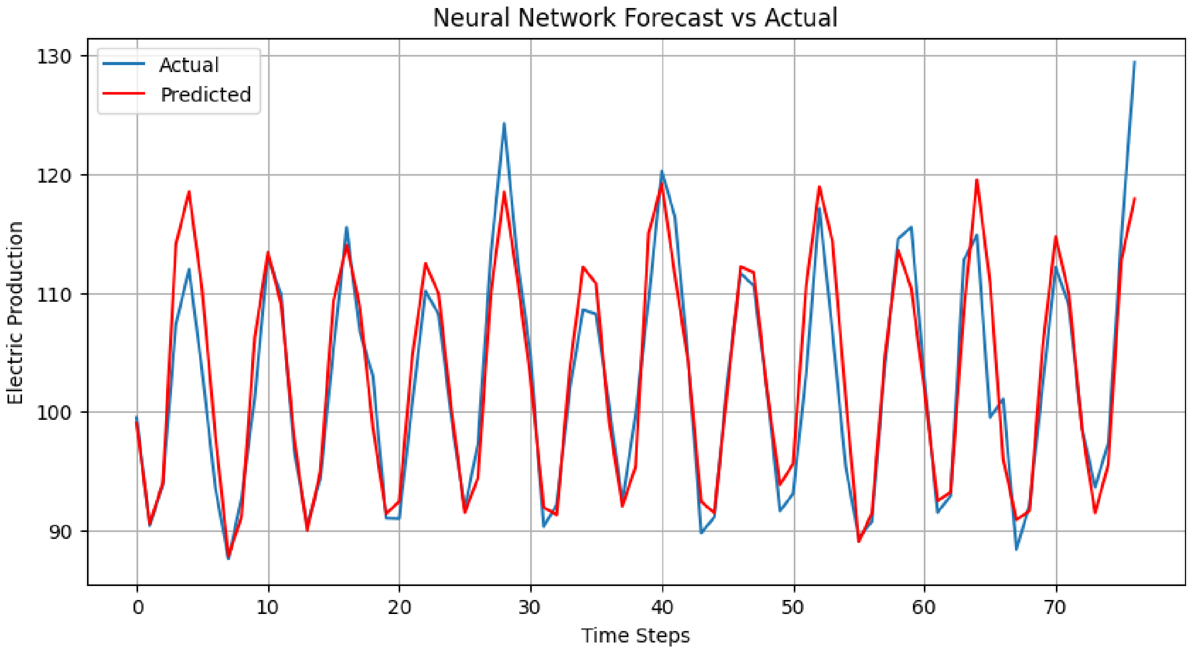
PROCESS:

```
# Install required packages (if not already available)
# !pip install pandas numpy matplotlib scikit-learn tensorflow
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense

# Load dataset
df = pd.read_csv('/content/Goldprice_Dataset.csv', parse_dates=['DATE'], index_col='DATE')

# Use the relevant column
data = df['IPG2211A2N'].values.reshape(-1, 1)

# Normalize the data
scaler = MinMaxScaler()
scaled_data = scaler.fit_transform(data)

# Function to prepare time series data for supervised learning
def create_dataset(dataset, window_size):
    X, y = [], []
    for i in range(len(dataset) - window_size):
        X.append(dataset[i:i+window_size, 0])
        y.append(dataset[i+window_size, 0])
    return np.array(X), np.array(y)

# Define time window
window_size = 12
X, y = create_dataset(scaled_data, window_size)

# Split into training and testing sets (80% training)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, shuffle=False)

# Build Neural Network model
```

```
model = Sequential([
    Dense(64, activation='relu', input_shape=(window_size,)),
    Dense(32, activation='relu'),
    Dense(1)
])

model.compile(optimizer='adam', loss='mse')

# Train the model
history = model.fit(X_train, y_train, epochs=100, batch_size=16, validation_data=(X_test, y_test), verbose=0)

# Predict on test set
predictions = model.predict(X_test)
predictions = scaler.inverse_transform(predictions.reshape(-1, 1))
actual = scaler.inverse_transform(y_test.reshape(-1, 1))

# Plot results
plt.figure(figsize=(10, 5))
plt.plot(actual, label='Actual')
plt.plot(predictions, label='Predicted', color='red')
plt.title('Neural Network Forecast vs Actual')
plt.xlabel('Time Steps')
plt.ylabel('Electric Production')
plt.legend()
plt.grid(True)
plt.show()

# Show RMSE
from sklearn.metrics import mean_squared_error
rmse = np.sqrt(mean_squared_error(actual, predictions))
print(f'RMSE: {rmse:.4f}')
```

OUTPUT:



RESULT:

The program to Develop neural network-based time series forecasting model created and executed successfully.