**Implement Program For Visualization OF Time Series Data**

**EX.No:2**

**DATE: 25/01/2**

**AIM:**

To analyze and visualize electricity production data using various statistical and graphical techniques, including histograms, box plots, scatter plots, bar charts, and heatmaps, for trend analysis and outlier detection.

**ALGORITHM:**

1. Load the electricity production data from a CSV file.
2. Convert the date column to datetime format and set it as the index.
3. Convert numerical columns to appropriate data types.
4. Handle missing values using forward fill.
5. Plot the histogram to visualize the distribution of electricity production.
6. Generate a box plot to detect outliers in the data.
7. Create a scatter plot to analyze electricity production trends over time.
8. Compute and visualize the monthly average electricity production using a bar chart.
9. Generate a heatmap to analyze electricity production trends across different months and years.
10. Analyze and interpret trends, patterns, and anomalies in the visualizations.

**CODE:**

import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

df = pd.read\_csv('C:\\Users\\Lenovo\\Downloads\\Electric\_Production.csv')

df[df.columns[0]] = pd.to\_datetime(df[df.columns[0]], errors='coerce')

df.set\_index(df.columns[0], inplace=True)

df[df.columns[0]] = pd.to\_numeric(df[df.columns[0]], errors='coerce')

df.fillna(method='ffill', inplace=True)

plt.figure(figsize=(8, 5))

plt.hist(df[df.columns[0]], bins=30, color='skyblue', edgecolor='black')

plt.xlabel('Electricity Production')

plt.ylabel('Frequency')

plt.title('Distribution of Electricity Production')

plt.grid(True)

plt.show()

plt.figure(figsize=(8, 5))

sns.boxplot(x=df[df.columns[0]], color='lightcoral')

plt.xlabel('Electricity Production')

plt.title('Box Plot of Electricity Production')

plt.grid(True)

plt.show()

plt.figure(figsize=(10, 5))

plt.scatter(df.index, df[df.columns[0]], color='purple', alpha=0.5)

plt.xlabel('Date')

plt.ylabel('Electricity Production')

plt.title('Electricity Production Over Time (Scatter Plot)')

plt.grid(True)

plt.show()

df['Year-Month'] = df.index.to\_period('M')

monthly\_avg = df.groupby('Year-Month')[df.columns[0]].mean()

plt.figure(figsize=(12, 5))

monthly\_avg.plot(kind='bar', color='green')

plt.xlabel('Year-Month')

plt.ylabel('Avg Electricity Production')

plt.title('Monthly Average Electricity Production')

plt.xticks(rotation=90)

plt.grid(True)

plt.show()

df['Year'] = df.index.year

df['Month'] = df.index.month

heatmap\_data = df.pivot\_table(values=df.columns[0], index='Year', columns='Month')

plt.figure(figsize=(10, 6))

sns.heatmap(heatmap\_data, cmap='coolwarm', annot=True, fmt=".1f", linewidths=0.5)

plt.xlabel('Month')

plt.ylabel('Year')

plt.title('Electricity Production Heatmap')

plt.show()

**OUTPUT:**

**A graph of a distribution of electricity

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**A graph of a box plot

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**A graph showing the amount of electricity in the time

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**A graph showing a number of green and white lines

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**A chart of heattrap

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**RESULT:**

Thus the program has been completed and verified successfully.