```
Command Prompt                                                              —  ☐  X

Microsoft Windows [Version 10.0.19045.4412]
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C:\Users\user>pip install numpy matplotlib seaborn scikit-learn
Requirement already satisfied: numpy in c:\users\user\appdata\local\programs\python\python312\lib\site-packages (2.1.1)
Collecting matplotlib
  Downloading matplotlib-3.9.2-cp312-cp312-win_amd64.whl.metadata (11 kB)
Collecting seaborn
  Downloading seaborn-0.13.2-py3-none-any.whl.metadata (5.4 kB)
Collecting scikit-learn
  Downloading scikit_learn-1.5.2-cp312-cp312-win_amd64.whl.metadata (13 kB)
Collecting contourpy>=1.0.1 (from matplotlib)
  Downloading contourpy-1.3.0-cp312-cp312-win_amd64.whl.metadata (5.4 kB)
Collecting cycler>=0.10 (from matplotlib)
  Downloading cycler-0.12.1-py3-none-any.whl.metadata (3.8 kB)
Collecting fonttools>=4.22.0 (from matplotlib)
  Downloading fonttools-4.54.1-cp312-cp312-win_amd64.whl.metadata (167 kB)
Collecting kiwisolver>=1.3.1 (from matplotlib)
  Downloading kiwisolver-1.4.7-cp312-cp312-win_amd64.whl.metadata (6.4 kB)
Collecting packaging>=20.0 (from matplotlib)
  Downloading packaging-24.1-py3-none-any.whl.metadata (3.2 kB)
Collecting pillow>=8 (from matplotlib)
  Downloading pillow-10.4.0-cp312-cp312-win_amd64.whl.metadata (9.3 kB)
Collecting pyparsing>=2.3.1 (from matplotlib)
  Downloading pyparsing-3.1.4-py3-none-any.whl.metadata (5.1 kB)
Collecting python-dateutil>=2.7 (from matplotlib)
  Downloading python_dateutil-2.9.0.post0-py2.py3-none-any.whl.metadata (8.4 kB)
Collecting pandas>=1.2 (from seaborn)
  Downloading pandas-2.2.3-cp312-cp312-win_amd64.whl.metadata (19 kB)
Collecting scipy>=1.6.0 (from scikit-learn)
  Downloading scipy-1.14.1-cp312-cp312-win_amd64.whl.metadata (60 kB)
Collecting joblib>=1.2.0 (from scikit-learn)
  Downloading joblib-1.4.2-py3-none-any.whl.metadata (5.4 kB)
Collecting threadpoolctl>=3.1.0 (from scikit-learn)
  Downloading threadpoolctl-3.5.0-py3-none-any.whl.metadata (13 kB)
Collecting pytz>=2020.1 (from pandas>=1.2->seaborn)
  Downloading pytz-2024.2-py2.py3-none-any.whl.metadata (22 kB)
Collecting tzdata>=2022.7 (from pandas>=1.2->seaborn)
  Downloading tzdata-2024.2-py2.py3-none-any.whl.metadata (1.4 kB)
Collecting six>=1.5 (from python-dateutil>=2.7->matplotlib)
  Downloading six-1.16.0-py2.py3-none-any.whl.metadata (1.8 kB)
Downloading matplotlib-3.9.2-cp312-cp312-win_amd64.whl (7.8 MB)
   ---------------------------------------- 7.8/7.8 MB 5.5 MB/s eta 0:00:00
Downloading seaborn-0.13.2-py3-none-any.whl (294 kB)
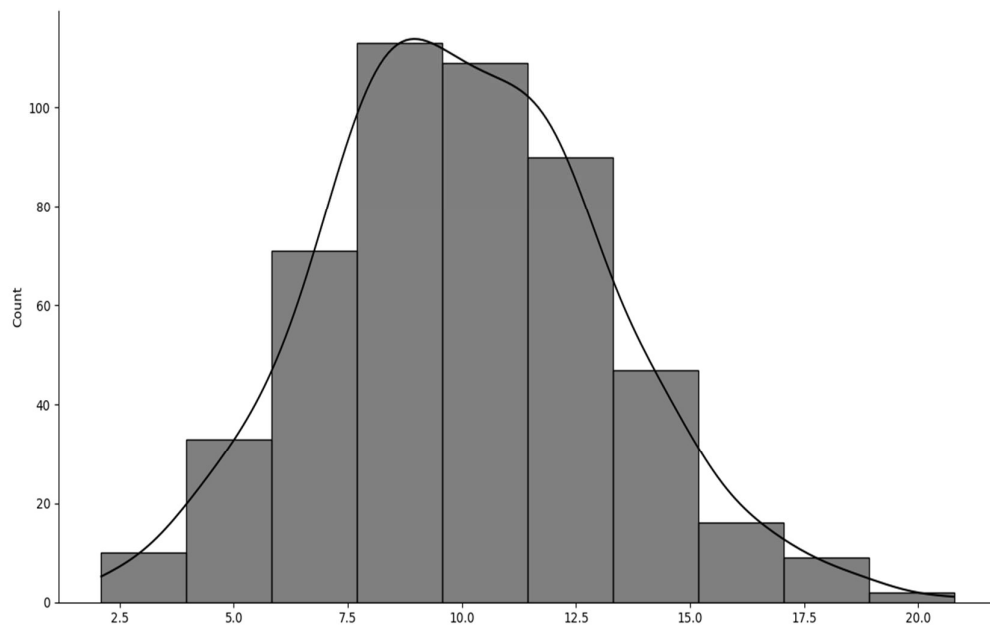```

```
C:\Users\user>python cluster_visualization.py
```

*cluster_visualization.py - Notepad

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```python
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Normal histogram plot
data = np.random.normal(10.0, 3, 500)
sns.displot(data, kde=True, bins=10, color='black')
plt.show()  # Add this line to display the plot
```

Figure 1

```
cluster_visualization.py - Notepad                                    —    □    X

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import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Bi-modal histogram
N = 400
mu_1, sigma_1 = 80, 10
mu_2, sigma_2 = 20, 10

# Generate two normal distributions of given mean and standard deviation
X_1 = np.random.normal(mu_1, sigma_1, N)
X_2 = np.random.normal(mu_2, sigma_2, N)

# Concatenate the two distributions
X = np.concatenate([X_1, X_2])

# Plot the bi-modal histogram
sns.displot(X, bins=10, kde=True, color='green')
plt.show()  # Add this line to display the plot
```
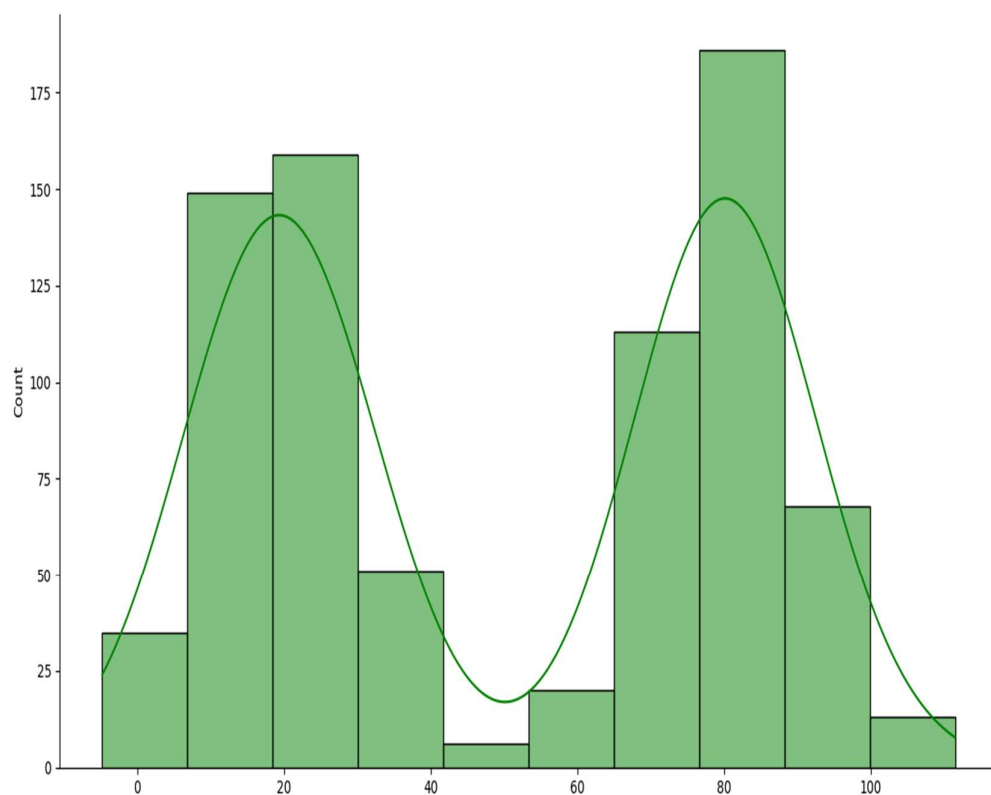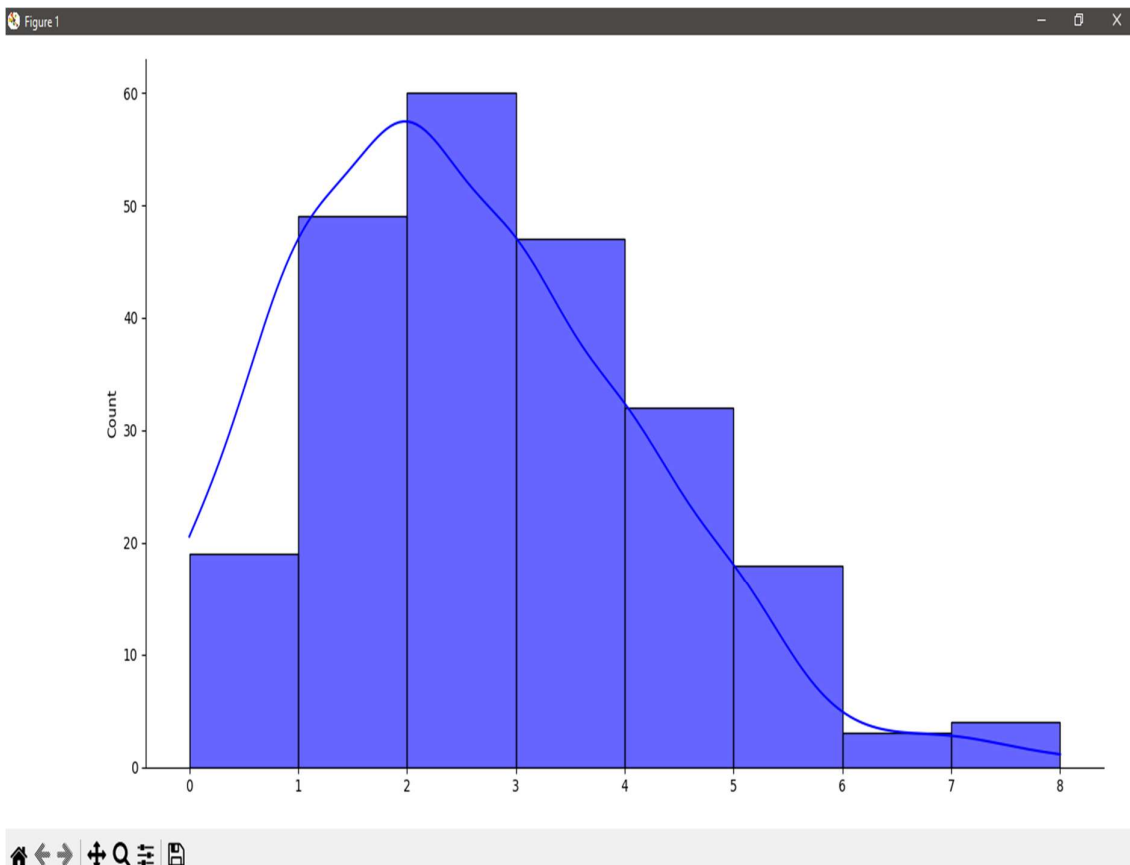
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```
cluster_visualization.py - Notepad
File  Edit  Format  View  Help
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Right-skewed Histogram data
rdata = [0] * 19 + [1] * 49 + [2] * 60 + [3] * \
        47 + [4] * 32 + [5] * 18 + [6] * 3 + [7] * 3 + [8]

# Plot the right-skewed histogram
sns.displot(rdata, bins=8, kde=True, alpha=0.6, color='blue')
plt.show()  # Add this line to display the plot
```
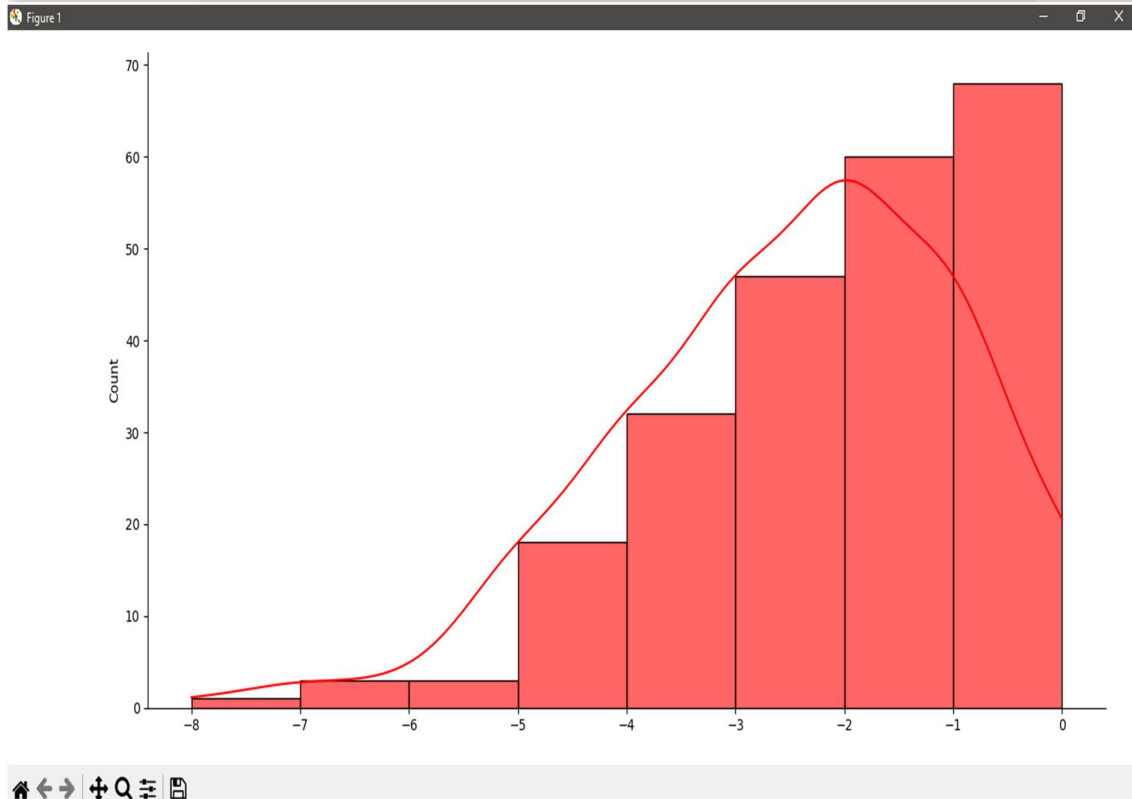
Ln 12, Col 1   100%   Windows (CRLF)   UTF-8

```
cluster_visualization.py - Notepad

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import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Left-skewed Histogram data
ldata = [0] * 19 + [-1] * 49 + [-2] * 60 + [-3] * 47 + [-4] * 32 + [-5] * 18 + \
        [-6] * 3 + [-7] * 3 + [-8]

# Plot the left-skewed histogram
sns.displot(ldata, kde=True, bins=8, alpha=0.6, color='red')
plt.show()  # Add this line to display the plot
```

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```python
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Generate random data following a uniform distribution
data = np.random.uniform(low=0, high=1, size=600)

# Plot the histogram with KDE
sns.histplot(data, kde=True, bins=10)
plt.show()  # Display the plot
```

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Figure 1