

# LAB ASSIGNMENT-17.2

PROGRAMME : BTECH-CSE  
SPECIALIZATION : AIML  
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## **Task 1 – Social Media Data Cleaning**

Task: Clean raw social media posts dataset.

Instructions:

- Remove stopwords, punctuation, and special symbols from post text.
- Handle missing values in likes and shares columns.
- Convert timestamp to datetime and extract features (hour, weekday).
- Detect and remove spam/duplicate posts.

Expected Output: A cleaned dataset with structured features for sentiment/engagement analysis.

**Prompt:** To clean a raw dataset of social media posts to prepare it for sentiment and engagement analysis. The cleaning process should include removing stopwords, punctuation, and special characters from the post text. It should also handle missing values in the likes and shares columns appropriately. Additionally, I want to convert the timestamp field into a proper datetime format and extract useful features like the hour of posting and the day of the week. Finally, the script should detect and eliminate any spam or duplicate posts. The expected result is a structured and cleaned dataset ready for further analysis.

**Code:**

C: > Users > thota > Desktop > test\_edge\_cases.py > ...

```
1 import pandas as pd
2 import re
3 import nltk
4 from nltk.corpus import stopwords
5 from datetime import datetime
6
7 # Download stopwords if not present
8 try:
9     nltk.data.find('corpora/stopwords')
10 except LookupError:
11     nltk.download('stopwords')
12
13 stop_words = set(stopwords.words('english'))
14
15 def clean_text(text):
16     if pd.isna(text):
17         return ""
18     # Lowercase
19     text = text.lower()
20     # Remove URLs
21     text = re.sub(r'http\S+', '', text)
22     # Remove mentions and hashtags
23     text = re.sub(r'[@#]\w+', '', text)
24     # Remove punctuation and special characters
25     text = re.sub(r'^\w\s', '', text)
26     # Remove extra spaces
27     text = re.sub(r'\s+', ' ', text).strip()
28     # Remove stopwords
29     words = text.split()
30     words = [word for word in words if word not in stop_words]
31     return ' '.join(words)
32
33 def clean_dataset(df):
```

C: > Users > thota > Desktop > test\_edge\_cases.py > ...

```
1 import pandas as pd
2 import re
3 import nltk
4 from nltk.corpus import stopwords
5 from datetime import datetime
6
7 # Download stopwords if not present
8 try:
9     nltk.data.find('corpora/stopwords')
10 except LookupError:
11     nltk.download('stopwords')
12
13 stop_words = set(stopwords.words('english'))
14
15 def clean_text(text):
16     if pd.isna(text):
17         return ""
18     # Lowercase
19     text = text.lower()
20     # Remove URLs
21     text = re.sub(r'http\S+', '', text)
22     # Remove mentions and hashtags
23     text = re.sub(r'[@#]\w+', '', text)
24     # Remove punctuation and special characters
25     text = re.sub(r'^\w\s', '', text)
26     # Remove extra spaces
27     text = re.sub(r'\s+', ' ', text).strip()
28     # Remove stopwords
29     words = text.split()
30     words = [word for word in words if word not in stop_words]
31     return ' '.join(words)
32
33 def clean_dataset(df):
```

C:\Users> thota > Desktop > test\_edge\_cases.py > ...

```
33 def clean_dataset(df):
34     # Clean post_text
35     df['cleaned_text'] = df['post_text'].apply(clean_text)
36
37     # Handle missing values in likes and shares
38     df['likes'] = df['likes'].fillna(0).astype(int)
39     df['shares'] = df['shares'].fillna(0).astype(int)
40
41     # Convert timestamp to datetime
42     df['timestamp'] = pd.to_datetime(df['timestamp'], errors='coerce')
43
44     # Extract hour and weekday
45     df['hour'] = df['timestamp'].dt.hour
46     df['weekday'] = df['timestamp'].dt.day_name()
47
48     # Remove duplicates based on cleaned_text
49     df = df.drop_duplicates(subset=['cleaned_text'])
50
51     # Remove spam: if cleaned_text is empty or too short (<5 chars)
52     df = df[df['cleaned_text'].str.len() >= 5]
53
54     return df
55
56 # Test 1: All missing values
57 print("Testing: All missing values")
58 df1 = pd.DataFrame({
59     'post_text': [None, None, None],
60     'likes': [None, None, None],
61     'shares': [None, None, None],
62     'timestamp': [None, None, None]
63 })
64 df1_clean = clean_dataset(df1)
65 print("Rows after cleaning:" len(df1_clean))
```

```

C: > Users > thota > Desktop > test_edge_cases.py > ...
110     'shares': [4, 2, 3],
111     'timestamp': ["2023-10-01 12:00:00", "10/02/2023 13:00", "2023-10-03T14:00:00"]
112 })
113 df5_clean = clean_dataset(df5)
114 print("Rows after cleaning:", len(df5_clean))
115 print(df5_clean[['timestamp', 'hour', 'weekday']])
116
117 # Test 6: Non-English stopwords (script uses English, so should still clean)
118 print("\nTesting: Non-English text")
119 df6 = pd.DataFrame({
120     'post_text': ["Hola mundo", "Bonjour le monde"],
121     'likes': [1, 2],
122     'shares': [1, 2],
123     'timestamp': ["2023-10-01 12:00:00", "2023-10-01 12:00:00"]
124 })
125 df6_clean = clean_dataset(df6)
126 print("Rows after cleaning:", len(df6_clean))
127 print(df6_clean)
128
129 # Test 7: Larger dataset (generate 1000 rows)
130 print("\nTesting: Larger dataset (1000 rows)")
131 import numpy as np
132 np.random.seed(42)
133 df7 = pd.DataFrame({
134     'post_text': ["Post " + str(i) + " with some text!" for i in range(1000)],
135     'likes': np.random.randint(0, 1000, 1000),
136     'shares': np.random.randint(0, 500, 1000),
137     'timestamp': pd.date_range("2023-10-01", periods=1000, freq='H')
138 })
139 df7_clean = clean_dataset(df7)
140 print("Rows after cleaning:", len(df7_clean))
141
142 print("\nAll edge case tests completed.")
143

```

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\thota\Desktop> python clean_data.py

Cleaned Dataset:
      post_text  likes  shares  timestamp  cleaned_text  hour  weekday
0  This is a great post! #awesome      100      20  2023-10-01 14:30:00      great post      14    Sunday
1  Wow, amazing content!!! @user         0      15  2023-10-02 09:15:00  wow amazing content         9    Monday
2  Check out this link: http://example.com    200      0  2023-10-03 18:45:00      check link      18    Tuesday
3      Spam spam spam!!!         5         2  2023-10-04 12:00:00      spam spam spam      12    Wednesday
4  Another post with punctuation!!!    150      30  2023-10-05 16:20:00  another post punctuation      16    Thursday
5              Short         0         5  2023-10-06 08:10:00              short         8    Friday

```

## Observation:

### ➤ Stopwords, Punctuation, and Special Symbols Removal

Check if the text preprocessing pipeline removes common stopwords (e.g., "the", "is", "at"), punctuation marks, and special characters that do not contribute to sentiment or engagement analysis.

➤ **Handling Missing Values in Likes and Shares**

Observe how the script deals with missing or null values in numeric columns. Does it impute with mean/median, fill with zeros, or drop rows? The strategy should be consistent and context-aware.

**Task 2 – Financial Data Preprocessing**

Task: Preprocess a stock market dataset.

Instructions:

- Handle missing values in closing\_price and volume.
- Create lag features (1-day, 7-day returns).
- Normalize volume column using log-scaling.
- Detect outliers in closing\_price using IQR method.

Expected Output: A time-series dataset ready for forecasting models.

**Prompt:** To preprocess a stock market dataset to prepare it for time-series forecasting. The preprocessing steps should include handling missing values in the closing\_price and volume columns, creating lag-based features such as 1-day and 7-day returns, and applying log-scaling to normalize the volume data. Additionally, I want to detect and remove outliers in the closing\_price column using the Interquartile Range (IQR) method. The final output should be a clean and structured dataset suitable for building forecasting models.

**Code:**



C: > Users > thota > Desktop > stock\_data.csv > data

1	date,closing_price,volume
2	2023-01-01,100.5,1000000
3	2023-01-02,101.2,1100000
4	2023-01-03,,1200000
5	2023-01-04,102.8,1300000
6	2023-01-05,103.1,1400000
7	2023-01-06,102.9,1500000
8	2023-01-07,104.5,1600000
9	2023-01-08,105.0,1700000
10	2023-01-09,106.2,1800000
11	2023-01-10,107.0,1900000
12	2023-01-11,108.5,2000000
13	2023-01-12,109.2,2100000
14	2023-01-13,110.0,2200000
15	2023-01-14,111.5,2300000
16	2023-01-15,112.0,2400000
17	2023-01-16,113.5,2500000
18	2023-01-17,114.0,2600000
19	2023-01-18,115.5,2700000
20	2023-01-19,116.0,2800000
21	2023-01-20,117.5,2900000
22	2023-01-21,118.0,3000000
23	2023-01-22,119.5,3100000
24	2023-01-23,120.0,3200000
25	2023-01-24,121.5,3300000
26	2023-01-25,122.0,3400000
27	2023-01-26,123.5,3500000
28	2023-01-27,124.0,3600000
29	2023-01-28,125.5,3700000
30	2023-01-29,126.0,3800000
31	2023-01-30,127.5,3900000
32	2023-01-31,128.0,4000000
33	2023-02-01,129.5,4100000

C: > Users > thota > Desktop > test\_edge\_cases.py > ...

```
1 import pandas as pd
2 import re
3 import nltk
4 from nltk.corpus import stopwords
5 from datetime import datetime
6
7 # Download stopwords if not present
8 try:
9     nltk.data.find('corpora/stopwords')
10 except LookupError:
11     nltk.download('stopwords')
12
13 stop_words = set(stopwords.words('english'))
14
15 def clean_text(text):
16     if pd.isna(text):
17         return ""
18     # Lowercase
19     text = text.lower()
20     # Remove URLs
21     text = re.sub(r'http\S+', '', text)
22     # Remove mentions and hashtags
23     text = re.sub(r'[@#]\w+', '', text)
24     # Remove punctuation and special characters
25     text = re.sub(r'^\w\s]', '', text)
26     # Remove extra spaces
27     text = re.sub(r'\s+', ' ', text).strip()
28     # Remove stopwords
29     words = text.split()
30     words = [word for word in words if word not in stop_words]
31     return ' '.join(words)
32
33 def clean_dataset(df):
```



C: > Users > thota > Desktop > test\_edge\_cases.py > ...

```
31     return ' '.join(words)
32
33 def clean_dataset(df):
34     # Clean post_text
35     df['cleaned_text'] = df['post_text'].apply(clean_text)
36
37     # Handle missing values in likes and shares
38     df['likes'] = df['likes'].fillna(0).astype(int)
39     df['shares'] = df['shares'].fillna(0).astype(int)
40
41     # Convert timestamp to datetime
42     df['timestamp'] = pd.to_datetime(df['timestamp'], errors='coerce')
43
44     # Extract hour and weekday
45     df['hour'] = df['timestamp'].dt.hour
46     df['weekday'] = df['timestamp'].dt.day_name()
47
48     # Remove duplicates based on cleaned_text
49     df = df.drop_duplicates(subset=['cleaned_text'])
50
51     # Remove spam: if cleaned_text is empty or too short (<5 chars)
52     df = df[df['cleaned_text'].str.len() >= 5]
53
54     return df
55
56 # Test 1: All missing values
57 print("Testing: All missing values")
58 df1 = pd.DataFrame({
59     'post_text': [None, None, None],
60     'likes': [None, None, None],
61     'shares': [None, None, None],
62     'timestamp': [None, None, None]
63 })
```

C:\Users\thota\Desktop > test\_edge\_cases.py > ...

```
64 df1_clean = clean_dataset(df1)
65 print("Rows after cleaning:", len(df1_clean))
66 print(df1_clean)
67
68 # Test 2: All duplicates
69 print("\nTesting: All duplicates")
70 df2 = pd.DataFrame({
71     'post_text': ["This is a test post", "This is a test post", "This is a test post"],
72     'likes': [10, 10, 10],
73     'shares': [5, 5, 5],
74     'timestamp': ["2023-10-01 12:00:00", "2023-10-01 12:00:00", "2023-10-01 12:00:00"]
75 })
76 df2_clean = clean_dataset(df2)
77 print("Rows after cleaning:", len(df2_clean))
78 print(df2_clean)
79
80 # Test 3: Empty texts
81 print("\nTesting: Empty texts")
82 df3 = pd.DataFrame({
83     'post_text': ["", " ", "Hello world"],
84     'likes': [1, 2, 3],
85     'shares': [1, 2, 3],
86     'timestamp': ["2023-10-01 12:00:00", "2023-10-01 12:00:00", "2023-10-01 12:00:00"]
87 })
88 df3_clean = clean_dataset(df3)
89 print("Rows after cleaning:", len(df3_clean))
90 print(df3_clean)
91
92 # Test 4: Very long texts
93 print("\nTesting: Very long texts")
94 long_text = "This is a very long post " * 100
95 df4 = pd.DataFrame({
96     'post_text': [long_text, "Short"]
97 })
```

C: > Users > totha > Desktop > preprocess\_stock.py > ...

```
1 import pandas as pd
2 import numpy as np
3
4 # Load data
5 df = pd.read_csv('stock_data.csv')
6
7 # Convert date to datetime
8 df['date'] = pd.to_datetime(df['date'])
9
10 # Handle missing values in closing_price and volume
11 df['closing_price'] = df['closing_price'].ffill()
12 df['volume'] = df['volume'].ffill()
13
14 # Create lag features: 1-day and 7-day returns
15 df['return_1d'] = df['closing_price'].pct_change(1)
16 df['return_7d'] = df['closing_price'].pct_change(7)
17
18 # Normalize volume using log-scaling
19 df['volume_log'] = np.log(df['volume'] + 1) # +1 to avoid log(0)
20
21 # Detect outliers in closing_price using IQR method
```

C: > Users > totha > Desktop > preprocess\_stock.py > ...

```
1 import pandas as pd
2 import numpy as np
3
4 # Load data
5 df = pd.read_csv('stock_data.csv')
6
7 # Convert date to datetime
8 df['date'] = pd.to_datetime(df['date'])
9
10 # Handle missing values in closing_price and volume
11 df['closing_price'] = df['closing_price'].ffill()
12 df['volume'] = df['volume'].ffill()
13
14 # Create lag features: 1-day and 7-day returns
15 df['return_1d'] = df['closing_price'].pct_change(1)
16 df['return_7d'] = df['closing_price'].pct_change(7)
17
18 # Normalize volume using log-scaling
19 df['volume_log'] = np.log(df['volume'] + 1) # +1 to avoid log(0)
20
21 # Detect outliers in closing_price using IQR method
22 Q1 = df['closing_price'].quantile(0.25)
23 Q3 = df['closing_price'].quantile(0.75)
24 IQR = Q3 - Q1
25 lower_bound = Q1 - 1.5 * IQR
26 upper_bound = Q3 + 1.5 * IQR
27 df['outlier'] = (df['closing_price'] < lower_bound) | (df['closing_price'] > upper_bound)
28
29 # Save preprocessed dataset
30 df.to_csv('preprocessed_stock_data.csv', index=False)
31
32 print("Financial data preprocessing completed. Preprocessed data saved to preprocessed_stock_data.csv")
33 print("\nPreprocessed Dataset (first 10 rows):")
```

```
PS C:\Users\thota\Desktop> python preprocess_stock.py
2023-01-02      101.2 1100000  0.006965      NaN  13.910822  False
2023-01-03      101.2 1200000  0.000000      NaN  13.997833  False
2023-01-04      102.8 1300000  0.015810      NaN  14.077876  False
2023-01-05      103.1 1400000  0.002918      NaN  14.151984  False
2023-01-06      102.9 1500000 -0.001940      NaN  14.220976  False
2023-01-07      104.5 1600000  0.015549      NaN  14.285515  False
2023-01-08      105.0 1700000  0.004785  0.044776  14.346139  False
2023-01-09      106.2 1800000  0.011429  0.049407  14.403298  False
2023-01-10      107.0 1900000  0.007533  0.057312  14.457365  False
PS C:\Users\thota\Desktop> 
```

**Observation:**

➤ **Handling Missing Values**

- Check how missing values in closing\_price and volume are treated.
- Are they dropped, forward/backward filled, or imputed with statistical measures like mean or median?
- Ensure the method preserves time-series integrity.

**Task 3 – IoT Sensor Data Preparation**

Task: Clean and preprocess IoT temperature and humidity logs.

Instructions:



- Handle missing values using forward fill.
- Remove sensor drift (apply rolling mean).
- Normalize readings using standard scaling.
- Encode categorical sensor IDs.

Expected Output: A structured dataset optimized for anomaly detection.

**Prompt:** To clean and preprocess a dataset containing IoT sensor logs that record temperature and humidity readings. The preprocessing steps should include handling missing values using forward fill, applying a rolling mean to smooth out sensor drift, and normalizing the readings using standard scaling. Additionally, the sensor IDs—if categorical—should be encoded appropriately for modeling. The final output should be a well-structured dataset optimized for anomaly detection tasks.

**Code:**



C: > Users > thota > Desktop >  `iot_data.csv` >  `data`

1	timestamp,sensor_id,temperature,humidity
2	2023-01-01 00:00:00,Sensor_A,25.5,60.2
3	2023-01-01 01:00:00,Sensor_A,26.0,61.0
4	2023-01-01 02:00:00,Sensor_A,,62.5
5	2023-01-01 03:00:00,Sensor_A,27.2,63.1
6	2023-01-01 04:00:00,Sensor_B,24.8,59.8
7	2023-01-01 05:00:00,Sensor_B,25.1,60.5
8	2023-01-01 06:00:00,Sensor_B,25.3,61.2
9	2023-01-01 07:00:00,Sensor_B,25.7,62.0
10	2023-01-01 08: Col 1: timestamp 6.5,63.5
11	2023-01-01 09:00:00,Sensor_C,27.0,64.0
12	2023-01-01 10:00:00,Sensor_C,27.5,64.5
13	2023-01-01 11:00:00,Sensor_C,28.0,65.0
14	2023-01-01 12:00:00,Sensor_A,28.5,65.5
15	2023-01-01 13:00:00,Sensor_A,29.0,66.0
16	2023-01-01 14:00:00,Sensor_A,29.5,66.5
17	2023-01-01 15:00:00,Sensor_A,30.0,67.0
18	2023-01-01 16:00:00,Sensor_B,30.5,67.5
19	2023-01-01 17:00:00,Sensor_B,31.0,68.0
20	2023-01-01 18:00:00,Sensor_B,31.5,68.5
21	2023-01-01 19:00:00,Sensor_B,32.0,69.0
22	2023-01-01 20:00:00,Sensor_C,32.5,69.5
23	2023-01-01 21:00:00,Sensor_C,33.0,70.0
24	2023-01-01 22:00:00,Sensor_C,33.5,70.5
25	2023-01-01 23:00:00,Sensor_C,34.0,71.0
26	2023-01-02 00:00:00,Sensor_A,34.5,71.5
27	2023-01-02 01:00:00,Sensor_A,35.0,72.0
28	2023-01-02 02:00:00,Sensor_A,35.5,72.5
29	2023-01-02 03:00:00,Sensor_A,36.0,73.0
30	2023-01-02 04:00:00,Sensor_B,36.5,73.5
31	2023-01-02 05:00:00,Sensor_B,37.0,74.0
32	2023-01-02 06:00:00,Sensor_B,37.5,74.5
33	2023-01-02 07:00:00,Sensor_B,38.0,75.0

```

C: > Users > thota > Desktop > preprocess_iot.py > ...
1 import pandas as pd
2 import numpy as np
3
4 # Load data
5 df = pd.read_csv('iot_data.csv')
6
7 # Convert timestamp to datetime
8 df['timestamp'] = pd.to_datetime(df['timestamp'])
9
10 # Handle missing values using forward fill
11 df['temperature'] = df['temperature'].ffill()
12 df['humidity'] = df['humidity'].ffill()
13
14 # Remove sensor drift (apply rolling mean with window=5)
15 df['temperature_smooth'] = df['temperature'].rolling(window=5, min_periods=1).mean()
16 df['humidity_smooth'] = df['humidity'].rolling(window=5, min_periods=1).mean()
17
18 # Normalize readings using standard scaling (manual)
19 df['temperature_scaled'] = (df['temperature_smooth'] - df['temperature_smooth'].mean()) / df['temperature_smooth'].std()
20 df['humidity_scaled'] = (df['humidity_smooth'] - df['humidity_smooth'].mean()) / df['humidity_smooth'].std()
21
22 # Encode categorical sensor IDs (manual mapping)
23 sensor_mapping = {'Sensor_A': 0, 'Sensor_B': 1, 'Sensor_C': 2}
24 df['sensor_id_encoded'] = df['sensor_id'].map(sensor_mapping)
25
26 # Save preprocessed dataset
27 df.to_csv('preprocessed_iot_data.csv', index=False)
28
29 print("IoT sensor data preprocessing completed. Preprocessed data saved to preprocessed_iot_data.csv")
30 print("\nPreprocessed Dataset (first 10 rows):")
31 print(df.head(10).to_string(index=False))
32

```

```

PS C:\Users\thota\Desktop> python preprocess_iot.py
969      1
2023-01-01 06:00:00 Sensor_B      25.3      61.2      25.680000      61.420000      -1.245151      -1.306
117      1
2023-01-01 07:00:00 Sensor_B      25.7      62.0      25.620000      61.320000      -1.254505      -1.320
748      1
2023-01-01 08:00:00 Sensor_C      26.5      63.5      25.480000      61.400000      -1.276330      -1.309
043      2
2023-01-01 09:00:00 Sensor_C      27.0      64.0      25.920000      62.240000      -1.207736      -1.186
141      2
PS C:\Users\thota\Desktop>

```



## **Observation:**

### ➤ **Missing Value Handling**

- Confirm that missing temperature and humidity readings are filled using forward fill (ffill), which maintains temporal continuity.
- Check if the method is applied consistently across all sensors and time intervals.

## **Task 4 – Real-Time Application: Movie Reviews Data Cleaning**

Task: A streaming platform wants to analyze customer reviews.

Instructions:

- Standardize text (lowercase, remove HTML tags).
- Tokenize and encode reviews using AI-assisted methods (TF-IDF or embeddings).
- Handle missing ratings (fill with median).
- Normalize ratings (0–10 → 0–1 scale).
- Generate a before vs after summary report

**Prompt:** A streaming service is aiming to enhance its understanding of customer feedback by cleaning and preparing movie review data for analysis. The task involves several preprocessing steps: first, standardize the review text by converting it to lowercase and stripping out any HTML tags. Next, tokenize the text and apply AI-driven encoding techniques such as TF-IDF or semantic embeddings to convert the reviews into numerical representations. For the ratings, identify any missing values and replace them with the median rating. Then, normalize all ratings from a 0–10 scale to a 0–1 scale to ensure consistency. Finally, produce a summary report comparing the dataset before and after cleaning, highlighting changes in review structure, rating distribution, and sample entries.

**Code:**

```
Welcome  <> <!DOCTYPE html> Untitled-1  clean_reviews.py 8  import pandas as pd Untitled-2  ●
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4    <meta charset="UTF-8">
5    <title>Movie Reviews Data Cleaning</title>
6    <script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@4.10.0/dist/tf.min.js"></script>
7    <style>
8      body { font-family: Arial, sans-serif; margin: 20px; }
9      h2 { color: #2c3e50; }
10     pre { background: #f4f4f4; padding: 10px; border-radius: 5px; }
11   </style>
12 </head>
13 <body>
14
15 <h2> 🎬 Movie Reviews Data Cleaning</h2>
16
17 <div id="before"></div>
18 <div id="after"></div>
19
20 <script>
21   // Sample raw data
22   const reviews = [
23     { text: "<p>Great movie! Loved it.</p>", rating: 9 },
24     { text: "<div>Terrible plot, bad acting.</div>", rating: 2 },
25     { text: "<span>Okay-ish. Not bad.</span>", rating: null },
26     { text: "Amazing visuals! <br> Story was weak.", rating: 7 },
27     { text: "Meh. Could be better.", rating: 5 }
28   ];
29
30   // Step 1: Standardize text
31   function cleanText(html) {
32     const doc = new DOMParser().parseFromString(html, 'text/html');
33     return doc.body.textContent.toLowerCase();
34   }
```

```

1  import pandas as pd
2  import numpy as np
3  import re
4  from sklearn.feature_extraction.text import TfidfVectorizer
5
6  # Sample raw data
7  data = {
8      'review': [
9          "<p>Great movie! Loved it.</p>",
10         "<div>Terrible plot, bad acting.</div>",
11         "<span>Okay-ish. Not bad.</span>",
12         "Amazing visuals! <br> Story was weak.",
13         "Meh. Could be better."
14     ],
15     'rating': [9, 2, None, 7, 5]
16 }
17
18 # Create DataFrame
19 df = pd.DataFrame(data)
20
21 # Step 1: Standardize text
22 def clean_html(text):
23     return re.sub(r'<.*?>', '', text).lower()
24
25 df['cleaned_review'] = df['review'].apply(clean_html)
26
27 # Step 2: Tokenize and encode using TF-IDF
28 vectorizer = TfidfVectorizer()
29 tfidf_matrix = vectorizer.fit_transform(df['cleaned_review'])
30 tfidf_df = pd.DataFrame(tfidf_matrix.toarray(), columns=vectorizer.get_feature_names_out())
31
32 # Step 3: Handle missing ratings
33 median_rating = df['rating'].median()
34 df['rating_filled'] = df['rating'].fillna(median_rating)

```

```

24
25 df['cleaned_review'] = df['review'].apply(clean_html)
26
27 # Step 2: Tokenize and encode using TF-IDF
28 vectorizer = TfidfVectorizer()
29 tfidf_matrix = vectorizer.fit_transform(df['cleaned_review'])
30 tfidf_df = pd.DataFrame(tfidf_matrix.toarray(), columns=vectorizer.get_feature_names_out())
31
32 # Step 3: Handle missing ratings
33 median_rating = df['rating'].median()
34 df['rating_filled'] = df['rating'].fillna(median_rating)
35
36 # Step 4: Normalize ratings (0-10 → 0-1)
37 df['normalized_rating'] = df['rating_filled'] / 10
38
39 # Step 5: Combine and export to CSV
40 final_df = pd.concat([df[['review', 'cleaned_review', 'normalized_rating']], tfidf_df], axis=1)
41 final_df.to_csv('cleaned_movie_reviews.csv', index=False)
42
43 print(f"✅ Cleaned dataset saved as 'cleaned_movie_reviews.csv'")

```

```
PS C:\Users\thota> PS C:\Users\thota> python clean_review.py  
>> ✅ CSV file 'cleaned_reviews.csv' created successfully.
```

### Observation:

- **Before:** Review texts contained inconsistent casing (mix of uppercase and lowercase), and many included HTML tags *which added noise to the data.*
- **After:** All texts were converted to lowercase, and HTML tags were successfully removed, resulting in cleaner and more uniform textual data.