Name-Ishan Kiran Joshi  Div-D15C  Roll No-21  A.Y.-2024-25

# DS-1 Lab Exp 1

**AIM:** Introduction to Data science and Data preparation using Pandas steps.

- Load data in Pandas.
- Description of the dataset.
- Drop columns that aren't useful.
- Drop rows with maximum missing values.
- Take care of missing data.
- Create dummy variables.
- Find out outliers (manually)
- standardization and normalization of columns

Step 1: Firstly import Pandas Library as pd an then Load data in Pandas using pd.read_csv.

You can import your own data into Colab notebooks from your Google Drive account, including from spreadsheets, as well as from Github and many other sources. To learn more about importing data, and how Colab can be used for data science, see the links below under Working with Data.

```
import pandas as pd
```

```
df = pd.read_csv('trending.csv')
```

Step 2: Get Description of the Dataset by using following 2 commands

df.info() -> Get basic information about the dataset

df.describe() -> Summary statistics of the dataset

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 16080 entries, 0 to 16079
Data columns (total 10 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Unnamed: 0         16080 non-null  int64
 1   id                 16080 non-null  int64
 2   original_title     12060 non-null  object
 3   original_language  16080 non-null  object
 4   release_date       12060 non-null  object
 5   popularity         16080 non-null  float64
 6   vote_average       16080 non-null  float64
 7   vote_count         16080 non-null  int64
 8   media_type         16080 non-null  object
 9   adult              16080 non-null  bool
dtypes: bool(1), float64(2), int64(3), object(4)
memory usage: 1.1+ MB
```

```
df.describe()
```

| | Unnamed: 0 | id | popularity | vote_average | vote_count |
|---|---|---|---|---|---|
| count | 16080.0000 | 1.608000e+04 | 16080.000000 | 16080.000000 | 16080.00000 |
| mean | 8039.5000 | 5.758387e+05 | 934.262000 | 7.536350 | 1039.75000 |
| std | 4642.0405 | 3.271352e+05 | 2229.935599 | 1.057306 | 2326.96193 |
| min | 0.0000 | 7.660000e+04 | 30.374000 | 4.800000 | 3.00000 |
| 25% | 4019.7500 | 1.963872e+05 | 61.750250 | 6.875000 | 9.75000 |
| 50% | 8039.5000 | 6.580765e+05 | 94.859000 | 7.721000 | 53.50000 |
| 75% | 12059.2500 | 8.569955e+05 | 804.053750 | 8.040250 | 363.00000 |
| max | 16079.0000 | 1.049638e+06 | 10224.280000 | 10.000000 | 8697.00000 |

Step 3: Drop Columns that aren't useful. From Our Dataset we are dropping the **"adult"** column .

```
cols = ['adult']
df = df.drop(cols,axis=1)
```

We can see that it returned total 9 columns as it dropped the adult column

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 16079 entries, 0 to 16079
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Unnamed: 0         16079 non-null  int64
 1   id                 16079 non-null  int64
 2   original_title     12060 non-null  object
 3   original_language  16079 non-null  object
 4   release_date       12060 non-null  object
 5   popularity         16079 non-null  float64
 6   vote_average       16079 non-null  float64
 7   vote_count         16079 non-null  int64
 8   media_type         16079 non-null  object
dtypes: float64(2), int64(3), object(4)
memory usage: 1.2+ MB
```

Step 4: Drop row with maximum missing values.
df.isnull().sum(axis=1) -> Computes the number of missing values (NaN) for each row.
.idxmax() -> Returns the index of row with max. no. of missing value

```
df= df.drop(df.isnull().sum(axis=1).idxmax())
```

We can see below that df.info() returns total 16079 entries, initially there were 16080 entries

```
df.info()

<class 'pandas.core.frame.DataFrame'>
Index: 16079 entries, 0 to 16079
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Unnamed: 0         16079 non-null  int64
 1   id                 16079 non-null  int64
 2   original_title     12060 non-null  object
 3   original_language  16079 non-null  object
 4   release_date       12060 non-null  object
 5   popularity         16079 non-null  float64
 6   vote_average       16079 non-null  float64
 7   vote_count         16079 non-null  int64
 8   media_type         16079 non-null  object
dtypes: float64(2), int64(3), object(4)
memory usage: 1.2+ MB
```

Step 5: Taking care of missing data.
We can fill the empty numeric values with mode or median or mean. Below we had filled it with median. Firstly we had fetched the numeric values and then using **.fillna().median** we had filled it.

```
numeric_columns = df.select_dtypes(include=['float64', 'int64']).columns
```

```
df[numeric_columns] = df[numeric_columns].fillna(df[numeric_columns].median())
```

We can see that all the columns which had empty are filled. As they returned the sum 0

```
print(df.isnull().sum())
```

```
Unnamed: 0              0
id                      0
original_title       4019
original_language       0
release_date         4019
popularity              0
vote_average            0
vote_count              0
media_type              0
dtype: int64
```

df.head() returns starting 5 values

```
print(df.head())
```

```
   Unnamed: 0      id          original_title original_language  \
0           0  638974       Murder Mystery 2           English
1           1  677179              Creed III           English
2           2  726759                 Tetris           English
3           3   76600  Avatar: The Way of Water           English
4           4  849869                    길복순            Korean

  release_date  popularity  vote_average  vote_count media_type
0   2023-03-26     235.901         6.800         187      movie
1   2023-03-01    1537.879         7.200         561      movie
2   2023-03-15      66.661         7.700         100      movie
3   2022-12-14   10224.280         7.742        6335      movie
4   2023-02-17      33.985         6.900          39      movie
```

```
print(df.head(20))
```

```
6            6   493529  Dungeons & Dragons: Honor Among Thieves
7            7   932430                                Prom Pact
9            9   816904                                   Momias
10          10   514999                           Murder Mystery
11          11  1049638                                 Rye Lane
12          12   739405       Operation Fortune: Ruse de Guerre
13          13   158876                                      NaN
14          14   921355                                 Assassin
15          15   117465                                      NaN
16          16   933419                                Champions
17          17   208891                                      NaN
18          18   878375                    On a Wing and a Prayer
19          19    82856                                      NaN
20          20   638974                         Murder Mystery 2

   original_language release_date  popularity  vote_average  vote_count  \
0            English   2023-03-26     235.901         6.800         187
1            English   2023-03-01    1537.879         7.200         561
```

0s completed at 12:09 PM

Step 6: Create dummy variables. By using the below commands separate columns are created for each unique value in a column

```
df = pd.get_dummies(df)
```

```
print(df.head(20))
```

```
7                       False                     False                     False
9                       False                     False                     False
10                      False                     False                     False
11                      False                      True                     False
12                      False                     False                     False
13                      False                     False                     False
14                      False                     False                     False
15                      False                     False                     False
16                      False                     False                     False
17                      False                     False                     False
18                      False                     False                     False
19                      False                     False                     False
20                      False                     False                     False

    release_date_2023-03-23  release_date_2023-03-26  release_date_2023-03-30  \
0                     False                      True                     False
```

We can understand the working here,
As we can see that we now it have returned 42 columns. But previously our data had 9 columns .
So this change is because of the dummy variables , it have created separate column for each unique value in a column
Below it shows original_title_Assassin, original_language_English.

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 16079 entries, 0 to 16079
Data columns (total 42 columns):
 #   Column                                              Non-Null Count  Dtype
---  ------                                              --------------  -----
 0   Unnamed: 0                                          16079 non-null  int64
 1   id                                                  16079 non-null  int64
 2   popularity                                          16079 non-null  float64
 3   vote_average                                        16079 non-null  float64
 4   vote_count                                          16079 non-null  int64
 5   original_title_Assassin                             16079 non-null  bool
 6   original_title_Avatar: The Way of Water             16079 non-null  bool
 7   original_title_Champions                            16079 non-null  bool
 8   original_title_Creed III                            16079 non-null  bool
 9   original_title_Dungeons & Dragons: Honor Among Thieves 16079 non-null  bool
 10  original_title_John Wick: Chapter 4                 16079 non-null  bool
 11  original_title_Momias                               16079 non-null  bool
 12  original_title_Murder Mystery                       16079 non-null  bool
 13  original_title_Murder Mystery 2                     16079 non-null  bool
 14  original_title_On a Wing and a Prayer               16079 non-null  bool
 15  original_title_Operation Fortune: Ruse de Guerre    16079 non-null  bool
 16  original_title_Prom Pact                            16079 non-null  bool
 17  original_title_Rye Lane                             16079 non-null  bool
 18  original_title_Tetris                               16079 non-null  bool
 19  original_title_길복순                                  16079 non-null  bool
 20  original_language_Chinese                           16079 non-null  bool
 21  original_language_English                           16079 non-null  bool
```

✓ 0s completed at 12:21 PM

Name-Ishan Kiran Joshi      Div-D15C    Roll No-21    A.Y.-2024-25

Step 7: Create Outliers
They identify and handle unusual values in a dataset.
We are using Z-score to handle the data

```
from scipy import stats

# Select only numerical columns
numerical_df = df.select_dtypes(include=['float64', 'int64'])

# Remove constant or problematic columns
numerical_df = numerical_df.loc[:, numerical_df.nunique() > 1]
numerical_df = numerical_df.dropna(axis=1)

# Calculate Z-scores
z_scores = stats.zscore(numerical_df)

# Handle cases with NaN Z-scores
z_scores = pd.DataFrame(z_scores, columns=numerical_df.columns).fillna(0)

# Identify rows with Z-scores > 3 or < -3
outliers = (abs(z_scores) > 3).any(axis=1)

# Filter the outliers
outlier_rows = df[outliers]
print(outlier_rows)
```

```
       Unnamed: 0     id  popularity  vote_average  vote_count  \
3               3  76600   10224.280         7.742        6335
19             19  82856    1108.646         8.488        8697
23             23  76600   10224.280         7.742        6335
39             39  82856    1108.646         8.488        8697
43             43  76600   10224.280         7.742        6335
...           ...    ...         ...           ...         ...
16039       16039  82856    1108.646         8.488        8697
16043       16043  76600   10224.280         7.742        6335
16059       16059  82856    1108.646         8.488        8697
```

Step 8: Standardization and Normalization
Import StandardScaler and MinMaxScaler

```
[23] from sklearn.preprocessing import StandardScaler, MinMaxScaler
```

Standardization (z-score scaling) transforms the data by subtracting the mean and dividing by the standard deviation for each feature.

```python
# Select numerical columns
numerical_columns = df.select_dtypes(include=['float64', 'int64']).columns

# Initialize the StandardScaler
scaler = StandardScaler()

# Standardize the numerical columns
df[numerical_columns] = scaler.fit_transform(df[numerical_columns])

# Check the results
print(df.head())
```

```
   Unnamed: 0        id  popularity  vote_average  vote_count  \
0   -1.732158  0.192916   -0.313201     -0.696417   -0.366495
1   -1.731943  0.309711    0.270665     -0.318094   -0.205769
2   -1.731727  0.461279   -0.389096      0.154808   -0.403883
3   -1.731512 -1.526286    4.166043      0.194532    2.275593
4   -1.731296  0.837632   -0.403749     -0.601836   -0.430097

   original_title_Assassin  original_title_Avatar: The Way of Water  \
0                    False                                    False
1                    False                                    False
2                    False                                    False
3                    False                                     True
4                    False                                    False
```

Normalization scales numerical data to a fixed range, usually [0, 1]. Use MinMaxScaler for this process.

```python
# Initialize the MinMaxScaler
scaler = MinMaxScaler()

# Normalize the numerical columns
df[numerical_columns] = scaler.fit_transform(df[numerical_columns])

# Check the results
print(df.head())
```

```
   Unnamed: 0        id  popularity  vote_average  vote_count  \
0    0.000000  0.577957    0.020162      0.384615    0.021164
1    0.000062  0.617220    0.147883      0.461538    0.064182
2    0.000124  0.668174    0.003560      0.557692    0.011157
3    0.000187  0.000000    1.000000      0.565769    0.728318
4    0.000249  0.794696    0.000354      0.403846    0.004141

   original_title_Assassin  original_title_Avatar: The Way of Water  \
0                    False                                    False
1                    False                                    False
2                    False                                    False
3                    False                                     True
4                    False                                    False
```

**Conclusion:** In this experiment, we applied various data preprocessing techniques, including handling missing values, removing irrelevant columns, and detecting outliers using the Z-score method. We then scaled the numerical data using standardization (Z-score method) and normalization (Min-Max scaling) to bring all features onto a uniform scale.

**Some Challenges we faced :**

1. Handling Missing Data: Identifying the appropriate method to handle missing values and replacing them with mean, median, or mode.

2. Scaling and Normalization: Deciding between standardization and normalization for different features can be tricky. Using incorrect scaling methods may distort the data and affect model accuracy.

3. Selection of Columns: Determining which columns are relevant for the model and dropping them is challenging.