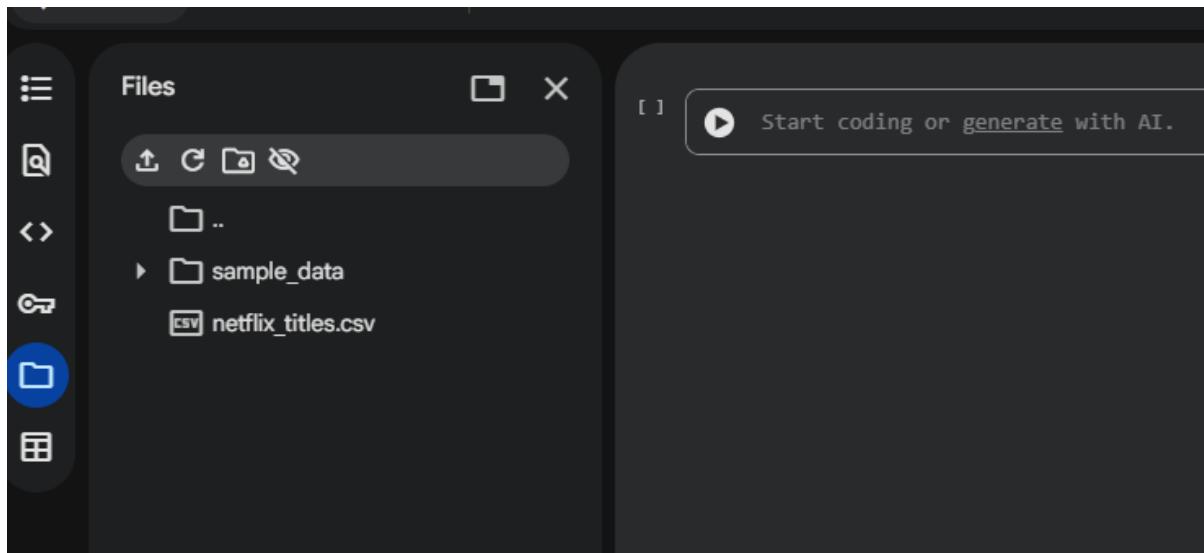


**Introduction:** In this task, advanced data cleaning and preprocessing techniques were applied to a real-world dataset as part of Week 1 of the Data Science Internship. The goal was to transform raw and messy data into a clean, analysis-ready format using Python



#### Import Libraries:

A screenshot of a Jupyter Notebook cell. The cell is numbered [1] and has a checkmark indicating it has been run successfully. The code in the cell imports four libraries: pandas, numpy, matplotlib.pyplot, and seaborn. The code is as follows:

```
[1]: ✓ 1s
    import pandas as pd
    import numpy as np
    import matplotlib.pyplot as plt
    import seaborn as sns
```

**Dataset Description:** The Netflix Movies and TV Shows dataset was selected for this task. It contains information such as title, type, director, cast, country, release year, rating, and duration. The dataset consists of more than 8,000 records and includes missing values and inconsistent data types.

### Load Dataset

```
[2] 0s
df = pd.read_csv("netflix_titles.csv")
df.head()
```

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
0	s1	Movie	Dick Johnson Is Dead	Kirsten Johnson	Nan	United States	September 25, 2021	2020	PG-13	90 min	Documentaries	As her father nears the end of his life, film...
1	s2	TV Show	Blood & Water	Nan	Ama Qamata, Khosi Ngema, Gall Mabalane, Thaban...	South Africa	September 24, 2021	2021	TV-MA	2 Seasons	International TV Shows, TV Dramas, TV Mysteries	After crossing paths at a party, a Cape Town t...
2	s3	TV Show	Ganglands	Julien Tracy Gotoas, NaN	September	2021	TV-MA	1 Season			Crime TV Shows, International TV Shows, TV Act...	To protect his family from a powerful drug lor...
3	s4	TV Show	Jailbirds New	What can I help you build?							Docuseries, Reality TV	Feuds, flirtations and toilet talk go

**Initial Diagnostics:** Initial data inspection was performed to understand the structure, size, and data types of the dataset. This step helped identify missing values and columns requiring preprocessing.

### Initial Diagnostics

```
[3] 0s
df.shape
df.info()
df.describe(include='all')
```

#	Column	Non-Null Count	Dtype
0	show_id	8807 non-null	object
1	type	8807 non-null	object
2	title	8807 non-null	object
3	director	6173 non-null	object
4	cast	7982 non-null	object
5	country	7976 non-null	object
6	date added	8797 non-null	object
7	release_year	8807 non-null	int64
8	rating	8803 non-null	object
9	duration	8804 non-null	object
10	listed_in	8807 non-null	object
11	description	8807 non-null	object

```
... 10 listed_in 8807 non-null object
11 description 8807 non-null object
dtypes: int64(1), object(11)
memory usage: 825.8+ KB
```

show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description	
count	8807	8807	8807	6173	7982	7976	8797	8807.000000	8803	8804	8807	8807
unique	8807	2	8807	4528	7692	748	1767	NaN	17	220	514	8775
top	s8807	Movie	Zubaan	Rajiv Chilaka	David Attenborough	United States	January 1, 2020	NaN	TV-MA	1 Season	Dramas, International Movies	Paranormal activity at a lush, abandoned propo...
freq	1	6131	1	19	19	2818	109	NaN	3207	1793	362	4
mean	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2014.180198	NaN	NaN	NaN	NaN
std	NaN	NaN	NaN	NaN	NaN	NaN	NaN	8.819312	NaN	NaN	NaN	NaN
min	NaN	NaN	NaN	NaN	NaN	NaN	NaN	1925.000000	NaN	NaN	NaN	NaN
25%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2013.000000	NaN	NaN	NaN	NaN
50%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2017.000000	NaN	NaN	NaN	NaN
75%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2019.000000	NaN	NaN	NaN	NaN
max	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2021.000000	NaN	NaN	NaN	NaN

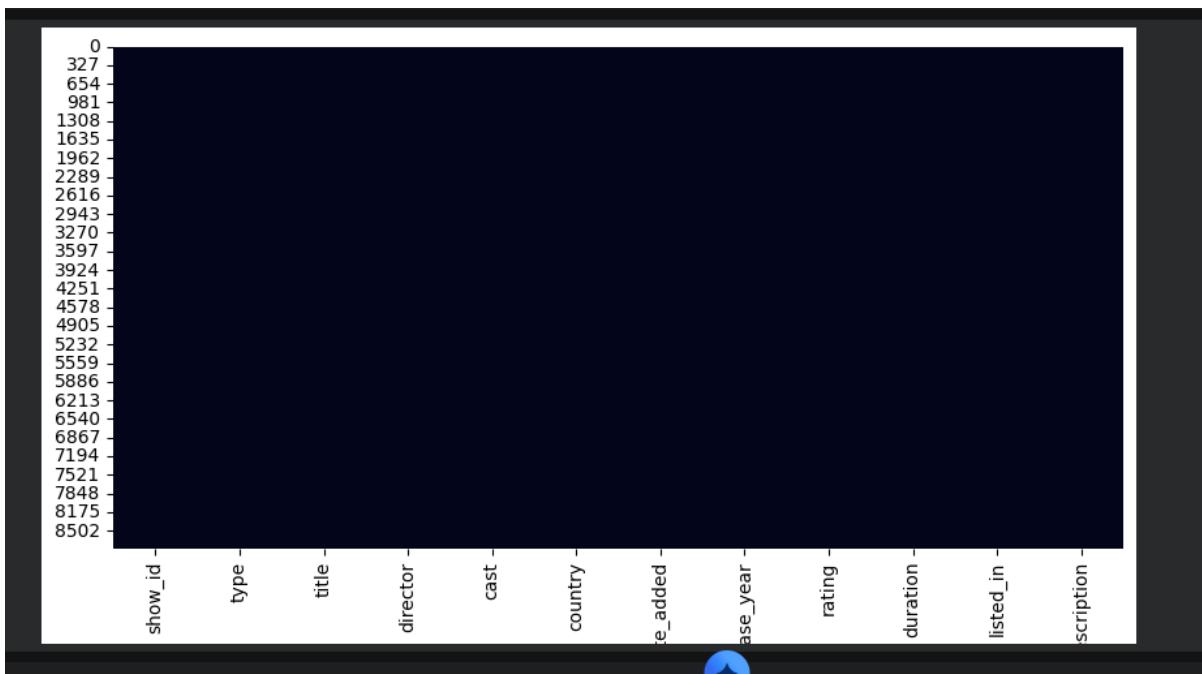
**Missing Value Analysis:** Missing values were analyzed using both tabular and visual methods. Several columns such as director, cast, country, and rating contained missing data.

Missing Values Analysis

```
[4]  os
      df.isnull().sum()
```

	0
show_id	0
type	0
title	0
director	2634
cast	825
country	831
date_added	10
release_year	0
rating	4
duration	3

```
0
show_id    0.000000
type       0.000000
title      0.000000
director   0.000000
cast       0.000000
country    0.000000
date_added 0.000000
release_year 0.000000
rating     0.045418
duration   0.000000
listed_in   0.000000
description 0.000000
dtype: float64
```



**Missing Value Imputation:** Two different imputation techniques were applied. Statistical methods such as mean and mode were used for numerical and categorical features. Additionally, KNN Imputation was applied as an advanced machine-learning-based technique to handle missing values more effectively.

```
Mean Imputation
[1] df['release_year'].fillna(df['release_year'].mean(), inplace=True)
  ... /tmp/ipython-input-1443942658.py:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an in-place method will never work because the intermediate object on which we are setting values always behave
  For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead
    df['release_year'].fillna(df['release_year'].mean(), inplace=True)

Mode Imputation
[2] df['rating'].fillna(df['rating'].mode()[0], inplace=True)
  ... /tmp/ipython-input-2284108631.py:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an in-place method will never work because the intermediate object on which we are setting values always behave
  For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead
    df['rating'].fillna(df['rating'].mode()[0], inplace=True)

▼ Missing value Imputation(Method 2 - KNN)
[9] from sklearn.impute import KNNImputer
  ✓ 0s
    imputer = KNNImputer(n_neighbors=5)
    df[['release_year']] = imputer.fit_transform(df[['release_year']])

[10] df['release_year'].isnull().sum()
  ✓ 0s
    np.int64(0)
```

**Data Type Correction & Date Parsing:** Data type corrections were performed to ensure consistency across the dataset. The date\_added column was converted into a proper datetime format for better usability.

## ▼ Data Parsing Data Type Correction

```
[ ] df['date_added'] = pd.to_datetime(df['date_added'], errors='coerce')
df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8807 entries, 0 to 8806
Data columns (total 12 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   show_id     8807 non-null    object  
 1   type        8807 non-null    object  
 2   title       8807 non-null    object  
 3   director    8807 non-null    object  
 4   cast        8807 non-null    object  
 5   country     8807 non-null    object  
 6   date_added  8807 non-null    datetime64[ns]
 7   release_year 8807 non-null    float64 
 8   rating      8807 non-null    object  
 9   duration    8807 non-null    object  
 10  listed_in   8807 non-null    object  
 11  description 8807 non-null    object  
dtypes: datetime64[ns](1), float64(1), object(10)
memory usage: 825.8+ KB
```

**Outlier Detection & Treatment:** Outliers in the release\_year column were detected using the Interquartile Range (IQR) method. Identified outliers were removed to improve data quality and reliability.

## ▼ IQR Method(Outlier Detection)

```
[13] 
✓ 0s
Q1 = df['release_year'].quantile(0.25)
Q3 = df['release_year'].quantile(0.75)

IQR = Q3 - Q1
lower = Q1 - 1.5 * IQR
upper = Q3 + 1.5 * IQR
```

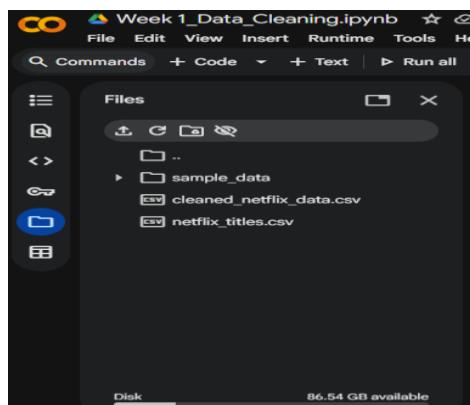
## ▼ Outlier Removal

```
[14] 
✓ 0s
▶ df = df[(df['release_year'] >= lower) & (df['release_year'] <= upper)]
df.shape

... (8088, 12)
```

**Final Cleaned Dataset:** After applying all cleaning and preprocessing steps, a final clean dataset was obtained. Sample rows were reviewed to verify the results.

	show_id	type	title	director	cast	country	date_added	release_year	rating	duration	listed_in	description
8802	s8803	Movie	Zodiac	David Fincher	Mark Ruffalo, Jake Gyllenhaal, Robert Downey J...	United States	2019-11-20	2007.0	R	158 min	Cult Movies, Dramas, Thrillers	A political cartoonist, a crime reporter and a...
8803	s8804	TV Show	Zombie Dumb	Unknown	Not Available	Unknown	2019-07-01	2018.0	TV-Y7	2 Seasons	Kids' TV, Korean TV Shows, TV Comedies	While living alone in a spooky town, a young g...
8804	s8805	Movie	Zombieland	Ruben Fleischer	Jesse Eisenberg, Woody Harrelson, Emma Stone, ...	United States	2019-11-01	2009.0	R	88 min	Comedies, Horror Movies	Looking to survive in a world taken over by zo...
8805	s8806	Movie	Zoom	Peter Hewitt	Tim Allen, Courteney Cox, Chevy Chase, Kate Ma...	United States	2020-01-11	2006.0	PG	88 min	Children & Family Movies, Comedies	Dragged from civilian life, a former superhero...
8806	s8807	Movie	Zubaan	Mozez Singh	Vicky Kaushal, Sarah-Jane Dias, Raaghav Chanan...	India	2019-03-02	2015.0	TV-14	111 min	Dramas, International Movies, Music & Musicals	A scrappy but poor boy worms his way into a ty...



**Conclusion:** This task provided hands-on experience in handling real-world data challenges. Advanced preprocessing techniques were successfully applied, resulting in a clean and structured dataset ready for further analysis.