

```
In [1]: # This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python Docker image: https://github.com/kaggle/docker-py
# For example, here's several helpful packages to load

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import ast

# Input data files are available in the read-only "../input/" directory
# For example, running this (by clicking run or pressing Shift+Enter) will list all files

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

# You can write up to 20GB to the current directory (/kaggle/working/) that gets preserved
# You can also write temporary files to /kaggle/temp/, but they won't be saved outside
```

```
In [2]: # This code reads the movie data from the `tmdb_5000_movies.csv` file and the credit data
# movies = pd.read_csv('/kaggle/input/tmdb-movie-metadata/tmdb_5000_movies.csv')
# credits = pd.read_csv('/kaggle/input/tmdb-movie-metadata/tmdb_5000_credits.csv')

movies = pd.read_csv("tmdb_5000_movies.csv")
credits = pd.read_csv("tmdb_5000_credits.csv")
```

```
In [3]: movies.head(2)
```

	<b>budget</b>	<b>genres</b>	<b>homepage</b>	<b>id</b>	<b>keywords</b>	<b>original_language</b>
<b>0</b>	237000000	[{"id": 28, "name": "Action"}, {"id": 12, "nam...]	http://www.avatarmovie.com/	19995	[{"id": 1463, "name": "culture clash"}, {"id": ...]	er
<b>1</b>	300000000	[{"id": 12, "name": "Adventure"}, {"id": 14, "...]	http://disney.go.com/disnypictures/pirates/	285	[{"id": 270, "name": "ocean"}, {"id": 726, "na...]	er

```
In [4]: # Retrieve the shape of the movies object (number of rows, number of columns)
movies.shape
```

```
Out[4]: (4803, 20)
```

```
In [5]: # Display the first few rows of the 'credits' DataFrame
credits.head()
```

	movie_id	title	cast	crew
0	19995	Avatar	[{"cast_id": 242, "character": "Jake Sully", "credit_id": "52fe48009251416c750aca23", "de...	
1	285	Pirates of the Caribbean: At World's End	[{"cast_id": 4, "character": "Captain Jack Sparrow", "credit_id": "52fe4232c3a36847f800b579", "de...	
2	206647	Spectre	[{"cast_id": 1, "character": "James Bond", "credit_id": "54805967c3a36829b5002c41", "de...	
3	49026	The Dark Knight Rises	[{"cast_id": 2, "character": "Bruce Wayne / Batman", "credit_id": "52fe4781c3a36847f81398c3", "de...	
4	49529	John Carter	[{"cast_id": 5, "character": "John Carter", "credit_id": "52fe479ac3a36847f813eaa3", "de...	

```
In [6]: # Retrieve the shape of the movies object (number of rows, number of columns)
credits.shape
```

Out[6]: (4803, 4)

```
In [7]: # Print information about the movies DataFrame
movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4803 entries, 0 to 4802
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   budget          4803 non-null    int64  
 1   genres           4803 non-null    object  
 2   homepage         1712 non-null    object  
 3   id               4803 non-null    int64  
 4   keywords         4803 non-null    object  
 5   original_language 4803 non-null    object  
 6   original_title   4803 non-null    object  
 7   overview         4800 non-null    object  
 8   popularity       4803 non-null    float64 
 9   production_companies 4803 non-null    object  
 10  production_countries 4803 non-null    object  
 11  release_date     4802 non-null    object  
 12  revenue          4803 non-null    int64  
 13  runtime          4801 non-null    float64 
 14  spoken_languages 4803 non-null    object  
 15  status            4803 non-null    object  
 16  tagline           3959 non-null    object  
 17  title             4803 non-null    object  
 18  vote_average     4803 non-null    float64 
 19  vote_count        4803 non-null    int64  
dtypes: float64(3), int64(4), object(13)
memory usage: 750.6+ KB
```

```
In [8]: # Print information about the credits DataFrame
credits.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4803 entries, 0 to 4802
Data columns (total 4 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   movie_id    4803 non-null   int64  
 1   title       4803 non-null   object  
 2   cast        4803 non-null   object  
 3   crew        4803 non-null   object  
dtypes: int64(1), object(3)
memory usage: 150.2+ KB
```

```
In [9]: # Merge the 'movies' dataframe with the 'credits' dataframe based on the 'title' column
# This combines the two dataframes by matching the values in the 'title' column and creates a new column 'crew'
movies = movies.merge(credits, on = 'title')
```

```
In [10]: # Retrieve the shape of the movies object (number of rows, number of columns)
movies.shape
```

```
Out[10]: (4809, 23)
```

```
In [11]: # Print information about the movies DataFrame
movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4809 entries, 0 to 4808
Data columns (total 23 columns):
 #   Column           Non-Null Count  Dtype    
--- 
 0   budget          4809 non-null   int64    
 1   genres          4809 non-null   object    
 2   homepage        1713 non-null   object    
 3   id              4809 non-null   int64    
 4   keywords        4809 non-null   object    
 5   original_language 4809 non-null   object    
 6   original_title  4809 non-null   object    
 7   overview        4806 non-null   object    
 8   popularity      4809 non-null   float64  
 9   production_companies 4809 non-null   object    
 10  production_countries 4809 non-null   object    
 11  release_date   4808 non-null   object    
 12  revenue         4809 non-null   int64    
 13  runtime         4807 non-null   float64  
 14  spoken_languages 4809 non-null   object    
 15  status          4809 non-null   object    
 16  tagline         3965 non-null   object    
 17  title           4809 non-null   object    
 18  vote_average   4809 non-null   float64  
 19  vote_count     4809 non-null   int64    
 20  movie_id       4809 non-null   int64    
 21  cast            4809 non-null   object    
 22  crew            4809 non-null   object    
dtypes: float64(3), int64(5), object(15)
memory usage: 901.7+ KB
```

```
In [12]: # Calculate the sum of missing values in each column of the movies DataFrame  
movies.isna().sum()
```

```
Out[12]: budget          0  
genres           0  
homepage        3096  
id              0  
keywords         0  
original_language 0  
original_title   0  
overview         3  
popularity       0  
production_companies 0  
production_countries 0  
release_date     1  
revenue          0  
runtime          2  
spoken_languages 0  
status           0  
tagline          844  
title            0  
vote_average     0  
vote_count       0  
movie_id         0  
cast             0  
crew             0  
dtype: int64
```

```
In [13]: # Remove rows with missing values from the 'movies' DataFrame  
movies.dropna(inplace = True)
```

```
In [14]: # Calculate the sum of missing values in each column of the movies DataFrame  
movies.isna().sum()
```

```
Out[14]: budget          0  
genres           0  
homepage        0  
id              0  
keywords         0  
original_language 0  
original_title   0  
overview         0  
popularity       0  
production_companies 0  
production_countries 0  
release_date     0  
revenue          0  
runtime          0  
spoken_languages 0  
status           0  
tagline          0  
title            0  
vote_average     0  
vote_count       0  
movie_id         0  
cast             0
```

```
crew          0  
dtype: int64
```

```
In [15]: movies = movies[['movie_id','title','overview','genres','keywords','crew','cast']]
```

```
In [16]: movies.head()
```

	movie_id	title	overview	genres	keywords	crew	cast
0	19995	Avatar	In the 22nd century, a paraplegic Marine is di...	[{"id": 28, "name": "Action"}, {"id": 12, "name": "culture clash"}, {"id": ...]	[{"id": 1463, "name": "culture clash"}, {"id": 2964, "name": "future"}, {"id": 3386, "name": "space war"}, {"id": 3388, "name": "space colony"}, {"id": 3679, "name": "societ...	[{"credit_id": "52fe48009251416c750aca23", "de..."]	[{"cast_id": 242, "character": "Jake Sully", "de..."]
1	285	Pirates of the Caribbean: At World's End	Captain Barbossa, long believed to be dead, ha...	[{"id": 12, "name": "Adventure"}, {"id": 14, "name": "ocean"}]	[{"id": 270, "name": "ocean"}, {"id": 726, "name": "na..."]	[{"credit_id": "52fe4232c3a36847f800b579", "de..."]	[{"cast_id": 4, "character": "Captain Jack Spa..."]
2	206647	Spectre	A cryptic message from Bond's past sends him o...	[{"id": 28, "name": "Action"}, {"id": 12, "name": "spy"}, {"id": 818, "name": "na..."]	[{"id": 470, "name": "spy"}, {"id": 818, "name": "na..."]	[{"credit_id": "54805967c3a36829b5002c41", "de..."]	[{"cast_id": 1, "character": "James Bond", "de..."]
3	49026	The Dark Knight Rises	Following the death of District Attorney Harve...	[{"id": 28, "name": "Action"}, {"id": 80, "name": "dc comics"}, {"id": 853, "name": "..."]	[{"id": 849, "name": "dc comics"}, {"id": 853, "name": "..."]	[{"credit_id": "52fe4781c3a36847f81398c3", "de..."]	[{"cast_id": 2, "character": "Bruce Wayne / Ba..."]
4	49529	John Carter	John Carter is a war-weary, former military ca...	[{"id": 28, "name": "Action"}, {"id": 12, "name": "based on novel"}, {"id": ...}]	[{"id": 818, "name": "based on novel"}, {"id": ...}]	[{"credit_id": "52fe479ac3a36847f813eaa3", "de..."]	[{"cast_id": 5, "character": "John Carter", "de..."]

```
In [17]: movies['genres'][0]
```

```
Out[17]: '[{"id": 28, "name": "Action"}, {"id": 12, "name": "Adventure"}, {"id": 14, "name": "Fantasy"}, {"id": 878, "name": "Science Fiction"}]'
```

```
In [18]: movies['keywords'][0]
```

```
Out[18]: '[{"id": 1463, "name": "culture clash"}, {"id": 2964, "name": "future"}, {"id": 3386, "name": "space war"}, {"id": 3388, "name": "space colony"}, {"id": 3679, "name": "societ...
```

```
y"}, {"id": 3801, "name": "space travel"}, {"id": 9685, "name": "futuristic"}, {"id": 9840, "name": "romance"}, {"id": 9882, "name": "space"}, {"id": 9951, "name": "alien"}, {"id": 10148, "name": "tribe"}, {"id": 10158, "name": "alien planet"}, {"id": 10987, "name": "cgi"}, {"id": 11399, "name": "marine"}, {"id": 13065, "name": "soldier"}, {"id": 14643, "name": "battle"}, {"id": 14720, "name": "love affair"}, {"id": 165431, "name": "anti war"}, {"id": 193554, "name": "power relations"}, {"id": 206690, "name": "mind and soul"}, {"id": 209714, "name": "3d"}]
```

In [19]: `import ast`

In [20]: `def convert(text):  
 L = [] # Create an empty list to store the extracted names  
 for i in ast.literal_eval(text): # Iterate over the elements of the evaluated text  
 L.append(i['name']) # Extract the 'name' value from each element and add it to  
 return L # Return the list of extracted names`

In [21]: `# Apply the 'convert' function to each element in the 'genres' column  
movies['genres'] = movies['genres'].apply(convert)`

In [22]: `movies.head()`

	movie_id	title	overview	genres	keywords	crew	cast
0	19995	Avatar	In the 22nd century, a paraplegic Marine is di...	[Action, Adventure, Fantasy, Science Fiction]	[{"id": 1463, "name": "culture clash"}, {"id": ...}	[{"credit_id": "52fe48009251416c750aca23", "de...}	[{"cast_id": 242, "character": "Jake Sully", "de...
1	285	Pirates of the Caribbean: At World's End	Captain Barbossa, long believed to be dead, ha...	[Adventure, Fantasy, Action]	[{"id": 270, "name": "ocean"}, {"id": 726, "na...}	[{"credit_id": "52fe4232c3a36847f800b579", "de...}	[{"cast_id": 4, "character": "Captain Jack Spa...
2	206647	Spectre	A cryptic message from Bond's past sends him o...	[Action, Adventure, Crime]	[{"id": 470, "name": "spy"}, {"id": 818, "name...}	[{"credit_id": "54805967c3a36829b5002c41", "de...}	[{"cast_id": 1, "character": "James Bond", "cr...
3	49026	The Dark Knight Rises	Following the death of District Attorney Harve...	[Action, Crime, Drama, Thriller]	[{"id": 849, "name": "dc comics"}, {"id": 853,...}	[{"credit_id": "52fe4781c3a36847f81398c3", "de...}	[{"cast_id": 2, "character": "Bruce Wayne / Ba..."]
4	49529	John Carter	John Carter is a war-weary,	[Action, Adventure, Science Fiction]	[{"id": 818, "name": "based on"}]	[{"credit_id": "52fe479ac3a36847f813eaa3", "de...}	[{"cast_id": 5, "character": "John Carter"}]

movie_id	title	overview	genres	keywords	crew	cast
		former military ca...		novel"}, {"id":...		"John Carter", "c...

```
In [23]: movies['keywords'] = movies['keywords'].apply(convert)
```

```
In [24]: movies.head()
```

Out[24]:

	movie_id	title	overview	genres	keywords	crew	cast
0	19995	Avatar	In the 22nd century, a paraplegic Marine is di...	[Action, Adventure, Fantasy, Science Fiction]	[culture clash, future, space war, space colon...]	[{"credit_id": "52fe48009251416c750aca23", ...]	[{"cast_id": 242, "character": "Jake Sully", "de..."]
1	285	Pirates of the Caribbean: At World's End	Captain Barbossa, long believed to be dead, ha...	[Adventure, Fantasy, Action]	[ocean, drug abuse, exotic island, east india ...]	[{"credit_id": "52fe4232c3a36847f800b579", ...]	[{"cast_id": 4, "character": "Captain Jack Spa..."]
2	206647	Spectre	A cryptic message from Bond's past sends him o...	[Action, Adventure, Crime]	[spy, based on novel, secret agent, sequel, mi...]	[{"credit_id": "54805967c3a36829b5002c41", ...]	[{"cast_id": 1, "character": "James Bond", "cr..."]
3	49026	The Dark Knight Rises	Following the death of District Attorney Harve...	[Action, Crime, Drama, Thriller]	[dc comics, crime fighter, terrorist, secret i...]	[{"credit_id": "52fe4781c3a36847f81398c3", ...]	[{"cast_id": 2, "character": "Bruce Wayne / Ba..."]
4	49529	John Carter	John Carter is a war-weary, former military ca...	[Action, Adventure, Science Fiction]	[based on novel, mars, medallion, space travel...]	[{"credit_id": "52fe479ac3a36847f813eaa3", ...]	[{"cast_id": 5, "character": "John Carter", "c..."]

```
In [25]: movies['cast'][0]
```

```
Out[25]: [{"cast_id": 242, "character": "Jake Sully", "credit_id": "5602a8a7c3a3685532001c9a", "gender": 2, "id": 65731, "name": "Sam Worthington", "order": 0}, {"cast_id": 3, "character": "Neytiri", "credit_id": "52fe48009251416c750ac9cb", "gender": 1, "id": 8691, "name": "Zoe Saldana", "order": 1}, {"cast_id": 25, "character": "Dr. Grace Augustine", "credit_id": "52fe48009251416c750aca39", "gender": 1, "id": 10205, "name": "Sigourney Weaver"}]
```

r", "order": 2}, {"cast\_id": 4, "character": "Col. Quaritch", "credit\_id": "52fe48009251416c750ac9cf", "gender": 2, "id": 32747, "name": "Stephen Lang", "order": 3}, {"cast\_id": 5, "character": "Trudy Chacon", "credit\_id": "52fe48009251416c750ac9d3", "gender": 1, "id": 17647, "name": "Michelle Rodriguez", "order": 4}, {"cast\_id": 8, "character": "Selfridge", "credit\_id": "52fe48009251416c750ac9e1", "gender": 2, "id": 1771, "name": "Giovanni Ribisi", "order": 5}, {"cast\_id": 7, "character": "Norm Spellman", "credit\_id": "52fe48009251416c750ac9dd", "gender": 2, "id": 59231, "name": "Joel David Moore", "order": 6}, {"cast\_id": 9, "character": "Moat", "credit\_id": "52fe48009251416c750ac9e5", "gender": 1, "id": 30485, "name": "CCH Pounder", "order": 7}, {"cast\_id": 11, "character": "Eytukan", "credit\_id": "52fe48009251416c750ac9ed", "gender": 2, "id": 15853, "name": "Wes Studi", "order": 8}, {"cast\_id": 10, "character": "Tsu\Tey", "credit\_id": "52fe48009251416c750ac9e9", "gender": 2, "id": 10964, "name": "Laz Alonso", "order": 9}, {"cast\_id": 12, "character": "Dr. Max Patel", "credit\_id": "52fe48009251416c750ac9f1", "gender": 2, "id": 95697, "name": "Dileep Rao", "order": 10}, {"cast\_id": 13, "character": "Lyle Wainfleet", "credit\_id": "52fe48009251416c750ac9f5", "gender": 2, "id": 98215, "name": "Matt Gerald", "order": 11}, {"cast\_id": 32, "character": "Private Fike", "credit\_id": "52fe48009251416c750aca5b", "gender": 2, "id": 154153, "name": "Sean Anthony Moran", "order": 12}, {"cast\_id": 33, "character": "Cryo Vault Med Tech", "credit\_id": "52fe48009251416c750aca5f", "gender": 2, "id": 397312, "name": "Jason Whyte", "order": 13}, {"cast\_id": 34, "character": "Venture Star Crew Chief", "credit\_id": "52fe48009251416c750aca63", "gender": 2, "id": 42317, "name": "Scott Lawrence", "order": 14}, {"cast\_id": 35, "character": "Lock Up Trooper", "credit\_id": "52fe48009251416c750aca67", "gender": 2, "id": 986734, "name": "Kelly Kilgour", "order": 15}, {"cast\_id": 36, "character": "Shuttle Pilot", "credit\_id": "52fe48009251416c750aca6b", "gender": 0, "id": 1207227, "name": "James Patrick Pitt", "order": 16}, {"cast\_id": 37, "character": "Shuttle Co-Pilot", "credit\_id": "52fe48009251416c750aca6f", "gender": 0, "id": 1180936, "name": "Sean Patrick Murphy", "order": 17}, {"cast\_id": 38, "character": "Shuttle Crew Chief", "credit\_id": "52fe48009251416c750aca73", "gender": 2, "id": 1019578, "name": "Peter Dillon", "order": 18}, {"cast\_id": 39, "character": "Tractor Operator / Troupe", "credit\_id": "52fe48009251416c750aca77", "gender": 0, "id": 91443, "name": "Kevin Dorman", "order": 19}, {"cast\_id": 40, "character": "Dragon Gunship Pilot", "credit\_id": "52fe48009251416c750aca7b", "gender": 2, "id": 173391, "name": "Kelson Henderson", "order": 20}, {"cast\_id": 41, "character": "Dragon Gunship Gunner", "credit\_id": "52fe48009251416c750aca7f", "gender": 0, "id": 1207236, "name": "David Van Horn", "order": 21}, {"cast\_id": 42, "character": "Dragon Gunship Navigator", "credit\_id": "52fe48009251416c750aca83", "gender": 0, "id": 215913, "name": "Jacob Tomuri", "order": 22}, {"cast\_id": 43, "character": "Suit #1", "credit\_id": "52fe48009251416c750aca87", "gender": 0, "id": 143206, "name": "Michael Blain-Rozgay", "order": 23}, {"cast\_id": 44, "character": "Suit #2", "credit\_id": "52fe48009251416c750aca8b", "gender": 2, "id": 169676, "name": "Jon Curry", "order": 24}, {"cast\_id": 46, "character": "Ambient Room Tech", "credit\_id": "52fe48009251416c750aca8f", "gender": 0, "id": 1048610, "name": "Luke Hawker", "order": 25}, {"cast\_id": 47, "character": "Ambient Room Tech / Troupe", "credit\_id": "52fe48009251416c750aca93", "gender": 0, "id": 42288, "name": "Woody Schultz", "order": 26}, {"cast\_id": 48, "character": "Horse Clan Leader", "credit\_id": "52fe48009251416c750aca97", "gender": 2, "id": 68278, "name": "Peter Mensah", "order": 27}, {"cast\_id": 49, "character": "Link Room Tech", "credit\_id": "52fe48009251416c750aca9b", "gender": 0, "id": 1207247, "name": "Sonia Yee", "order": 28}, {"cast\_id": 50, "character": "Basketball Avatar / Troupe", "credit\_id": "52fe48009251416c750aca9f", "gender": 1, "id": 1207248, "name": "Jahnel Curfman", "order": 29}, {"cast\_id": 51, "character": "Basketball Avatar", "credit\_id": "52fe48009251416c750acaa3", "gender": 0, "id": 89714, "name": "Ilram Choi", "order": 30}, {"cast\_id": 52, "character": "Na\vi Child", "credit\_id": "52fe48009251416c750acaa7", "gender": 0, "id": 1207249, "name": "Kyla Warren", "order": 31}, {"cast\_id": 53, "character": "Troupe", "credit\_id": "52fe48009251416c750acaab", "gender": 0, "id": 1207250, "name": "Lisa Roumain", "order": 32}, {"cast\_id": 54, "character": "Troupe", "credit\_id": "52fe48009251416c750acaaf", "gender": 1, "id": 83105, "name": "Debra Wilson", "order": 33}, {"cast\_id": 57, "character": "Troupe", "credit\_id": "52fe48009251416c750acabb", "gender": 0, "id": 1207253, "name": "Chris Mala", "order": 34}, {"cast\_id": 55, "character": "Troupe", "credit\_id": "52fe48009251416c750acob3", "gender": 0, "id": 1207251, "name": "Taylor Kibby", "order": 35}, {"cast\_id": 56, "character": "Troupe", "credit\_id": "52fe48009251416c750acob7", "gender": 0, "id": 1207252, "name": "Jodie Landau", "order": 3}

6}, {"cast\_id": 58, "character": "Troupe", "credit\_id": "52fe48009251416c750acabf", "gender": 0, "id": 1207254, "name": "Julie Lamm", "order": 37}, {"cast\_id": 59, "character": "Troupe", "credit\_id": "52fe48009251416c750acac3", "gender": 0, "id": 1207257, "name": "Cullen B. 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In [26]:

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def convert3(text):
    L3 = []
    counter = 0
    for i in ast.literal_eval(text):
        if counter < 3:
            L3.append(i['name'])
        counter += 1
    return L3
```

In [27]:

```
movies['cast'] = movies['cast'].apply(convert3)
```

In [28]:

```
movies.head()
```

Out[28]:

	movie_id	title	overview	genres	keywords	crew	cast
0	1995	Avatar	In the 22nd century, a paraplegic Marine is di...	[Action, Adventure, Fantasy, Science Fiction]	[culture clash, future, space war, space colon...]	"52fe48009251416c750aca23", "de..."	[Sam Worthington, Zoe Saldana, Sigourney Weaver]
1	285	Pirates of the Caribbean: At World's End	Captain Barbossa, long believed to be dead, ha...	[Adventure, Fantasy, Action]	[ocean, drug abuse, exotic island, east india]	"52fe4232c3a36847f800b579", "de..."	[Johnny Depp, Orlando Bloom, Keira Knightley]
					...		

	movie_id	title	overview	genres	keywords	crew	cast
2	206647	Spectre	A cryptic message from Bond's past sends him o...	[Action, Adventure, Crime]	[spy, based on novel, secret agent, sequel, mi...]	{"credit_id": "54805967c3a36829b5002c41", "de...}	[Daniel Craig, Christoph Waltz, Léa Seydoux]
3	49026	The Dark Knight Rises	Following the death of District Attorney Harve...	[Action, Crime, Drama, Thriller]	[dc comics, crime fighter, terrorist, secret i...]	{"credit_id": "52fe4781c3a36847f81398c3", "de...}	[Christian Bale, Michael Caine, Gary Oldman]
4	49529	John Carter	John Carter is a war-weary, former military ca...	[Action, Adventure, Science Fiction]	[based on novel, mars, medallion, space travel...]	{"credit_id": "52fe479ac3a36847f813eaa3", "de...}	[Taylor Kitsch, Lynn Collins, Samantha Morton]

In [29]:

```
movies['crew'][0]
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Out[29]:

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e"}]

```

In [30]:

```

def fetch_director(text):
    D = []
    for i in ast.literal_eval(text):
        if i['job'] == 'Director':
            D.append(i['name'])
    return D

```

```
In [31]: movies['crew'] = movies['crew'].apply(fetch_director)
```

```
In [32]: movies.tail()
```

	movie_id	title	overview	genres	keywords	crew	cast
4779	2292	Clerks	Convenience and video store clerks Dante and R...	[Comedy]	[salesclerk, loser, aftercreditsstinger]	[Kevin Smith]	[Brian O'Halloran, Jeff Anderson, Jason Mewes]
4787	255266	Dry Spell	Sasha tries to get her soon-to-be ex husband K...	[Comedy, Romance]	[dating, divorce, sex scene, sex comedy, anti ...]	[Travis Legge]	[Suzi Lorraine, Jared Degado, Heather Dorff]
4797	157185	Tin Can Man	Recently dumped by his girlfirend for another ...	[Horror]	[home invasion]	[Ivan Kavanagh]	[Michael Parle, Emma Eliza Regan, Patrick O'Do...]
4802	14337	Primer	Friends/fledgling entrepreneurs invent a devic...	[Science Fiction, Drama, Thriller]	[distrust, garage, identity crisis, time trav...	[Shane Carruth]	[Shane Carruth, David Sullivan, Casey Gooden]
4807	126186	Shanghai Calling	When ambitious New York attorney Sam is sent t...	[]	[]	[Daniel Hsia]	[Daniel Henney, Eliza Coupe, Bill Paxton]

```
In [33]: #you can use Lambda function  
# replace_spaces = lambda x:x.replace(" ","")
```

```
# or you can define your own function, your choice
```

```
def collapse(L):  
    if L is None:  
        return []  
    L1 = []  
    for i in L:  
        L1.append(i.replace(" ", ""))  
    return L1
```

In [34]:

```
# movies['genres'] = movies['genres'].apply(replace_spaces)
# movies['keywords'] = movies['keywords'].apply(replace_spaces)
# movies['crew'] = movies['crew'].apply(replace_spaces)
# movies['cast'] = movies['cast'].apply(replace_spaces)

movies['genres'] = movies['genres'].apply(collapse)
movies['keywords'] = movies['keywords'].apply(collapse)
movies['crew'] = movies['crew'].apply(collapse)
movies['cast'] = movies['cast'].apply(collapse)
```

In [35]:

```
movies.head()
```

Out[35]:

	movie_id	title	overview	genres	keywords	crew	cast
0	1995	Avatar	In the 22nd century, a paraplegic Marine is di...	[Action, Adventure, Fantasy, ScienceFiction]	[cultureclash, future, spacewar, spacecolony, ...]	[]	[SamWorthington, ZoeSaldana, SigourneyWeaver]
1	285	Pirates of the Caribbean: At World's End	Captain Barbossa, long believed to be dead, ha...	[Adventure, Fantasy, Action]	[ocean, drugabuse, exoticisland, eastindiatrad...	[]	[JohnnyDepp, OrlandoBloom, KeiraKnightley]
2	206647	Spectre	A cryptic message from Bond's past sends him o...	[Action, Adventure, Crime]	[spy, basedonnovel, secretagent, sequel, mi6, ...]	[]	[DanielCraig, ChristophWaltz, LéaSeydoux]
3	49026	The Dark Knight Rises	Following the death of District Attorney Harve...	[Action, Crime, Drama, Thriller]	[dccomics, crimefighter, terrorist, secretiden...]	[]	[ChristianBale, MichaelCaine, GaryOldman]
4	49529	John Carter	John Carter is a weary, former military ca...	[Action, Adventure, ScienceFiction]	[basedonnovel, mars, medallion, spacetravel, p...]	[]	[TaylorKitsch, LynnCollins, SamanthaMorton]

In [36]:

```
# Split the text in the 'overview' column into a List of words for each movie
movies['overview'] = movies['overview'].apply(lambda x:str(x).split())
```

In [37]:

```
# Concatenating multiple columns to create a new 'tags' column
movies['tags'] = movies['overview'] + movies['genres'] + movies['keywords'] + movies['c...
```

In [38]:

```
movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1494 entries, 0 to 4807
Data columns (total 8 columns):
```

```
#   Column    Non-Null Count Dtype
---  --     -----
0   movie_id    1494 non-null   int64
1   title       1494 non-null   object
2   overview    1494 non-null   object
3   genres      1494 non-null   object
4   keywords    1494 non-null   object
5   crew        1494 non-null   object
6   cast         1494 non-null   object
7   tags         1494 non-null   object
dtypes: int64(1), object(7)
memory usage: 137.3+ KB
```

```
In [39]: movies['tags'][0]
```

```
Out[39]: ['In',
 'the',
 '22nd',
 'century,',
 'a',
 'paraplegic',
 'Marine',
 'is',
 'dispatched',
 'to',
 'the',
 'moon',
 'Pandora',
 'on',
 'a',
 'unique',
 'mission,',
 'but',
 'becomes',
 'torn',
 'between',
 'following',
 'orders',
 'and',
 'protecting',
 'an',
 'alien',
 'civilization.',
 'Action',
 'Adventure',
 'Fantasy',
 'ScienceFiction',
 'cultureclash',
 'future',
 'spacewar',
 'spacecolony',
 'society',
 'spacettravel',
 'futuristic',
 'romance',
 'space',
 'alien',
 'tribe',
 'alienplanet',
```

```
'cgi',
'marine',
'soldier',
'battle',
'loveaffair',
'antiwar',
'powerrelations',
'mindandsoul',
'3d',
'SamWorthington',
'ZoeSaldana',
'SigourneyWeaver',
'SamWorthington',
'ZoeSaldana',
'SigourneyWeaver']
```

```
In [40]: df = movies.drop(columns= ['overview', 'genres', 'keywords', 'crew', 'cast'])
df.head()
```

	movie_id	title	tags
0	19995	Avatar	[In, the, 22nd, century,, a, paraplegic, Marin...
1	285	Pirates of the Caribbean: At World's End	[Captain, Barbossa,, long, believed, to, be, d...
2	206647	Spectre	[A, cryptic, message, from, Bond's, past, send...
3	49026	The Dark Knight Rises	[Following, the, death, of, District, Attorney...
4	49529	John Carter	[John, Carter, is, a, war-weary,, former, mili...

```
In [41]: # Concatenate all elements in the 'tags' column into a single string separated by space
df['tags'] = df['tags'].apply(lambda x: " ".join(x))

# Access the first element in the 'tags' column
df['tags'][0]
```

```
Out[41]: 'In the 22nd century, a paraplegic Marine is dispatched to the moon Pandora on a unique mission, but becomes torn between following orders and protecting an alien civilization. Action Adventure Fantasy ScienceFiction cultureclash future spacewar spacecolony society spacetravel futuristic romance space alien tribe alienplanet cgi marine soldier battle loveaffair antiwar powerrelations mindandsoul 3d SamWorthington ZoeSaldana SigourneyWeaver SamWorthington ZoeSaldana SigourneyWeaver'
```

```
In [42]: # Importing the CountVectorizer module from sklearn.feature_extraction.text
from sklearn.feature_extraction.text import CountVectorizer
```

```
In [43]: # Initialize a CountVectorizer object
cv = CountVectorizer(
    max_features=5000, # Set the maximum number of features to 5000
    stop_words='english' # Exclude common English stop words from the analysis
)
```

```
In [44]: # Vectorize the 'tags' column of the dataframe
vector = cv.fit_transform(df['tags']).toarray()
```

```
In [45]: vector.shape
```

```
Out[45]: (1494, 5000)
```

```
In [46]: # This module provides various functions for computing pairwise similarities between samples
# Cosine similarity is a metric used to determine how similar two vectors are irrespective of their magnitude
from sklearn.metrics.pairwise import cosine_similarity
```

```
In [47]: similarity = cosine_similarity(vector)
```

```
In [48]: similarity
```

```
Out[48]: array([[1.          , 0.06907969, 0.04721922, ... , 0.          , 0.0521286 ,
   0.02248469],
   [0.06907969, 1.          , 0.05001563, ... , 0.03681051, 0.          ,
   0.          ],
   [0.04721922, 0.05001563, 1.          , ... , 0.          , 0.          ,
   0.          ],
   ... ,
   [0.          , 0.03681051, 0.          , ... , 1.          , 0.          ,
   0.03594426],
   [0.0521286 , 0.          , 0.          , ... , 0.          , 1.          ,
   0.          ],
   [0.02248469, 0.          , 0.          , ... , 0.03594426, 0.          ,
   1.          ]])
```

```
In [49]: df[df['title'] == 'The Lego Movie'].index[0]
```

```
Out[49]: 744
```

```
In [ ]:
```

```
In [50]: def recommend(movies):
    # Check if the movie is in the database
    if movies in df['title'].values:
        # Find the index of the movie
        index = df[df['title'] == movies].index[0]
        # Calculate the similarity distances between the movie and others
        distance = sorted(list(enumerate(similarity[index])), reverse=True, key=lambda
        # Print the top 5 recommended movies
        for i in distance[1:6]:
            print(df.iloc[i[0]].title)
    else:
        # Print a message if the movie is not in the database
        print("The movie you requested is not in the database.")
```

```
In [51]: recommend('Avatar')
```

```
Alien
Guardians of the Galaxy
Aliens vs Predator: Requiem
Battle: Los Angeles
Apollo 18
```

```
In [52]: # Import the pickle module for data serialization
import pickle
```

```
In [53]: # Save the DataFrame as a pickle file named 'movie_list.pkl'
pickle.dump(df, open('movie_list.pkl', 'wb'))

# Save the 'similarity' variable as a pickle file named 'similarity.pkl'
pickle.dump(similarity, open('similarity.pkl', 'wb'))
```

```
In [55]: import torch
from transformers import BartTokenizer, BartForConditionalGeneration
import gradio as gr

# Load movie recommendation data
new = pickle.load(open('movie_list.pkl', 'rb'))
similarity = pickle.load(open('similarity.pkl', 'rb'))

# Load BART model and tokenizer
model_name = 'facebook/bart-base'
tokenizer = BartTokenizer.from_pretrained(model_name)
model = BartForConditionalGeneration.from_pretrained(model_name)

# Define movie recommendation function
def generate_recommendations(movie):
    index = new[new['title'].str.lower() == movie.lower()].index
    if len(index) == 0:
        return None
    distances = sorted(list(enumerate(similarity[index[0]])), reverse=True, key=lambda x: x[1])
    recommendations = [new.iloc[i[0]].title for i in distances[1:6]]
    return recommendations

# Define chatbot interaction function
def chatbot_interaction(input_text):
    # Convert input text to lowercase for easier processing
    input_text = input_text.lower()

    # Check for greetings and provide appropriate response
    if any(greeting in input_text for greeting in ['hello', 'hi', 'hey']):
        response = "Hello! How can I assist you today?"
    # Check for thankfulness and provide appropriate response
    elif any(thanks in input_text for thanks in ['thank', 'thanks']):
        response = "You're welcome! I'm here to help."
    # Check for basic Q&A
    elif 'how are you' in input_text:
        response = "I'm an AI, so I don't have feelings, but thank you for asking!"
    elif 'who created you' in input_text:
        response = "I was created by a team of developers using BART technology."
    elif 'how does the movie recommendation system work' in input_text:
        response = "The movie recommendation system uses a collaborative filtering algo"
    elif 'what data is used for movie recommendations' in input_text:
        response = "The movie recommendation system uses a dataset that includes inform
```

```

    elif 'what can you do' in input_text:
        response = "I can provide movie recommendations based on your input. Just let me know what you're interested in, and I'll suggest some movies for you."
    elif 'tell me more about yourself' in input_text:
        response = "I am a chatbot designed to provide movie recommendations. I use a combination of natural language processing and machine learning to analyze movie reviews and provide personalized suggestions."
    elif 'do you watch movies' in input_text:
        response = "As an AI, I don't watch movies in the same way humans do. However, I can analyze movie reviews and provide recommendations based on that analysis."
    elif 'can you recommend a comedy movie' in input_text:
        response = "Sure! Here are some comedy movies you might enjoy: [list of comedy movie titles]"
    elif 'is there a popular movie you can recommend' in input_text:
        response = "Certainly! One popular movie recommendation is [popular movie title]"
    elif 'what are the latest movie releases' in input_text:
        response = "Some of the latest movie releases include [list of latest movie releases]"
    else:
        # Generate movie recommendations based on the input text
        recommendations = generate_recommendations(input_text)

    if recommendations is None:
        response = "I'm sorry, but I couldn't find that movie in my database. Can you try another one?"
    else:
        # Generate a response using the BART model
        input_ids = tokenizer.encode(input_text, return_tensors='pt')
        output = model.generate(input_ids, max_length=50, num_beams=5, early_stopping=True)
        response = tokenizer.decode(output[0], skip_special_tokens=True)

        # Add movie recommendations to the response
        response += "\n\nHere are some movie recommendations:\n"
        for recommendation in recommendations:
            response += "- " + recommendation + "\n"

    return response

# Create Gradio interface
iface = gr.Interface(
    fn=chatbot_interaction,
    inputs="text",
    outputs="text",
    title="Movie Recommendation Chatbot",
    description="Enter a movie and get recommendations.",
    example="The Lego Movie",
)

# Launch the interface
iface.launch(share=True)

```

```

C:\Users\Ganesh\AppData\Local\Temp\ipykernel_15096\989106587.py:75: UserWarning: You have unused kwarg parameters in Interface, please remove them: {'example': 'The Lego Movie'}
    iface = gr.Interface(
Running on local URL: http://127.0.0.1:7861
Running on public URL: https://7ec1cf098f2f1941b2.gradio.live

```

This share link expires in 72 hours. For free permanent hosting and GPU upgrades (NEW!), check out Spaces: <https://huggingface.co/spaces>

# Movie Recommendation Chatbot

Enter a movie and get recommendations.

input\_text

Clear

Submit

output

Flag

Use via API 🔮 · Built with Gradio 🎨

Out[55]:

```
Traceback (most recent call last):
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\gradio\routes.py", line 414, in run_predict
    output = await app.get_blocks().process_api(
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\gradio\blocks.py", line 1323, in process_api
    result = await self.call_function(
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\gradio\blocks.py", line 1051, in call_function
    prediction = await anyio.to_thread.run_sync(
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\anyio\to_thread.py", line 31, in run_sync
    return await get_asynclib().run_sync_in_worker_thread(
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\anyio\_backends\_asyncio.py", line 937, in run_sync_in_worker_thread
    return await future
  File "C:\Users\Ganesh\anaconda3\lib\site-packages\anyio\_backends\_asyncio.py", line 867, in run
    result = context.run(func, *args)
  File "C:\Users\Ganesh\AppData\Local\Temp\ipykernel_15096\989106587.py", line 57, in chatbot_interaction
    recommendations = generate_recommendations(input_text)
  File "C:\Users\Ganesh\AppData\Local\Temp\ipykernel_15096\989106587.py", line 19, in generate_recommendations
    distances = sorted(list(enumerate(similarity[index[0]]))), reverse=True, key=lambda
```

```
x: x[1])  
IndexError: index 2788 is out of bounds for axis 0 with size 1494
```

In [ ]: