Final Project Submission

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- **Student pace:** full time
- **Scheduled project review date/time:**
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UNDERSTANDING THE PROBLEM

I have assumed the role of a Data Scientist hired by Microsoft. My task is to use the six provided datasets from the various Movie Database website found online in order to give them actionable insights on how to go about creating a new movie studio.

> **This will be done by giving an insight on the popular languages and whether to focus on Domestic market or World-wide market.**
>
> **What is the best time of the month to release movies and the preferred length or movie length/duration**
>
> **The most popular genres.**

DATA UNDERSTANDING.

To make this stage easier i will define the functions below, but first i ave to import the relevant modules.

Movie_budgets.csv.gz

In [1]:

```
#importing the relevant modules

#pandas
import pandas as pd

# matlab
import matplotlib.pyplot as plt

# to ensure all data visualizations appear on the same notebook and also stored here.
%matplotlib inline

#seaborn
import seaborn as sns

#sqlite3
import sqlite3

#csv
import csv

#regex
import re
```

Below I will now define some functions to make Data understanding easier.

In [2]:

```
#let us define some functions to get relevant information from the Data Frames.
```

```
#get value types of entries per column.

def get_value(data,col_name):

    return data[col_name].value_counts()

#get information

def get_info(data):
    info_ = data.info()
    return info_

#Identify missing values

def missing_values(data):
    miss_vals = data.isnull().sum().sort_values(ascending=False)

    #percentages
    percentages = (((data.isnull().sum()) / len(data)).sort_values(ascending=False))*100

    #create dataframe of missing values

    missing_df = pd.DataFrame({"Total missing values": miss_vals, 'Percentage(%)':percen
tages})

    #if percentage == 0 implies no missing values
    missing_df.drop(missing_df[missing_df['Percentage(%)']==0].index, inplace = True)

    return missing_df

#get column names

def get_columns(data):
    columns = data.columns
    return columns

#defining a function for loading all columns from a table for Exploritory Data Analysis.

def load_SQL(column,table):

    data =pd.read_sql(f'''
                        SELECT {column}
                        FROM {table}
                        ''',conn)
    return data


# defining a function to look for duplicates from the DataFrames.

def get_duplicate(data):
    duplicate = data.duplicated().value_counts()
    return duplicate

#define a function that returns the unique values in a column.

def get_unique(data,column):
    return data[column].unique()
```

Data Understanding.

"tn.movie_budgets.csv.gz"

First file I shall load then explore is the `'tn.movie_budgets.csv.gz'`.

In [3]:

```
# using pandas to load the file into budget_df
```

```
#compression is set to 'infer' to cater for its gz file compression type.

#index_col=0 to ensure data doesnt have more than one index column.

budget_df = pd.read_csv('zippedData/tn.movie_budgets.csv.gz',compression='infer',index_co
l=0)

#.head() allows us to preview the first five rows.
budget_df.head()
```

Out[3]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [4]:

```
# getting info for the DataFrame "movie_budget_db"

get_info(budget_df)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5782 entries, 1 to 82
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   object
 3   domestic_gross     5782 non-null   object
 4   worldwide_gross    5782 non-null   object
dtypes: object(5)
memory usage: 271.0+ KB
```

In [5]:

```
#checking for duplicated data in budget_df

get_duplicate(budget_df)
```

Out[5]:

```
False    5782
dtype: int64
```

In [6]:

```
#Visual inspection of the Column names to ensure there are no whitespaces.
get_columns(budget_df)
```

Out[6]:

```
Index(['release_date', 'movie', 'production_budget', 'domestic_gross',
       'worldwide_gross'],
      dtype='object')
```

Understanding of budget_df.

The DataFrame has a total of 6 columns and 5782 rows.

The DataFrame has no missing value.

There are data types in string form which will make it hard to sort them and use them for statistical analysis. The problem columns are `'production_budget'`, `'domestic_gross'` and `'worldwide_gross'`.

There are no duplicated data in the DataFrame as all the 5782 rows have no null data.

The column names are written with good syntax and easy to understand format.

I want to use the date column, so I will convert it to a datetype.

"rt.reviews.tsv.gz"

In [7]:

```
#Using pandas to load the data into review_df.

#since its a tab separated value delimiter is set to '\t'.

#encoding is set to 'latin-1' as the defualt 'utf-8' is not working for the file type.

#compression is set to 'infer' to cater for its gz file compression type.



rt_movie_df = pd.read_csv('zippedData/rt.movie_info.tsv.gz', delimiter = '\t', encoding
= 'latin-1',
                          compression='infer',index_col=0)

#.head() allows us to preview the first five rows.
rt_movie_df.head()
```

Out[7]:

id	synopsis	rating	genre	director	writer	theater_date	dvd_date	currency	box_offic
1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 1971	Sep 25, 2001	NaN	Nal
3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	Jan 1, 2013	$	600,00
5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13, 1996	Apr 18, 2000	NaN	Nal
6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9, 1994	Aug 27, 1997	NaN	Nal
7	NaN	NR	Drama|Romance	Rodney Bennett	Giles Cooper	NaN	NaN	NaN	Nal

In [8]:

```
#getting info on rt_movie_df
```

```
get_info(rt_movie_df)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1560 entries, 1 to 2000
Data columns (total 11 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   synopsis      1498 non-null   object
 1   rating        1557 non-null   object
 2   genre         1552 non-null   object
 3   director      1361 non-null   object
 4   writer        1111 non-null   object
 5   theater_date  1201 non-null   object
 6   dvd_date      1201 non-null   object
 7   currency      340 non-null    object
 8   box_office    340 non-null    object
 9   runtime       1530 non-null   object
 10  studio        494 non-null    object
dtypes: object(11)
memory usage: 146.2+ KB
```

In [9]:

```
get_unique(rt_movie_df,'rating')
```

Out[9]:

```
array(['R', 'NR', 'PG', 'PG-13', nan, 'G', 'NC17'], dtype=object)
```

In [10]:

```
#search for duplicate data

get_duplicate(rt_movie_df)
```

Out[10]:

```
False    1556
True        4
dtype: int64
```

In [11]:

```
#looking at the column names.

get_columns(rt_movie_df)
```

Out[11]:

```
Index(['synopsis', 'rating', 'genre', 'director', 'writer', 'theater_date',
       'dvd_date', 'currency', 'box_office', 'runtime', 'studio'],
      dtype='object')
```

In [12]:

```
#percentage of duplicated data

missing_values(rt_movie_df)
```

Out[12]:

	Total missing values	Percentage(%)
currency	1220	78.205128
box_office	1220	78.205128
studio	1066	68.333333
writer	449	28.782051
theater_date	359	23.012821
dvd_date	359	23.012821

	Total missing values	Percentage(%)
director	199	12.756410
synopsis	62	3.974359
runtime	30	1.923077
genre	8	0.512821
rating	3	0.192308

Undestanding of rt_movie_df

Review_df has 1560 row entries and 11 columns.

Out of 1560 row entries it has 4 duplicates.

The column names are well written without any ambiguos symbols or denotations, and no random whitespaces.

Missing values were observed as not all columns had the expected 1560 entries. on further inspection the following had missing values;

```
currency : 78.20 %
box_office : 78.20%
studio : 68.33%
writer: 28.78%
theater_date: 23.01%
dvd_date : 23.01%
director : 12.75%
synopsis : 3.97%
runtime : 1.92%
genre : 0.51%
rating :0.19%
```

"rt.reviews.tsv.gz"

In [13]:

```
#Using pandas to load the data into review_df.

#since its a tab separated value delimiter is set to '\t'.

#encoding is set to 'latin-1' as the defualt 'utf-8' is not working for the file type.

#compression is set to 'infer' to cater for its gz file compression type.



review_df = pd.read_csv('zippedData/rt.reviews.tsv.gz', delimiter = '\t', encoding = 'latin-1',
                        compression='infer',index_col=0)

#.head() allows us to preview the first five rows.
review_df.head()
```

Out[13]:

id	review	rating	fresh	critic	top_critic	publisher	date
3	A distinctly gallows take on contemporary fina...	3/5	fresh	PJ Nabarro	0	Patrick Nabarro	November 10, 2018
3	It's an allegory in search of a meaning that n...	NaN	rotten	Annalee Newitz	0	io9.com	May 23, 2018
3	... life lived in a bubble in financial dealin...	NaN	fresh	Sean Axmaker	0	Stream on Demand	January 4, 2018

id	review	rating	fresh	critic	top_critic	publisher	date
3	Continuing along a line introduced in last yea...	NaN	fresh	Daniel Kasman	0	MUBI	November 16, 2017
3	... a perverse twist on neorealism...	NaN	fresh	NaN	0	Cinema Scope	October 12, 2017

In [14]:

```
#getting info on review_df
get_info(review_df)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 54432 entries, 3 to 2000
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   review      48869 non-null  object
 1   rating      40915 non-null  object
 2   fresh       54432 non-null  object
 3   critic      51710 non-null  object
 4   top_critic  54432 non-null  int64 
 5   publisher   54123 non-null  object
 6   date        54432 non-null  object
dtypes: int64(1), object(6)
memory usage: 3.3+ MB
```

In [15]:

```
#search for duplicate data
get_duplicate(review_df)
```

Out[15]:

```
False    52309
True      2123
dtype: int64
```

In [16]:

```
#looking at the column names.

get_columns(review_df)
```

Out[16]:

```
Index(['review', 'rating', 'fresh', 'critic', 'top_critic', 'publisher',
       'date'],
      dtype='object')
```

In [17]:

```
#percentage of duplicated data

missing_values(review_df)
```

Out[17]:

	Total missing values	Percentage(%)
rating	13517	24.832819
review	5563	10.220091
critic	2722	5.000735
publisher	309	0.567681

In [18]:

```
#checking the unique value_count of the data under 'top_critic' column


get_value(review_df,'top_critic')
```

Out[18]:

```
0    41336
1    13096
Name: top_critic, dtype: int64
```

In [19]:

```
#checking the unique values of the 'fresh' column


get_unique(review_df,'fresh')
```

Out[19]:

```
array(['fresh', 'rotten'], dtype=object)
```

Undestanding of review_df

Review_df has 54432 row entries and 8 columns.

Out of 54432 row entries it has 9 duplicates.

The column names are well written without any ambiguos symbols or denotations, and no random whitespaces.

Missing values were observed as not all columns had the expected 54432 entries. on further inspection the following had missing values;

> - `rating` **: 24.83 %**
> - `review` **: 10.22%**
> - `critic` **:5.00%**
> - `publisher` **:0.56%**

Looking further into the column `top_critic` **and** `fresh` **reveals they only have two kinds of data entry.**

> `fresh` **only has fresh or rotten.**
> `top_critic` **only has 0 or 1 meaning it is a bolleon data type.**

further understanding through research is needed.

"bom.movie_gross.csv.gz"

In [20]:

```
#Using pandas to load the data into gross_df.

#encoding is set to 'latin-1' as the defualt 'utf-8' is not working for the file type.

#compression is set to 'infer' to cater for its gz file compression type.


gross_df = pd.read_csv('zippedData/bom.movie_gross.csv.gz', encoding = 'latin-1',compress
ion='infer')

gross_df.head()
```

Out[20]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010

2	Harry Potter and the Deathly Hallows Pa	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010

In [21]:

```
get_info(gross_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3387 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3387 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3359 non-null   float64
 3   foreign_gross   2037 non-null   object 
 4   year            3387 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 132.4+ KB
```

In [22]:

```
#missing values observed so checking for percentage of missing values per columns.

missing_values(gross_df)
```

Out[22]:

	Total missing values	Percentage(%)
foreign_gross	1350	39.858282
domestic_gross	28	0.826690
studio	5	0.147623

In [23]:

```
#checking for duplicates.

get_duplicate(gross_df)
```

Out[23]:

```
False    3387
dtype: int64
```

In [24]:

```
#checking column names.

get_columns(gross_df)
```

Out[24]:

```
Index(['title', 'studio', 'domestic_gross', 'foreign_gross', 'year'], dtype='object')
```

In [25]:

```
#studio counts
get_unique(gross_df,'studio')
```

Out[25]:

```
array(['BV', 'WB', 'P/DW', 'Sum.', 'Par.', 'Uni.', 'Fox', 'Wein.', 'Sony',
       'FoxS', 'SGem', 'WB (NL)', 'LGF', 'MBox', 'CL', 'W/Dim.', 'CBS',
       'Focus', 'MGM', 'Over.', 'Mira.', 'IFC', 'CJ', 'NM', 'SPC', 'ParV',
       'Gold.', 'JS', 'RAtt.', 'Magn.', 'Free', '3D', 'UTV', 'Rela.',
       'Zeit.', 'Anch.', 'PDA', 'Lorb.', 'App.', 'Drft.', 'Osci.', 'IW',
       'Rog.', nan, 'Eros', 'Relbig.', 'Viv.', 'Hann.', 'Strand', 'NGE',
       'Scre.', 'Kino', 'Abr.', 'CZ', 'ATO', 'First', 'GK', 'FInd.',
```

```
'NFC', 'TFC', 'Pala.', 'Imag.', 'NAV', 'Arth.', 'CLS', 'Mont.',
'Olive', 'CGld', 'FOAK', 'IVP', 'Yash', 'ICir', 'FM', 'Vita.',
'WOW', 'Truly', 'Indic.', 'FD', 'Vari.', 'TriS', 'ORF', 'IM',
'Elev.', 'Cohen', 'NeoC', 'Jan.', 'MNE', 'Trib.', 'Rocket',
'OMNI/FSR', 'KKM', 'Argo.', 'SMod', 'Libre', 'FRun', 'WHE', 'P4',
'KC', 'SD', 'AM', 'MPFT', 'Icar.', 'AGF', 'A23', 'Da.', 'NYer',
'Rialto', 'DF', 'KL', 'ALP', 'LG/S', 'WGUSA', 'MPI', 'RTWC', 'FIP',
'RF', 'ArcEnt', 'PalUni', 'EpicPics', 'EOne', 'LD', 'AF', 'TFA',
'Myr.', 'BM&DH', 'SEG', 'PalT', 'Outs', 'OutF', 'BSM', 'WAMCR',
'PM&E', 'A24', 'Cdgm.', 'Distrib.', 'Imax', 'PH', 'HTR', 'ELS',
'PI', 'E1', 'TVC', 'FEF', 'EXCL', 'MSF', 'P/108', 'FCW', 'XL',
'Shout!', 'SV', 'CE', 'VPD', 'KE', 'Saban', 'CF&SR', 'Triu', 'DR',
'Crnth', 'Ampl.', 'CP', 'Proud', 'BGP', 'Abk.', 'DLA', 'B360',
'BWP', 'SEA', 'RME', 'KS', 'VE', 'LGP', 'EC', 'FUN', 'STX', 'AR',
'BG', 'PFR', 'BST', 'BH Tilt', 'BSC', 'U/P', 'UHE', 'CLF', 'FR',
'AaF', 'Orch.', 'Alc', 'PBS', 'SHO', 'Grav.', 'Gathr', 'Asp.',
'ADC', 'Rel.', 'SM', 'AZ', 'UEP', 'ITL', 'TA', 'MR', 'BBC',
'CFilms', 'Part.', 'FOR', 'TAFC', 'JBG', 'PNT', 'CineGalaxy',
'Fathom', 'Zee', 'Men.', 'YFG', 'Gaatri', 'Mon', 'Ghop',
'Cleopatra', 'Dreamwest', 'SDS', 'Linn', 'Electric', 'Jampa', 'HC',
'GrtIndia', 'Neon', 'ENTMP', 'Good Deed', 'ParC', 'Aviron',
'Annapurna', 'Amazon', 'Affirm', 'MOM', 'Orion', 'CFI', 'UTMW',
'Crimson', 'CAVU', 'EF', 'Arrow', 'Hiber', 'Studio 8',
'Global Road', 'Trafalgar', 'Greenwich', 'Spanglish', 'Blue Fox',
'RLJ', 'Swen', 'PackYourBag', 'Gaum.', 'Grindstone',
'Conglomerate', 'MUBI', 'Darin Southa', 'Super', 'CARUSEL', 'PDF',
'Synergetic'], dtype=object)
```

Understanding of gross_df

Missing values are obsereved.
Specifically in;

```
> * `foreign_gross`   : 39.85%<br>
> * `domestic_gross`  : 0.82%<br>
> * `studio`          : 0.14%
```

Also a column is a string data type instead of integer. `domestic_gross`

No duplicates in the data.

Column names are well written in easy to understand manner.

Studio names are in abbreviations, i should research on their denotations.

tmdb.movies.csv.gz

In [26]:

```
#Using pandas to load the data into tmdb_df.

#encoding is set to 'latin-1' as the defualt 'utf-8' is not working for the file type.

#compression is set to 'infer' to cater for its gz file compression type.

#index_col is set to 0 to remove extra index.


tmdb_df = pd.read_csv('zippedData/tmdb.movies.csv.gz', encoding = 'latin-1', compression
='infer',index_col=0)

tmdb_df.head()
```

Out[26]:

	genre_ids	id	original_language	original_title	popularity	release_date	title	vote_average	vote_count
0	[12, 14, 10751]	12444	en	Harry Potter and the Deathly Hallows: Part 1	33.533	2010-11-19	Harry Potter and the Deathly Hallows: Part 1	7.7	10788
1	[14, 12, 16, 10751]	10191	en	How to Train Your Dragon	28.734	2010-03-26	How to Train Your Dragon	7.7	7610
2	[12, 28, 878]	10138	en	Iron Man 2	28.515	2010-05-07	Iron Man 2	6.8	12368
3	[16, 35, 10751]	862	en	Toy Story	28.005	1995-11-22	Toy Story	7.9	10174
4	[28, 878, 12]	27205	en	Inception	27.920	2010-07-16	Inception	8.3	22186

In [27]:

```
get_info(tmdb_df)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 26517 entries, 0 to 26516
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   genre_ids          26517 non-null  object 
 1   id                 26517 non-null  int64  
 2   original_language  26517 non-null  object 
 3   original_title     26517 non-null  object 
 4   popularity         26517 non-null  float64
 5   release_date       26517 non-null  object 
 6   title              26517 non-null  object 
 7   vote_average       26517 non-null  float64
 8   vote_count         26517 non-null  int64  
dtypes: float64(2), int64(2), object(5)
memory usage: 2.0+ MB
```

In [28]:

```
get_duplicate(tmdb_df)
```

Out[28]:

```
False    25497
True      1020
dtype: int64
```

In [29]:

```
#inspecting column names

get_columns(tmdb_df)
```

Out[29]:

```
Index(['genre_ids', 'id', 'original_language', 'original_title', 'popularity',
       'release_date', 'title', 'vote_average', 'vote_count'],
      dtype='object')
```

Understanding tmdb_df.

No missing data.

Duplicates observed, 1020 in number.

index for columns should be changed from `unknown:` to avoid confusion in data interpretation.

questions i need to answer if i want to understand this data set.

What are genre_ids?

What are genre_ids?

> - **{"genres":[{"id":28,"name":"Action"},{"id":12,"name":"Adventure"},
> {"id":16,"name":"Animation"},{"id":35,"name":"Comedy"},{"id":80,"name":"Crime"},
> {"id":99,"name":"Documentary"},{"id":18,"name":"Drama"},{"id":10751,"name":"Family"},
> {"id":14,"name":"Fantasy"},{"id":36,"name":"History"},{"id":27,"name":"Horror"},
> {"id":10402,"name":"Music"},{"id":9648,"name":"Mystery"},{"id":10749,"name":"Romance"},
> {"id":878,"name":"Science Fiction"},{"id":10770,"name":"TV Movie"},{"id":53,"name":"Thriller"},
> {"id":10752,"name":"War"},{"id":37,"name":"Western"}]}**

im.db with SQL.

In [30]:

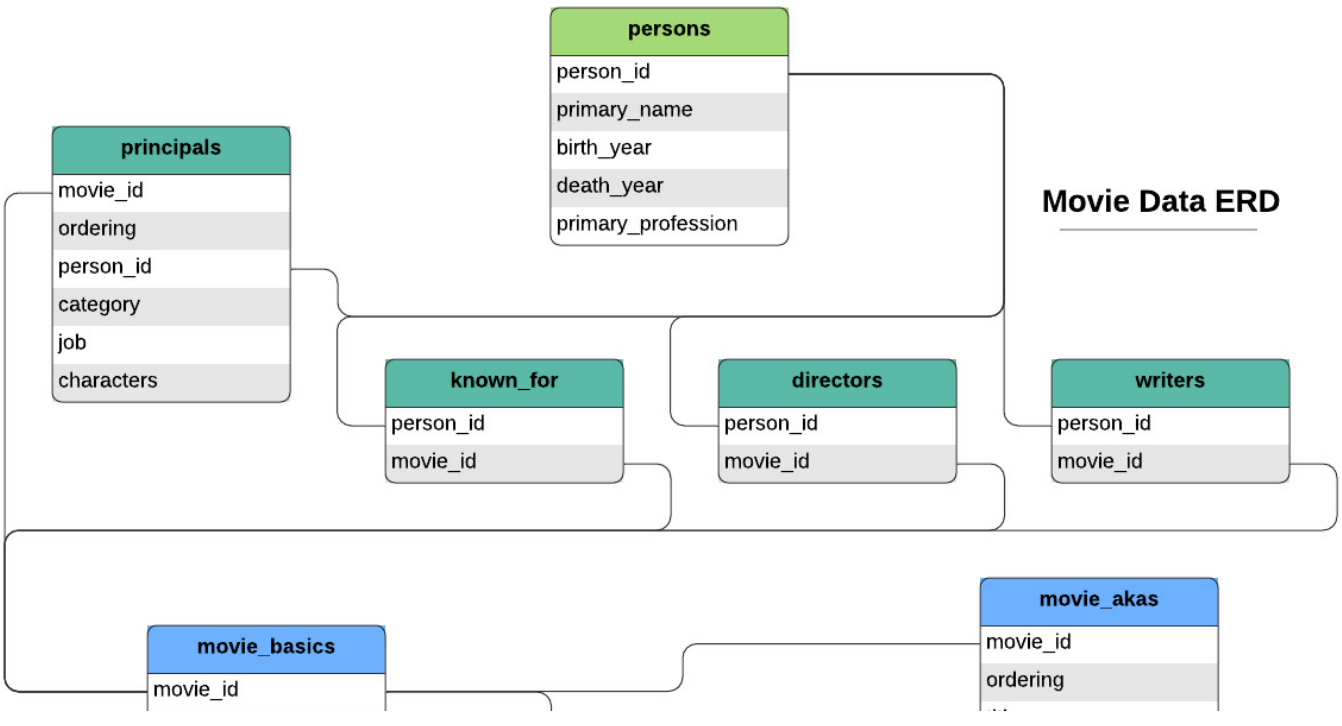
```
# creating a connection to the sql database

conn = sqlite3.connect('zippedData/im.db')
```

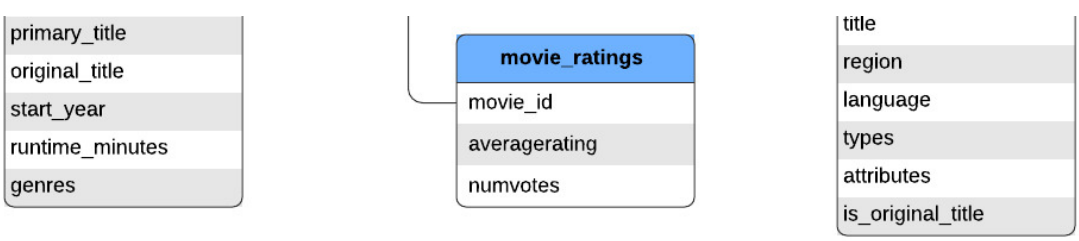
In [31]:

```
#fetching all the names of the tables found in the database.
cursor_ = conn.cursor()

cursor_.execute("""
SELECT name
FROM sqlite_master
WHERE type ='table';
""")

table_names = cursor_.fetchall()
table_names
```

Out[31]:

```
[('movie_basics',),
 ('directors',),
 ('known_for',),
 ('movie_akas',),
 ('movie_ratings',),
 ('persons',),
 ('principals',),
 ('writers',)]
```





`movie_basics`

In [32]:

```
# taking a look at the movie_basics table from the sql.
movie_basics_df = load_SQL('*','movie_basics')


movie_basics_df.head()
```

Out[32]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy

In [33]:

```
# getting information on the movie_basics table

get_info(movie_basics_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   movie_id         146144 non-null  object 
 1   primary_title    146144 non-null  object 
 2   original_title   146123 non-null  object 
 3   start_year       146144 non-null  int64  
 4   runtime_minutes  114405 non-null  float64
 5   genres           140736 non-null  object 
dtypes: float64(1), int64(1), object(4)
memory usage: 6.7+ MB
```

In [34]:

```
# missing values detected so we are checking the percentage of the missing values.
missing_values(movie_basics_df)
```

Out[34]:

	Total missing values	Percentage(%)
runtime_minutes	31739	21.717621
genres	5408	3.700460
original_title	21	0.014369

In [35]:

In [35]:

```
# checking for duplicates.

get_duplicate(movie_basics_df)
```

Out[35]:

```
False    146144
dtype: int64
```

Understanding movie_basics

No duplacated rows detected.

missing values observed

> - **runtime_minutes**
> - **genres**
> - **original_title**

Movie_basics has 146144 row entries and 6 columns.

The column names are not ambiguous.

`directors`

In [36]:

```
#using pandas to view the sql table.

directors_df = load_SQL('*','directors')

directors_df.head()
```

Out[36]:

	movie_id	person_id
0	tt0285252	nm0899854
1	tt0462036	nm1940585
2	tt0835418	nm0151540
3	tt0835418	nm0151540
4	tt0878654	nm0089502

In [37]:

```
#getting information on the directors table.

get_info(directors_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 291174 entries, 0 to 291173
Data columns (total 2 columns):
 #   Column     Non-Null Count   Dtype 
---  ------     --------------   ----- 
 0   movie_id   291174 non-null  object
 1   person_id  291174 non-null  object
dtypes: object(2)
memory usage: 4.4+ MB
```

In [38]:

```
#looking for duplicates
get_duplicate(directors_df)
```

Out[38]:

Out[38]:

```
False    163535
True     127639
dtype: int64
```

Understanding Directors.

The table consists of 2 columns and 291174 rows.

The table comprises of primary and foreign keys.

It has no missing values.

It contains duplicate files, 127639 duplicates exactly.

`known_for`

In [39]:

```
#using pandas to view the sql table 'known_for'

known_for_df = load_SQL('*','known_for')

known_for_df.head()
```

Out[39]:

	person_id	movie_id
0	nm0061671	tt0837562
1	nm0061671	tt2398241
2	nm0061671	tt0844471
3	nm0061671	tt0118553
4	nm0061865	tt0896534

In [40]:

```
#getting information on the table.

get_info(known_for_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1638260 entries, 0 to 1638259
Data columns (total 2 columns):
 #   Column     Non-Null Count    Dtype 
---  ------     --------------    ----- 
 0   person_id  1638260 non-null  object
 1   movie_id   1638260 non-null  object
dtypes: object(2)
memory usage: 25.0+ MB
```

In [41]:

```
#checking for duplicates

get_duplicate(known_for_df)
```

Out[41]:

```
False    1638260
dtype: int64
```

Understanding known_for.

No Missing data or Duplicates observed.

The table has 1638260 row entries and 2 columns

`movies_akas`

In [42]:

```
#using pandas to load the sql table.

movie_akas_df = load_SQL('*','movie_akas')


movie_akas_df.head()
```

Out[42]:

	movie_id	ordering	title	region	language	types	attributes	is_original_title
0	tt0369610	10	Джурасик свят	BG	bg	None	None	0.0
1	tt0369610	11	Jurashikku warudo	JP	None	imdbDisplay	None	0.0
2	tt0369610	12	Jurassic World: O Mundo dos Dinossauros	BR	None	imdbDisplay	None	0.0
3	tt0369610	13	O Mundo dos Dinossauros	BR	None	None	short title	0.0
4	tt0369610	14	Jurassic World	FR	None	imdbDisplay	None	0.0

In [43]:

```
#observing language Value count.

movie_akas_df['language'].value_counts().sort_values(ascending=False).head(30)
```

Out[43]:

```
en     22895
tr      3847
bg      3609
fr      3576
he      2680
sv       965
cmn      727
fa       482
hi       307
yue      286
ca       239
es       223
ta       221
ml       207
te       178
hr       151
de       131
ar        98
bs        97
nl        84
bn        61
id        56
th        55
it        50
tl        45
sr        45
qbp       42
qbn       35
kn        29
mr        23
Name: language, dtype: int64
```

In [44]:

```
#getting info of the table.
get_info(movie_akas_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 331703 entries, 0 to 331702
Data columns (total 8 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   movie_id           331703 non-null  object 
 1   ordering           331703 non-null  int64  
 2   title              331703 non-null  object 
 3   region             278410 non-null  object 
 4   language           41715 non-null   object 
 5   types              168447 non-null  object 
 6   attributes         14925 non-null   object 
 7   is_original_title  331678 non-null  float64
dtypes: float64(1), int64(1), object(6)
memory usage: 20.2+ MB
```

In [45]:

```
movie_akas_df['is_original_title'].value_counts()
```

Out[45]:

```
0.0    286978
1.0     44700
Name: is_original_title, dtype: int64
```

In [46]:

```
#missing data observed , looking for there percentages per column.

missing_values(movie_akas_df)
```

Out[46]:

	Total missing values	Percentage(%)
attributes	**316778**	**95.500493**
language	**289988**	**87.423991**
types	**163256**	**49.217523**
region	**53293**	**16.066481**
is_original_title	**25**	**0.007537**

In [47]:

```
#looking for duplicate files.

get_duplicate(movie_akas_df)
```

Out[47]:

```
False    331703
dtype: int64
```

Understanding movies_akas.

It has no duplicate values.

The table has 331703 row entries and 8 columns.

Some columns namely;

> - **attributes : 95.55 %**
> - **language : 87.42 %**
> - **types : 49.21 %**
> - **region : 16.06 %**
> - **is_original_title : 0.000075%**

The is_original_title column is a boleon data type hence the ones and zeros.

`movie_ratings`

In [48]:

```
# Using pandas to open/load the sql table.

movie_ratings_df = load_SQL('*','movie_ratings')

movie_ratings_df.head()
```

Out[48]:

	movie_id	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559
2	tt1042974	6.4	20
3	tt1043726	4.2	50352
4	tt1060240	6.5	21

In [49]:

```
#getting info on the dataframe of 'movie_ratings'.

get_info(movie_ratings_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   movie_id       73856 non-null  object 
 1   averagerating  73856 non-null  float64
 2   numvotes       73856 non-null  int64  
dtypes: float64(1), int64(1), object(1)
memory usage: 1.7+ MB
```

In [50]:

```
# Looking for duplicates

get_duplicate(movie_ratings_df)
```

Out[50]:

```
False    73856
dtype: int64
```

Understanding movie_ratings sql

The table contains 73856 entries and 3 columns.
It does not have any missing data or duplicates.

`writers`

In [51]:

```
# Using pandas to load the data.

writers_df = load_SQL('*','writers')

writers_df.head()
```

Out[51]:

Out[51]:

	movie_id	person_id
0	tt0285252	nm0899854
1	tt0438973	nm0175726
2	tt0438973	nm1802864
3	tt0462036	nm1940585
4	tt0835418	nm0310087

In [52]:

```
#looking for information on the table.

get_info(writers_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 255873 entries, 0 to 255872
Data columns (total 2 columns):
 #   Column     Non-Null Count   Dtype 
---  ------     --------------   ----- 
 0   movie_id   255873 non-null  object
 1   person_id  255873 non-null  object
dtypes: object(2)
memory usage: 3.9+ MB
```

In [53]:

```
#looking for duplicates in the table.

get_duplicate(writers_df)
```

Out[53]:

```
False    178352
True      77521
dtype: int64
```

Understanding the writers_df table.

No missing values observed.

the table contains 255873 row entries and 2 columns.

The table has 77521 duplicates.

`principals`

In [54]:

```
#using pandas to load the data.

principals_df = load_SQL('*','principals')

principals_df.head(20)
```

Out[54]:

	movie_id	ordering	person_id	category	job	characters
0	tt0111414	1	nm0246005	actor	None	["The Man"]
1	tt0111414	2	nm0398271	director	None	None
2	tt0111414	3	nm3739909	producer	producer	None
3	tt0323808	10	nm0059247	editor	None	None
4	tt0323808	1	nm3579312	actress	None	["Beth Boothby"]

	movie_id	ordering	person_id	category	job	characters
5	tt0323808	2	nm2694680	actor	None	["Steve Thomson"]
6	tt0323808	3	nm0574615	actor	None	["Sir Lachlan Morrison"]
7	tt0323808	4	nm0502652	actress	None	["Lady Delia Morrison"]
8	tt0323808	5	nm0362736	director	None	None
9	tt0323808	6	nm0811056	producer	producer	None
10	tt0323808	7	nm0914939	producer	producer	None
11	tt0323808	8	nm0779346	composer	None	None
12	tt0323808	9	nm0676104	cinematographer	None	None
13	tt0417610	10	nm0284261	composer	None	None
14	tt0417610	1	nm0532721	actor	None	["Lucio"]
15	tt0417610	2	nm0330974	actress	None	["Diana"]
16	tt0417610	3	nm0069209	actor	None	["Dr. Samaniego"]
17	tt0417610	4	nm0679167	actress	None	["Adriana María"]
18	tt0417610	5	nm1145057	director	None	None
19	tt0417610	6	nm0083201	writer	story	None

In [55]:

```
get_info(principals_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1028186 entries, 0 to 1028185
Data columns (total 6 columns):
 #   Column      Non-Null Count    Dtype 
---  ------      --------------    ----- 
 0   movie_id    1028186 non-null  object
 1   ordering    1028186 non-null  int64 
 2   person_id   1028186 non-null  object
 3   category    1028186 non-null  object
 4   job         177684 non-null   object
 5   characters  393360 non-null   object
dtypes: int64(1), object(5)
memory usage: 47.1+ MB
```

In [56]:

```
get_value(principals_df,'job')
```

Out[56]:

```
producer                    108168
screenplay                    8172
director of photography       6517
writer                        6479
co-director                   5796
                             ...  
novel Arlington Park             1
first story                      1
scenario revisions               1
poem by                          1
planning                         1
Name: job, Length: 2965, dtype: int64
```

In [57]:

```
#Missing values observed, checking for their percentages.
missing_values(principals_df)
```

Out[57]:

	Total missing values	Percentage(%)
job	850502	82.718691

	Total missing values	Percentage(%)
characters	634826	61.742331

In [58]:

```
#checking for duplicates.

get_duplicate(principals_df)
```

Out[58]:

```
False    1028186
dtype: int64
```

Understanding principals_df

The table contains 1028186 row entries and 6 columns.

Two columns are obseved with missing data;

- `job` **: 82.71%**
- `characters` **: 61.74%**

No duplicated data observed.

`persons`

In [59]:

```
# Using pandas to open the sql table.

persons_df = load_SQL('*','persons')

persons_df.head()
```

Out[59]:

	person_id	primary_name	birth_year	death_year	primary_profession
0	nm0061671	Mary Ellen Bauder	NaN	NaN	miscellaneous,production_manager,producer
1	nm0061865	Joseph Bauer	NaN	NaN	composer,music_department,sound_department
2	nm0062070	Bruce Baum	NaN	NaN	miscellaneous,actor,writer
3	nm0062195	Axel Baumann	NaN	NaN	camera_department,cinematographer,art_department
4	nm0062798	Pete Baxter	NaN	NaN	production_designer,art_department,set_decorator

In [60]:

```
#getting info on the DataFrames.

get_info(persons_df)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 606648 entries, 0 to 606647
Data columns (total 5 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   person_id          606648 non-null  object 
 1   primary_name       606648 non-null  object 
 2   birth_year         82736 non-null   float64
 3   death_year         6783 non-null    float64
 4   primary_profession  555308 non-null  object 
dtypes: float64(2), object(3)
memory usage: 23.1+ MB
```

In [61]:

```
#missing values observed, checking for there percentage.

missing_values(persons_df)
```

Out[61]:

	Total missing values	Percentage(%)
death_year	599865	98.881889
birth_year	523912	86.361778
primary_profession	51340	8.462898

In [62]:

```
# Checking for Duplicates.
get_duplicate(persons_df)
```

Out[62]:

```
False    606648
dtype: int64
```

Understanding persons_df

The dataframe has 606648 row entries and 5 columns.

It contains missing values namely;

- `death_year` **: 98.88 %**
- `birth_year` **: 86.36 %**
- `primary_profession` **: 8.46 %**

It has no Duplicates.

DATA PREPARATION.

DATA CLEANING

In this part of the project I will be selecting the data i will use and clean them accordingly before Analysing them.

`"budget_df"("tn.movie_budgets.csv.gz")`

The DataFrame had no missing values or duplicated rows.

**The only issue was that some column data types were in string form,
which will make it hard to sort them and use them for statistical analysis.**

The problem columns are;

- **'production_budget'**
- **'domestic_gross'**
- **'worldwide_gross'.**

In [63]:

```
# Start by defining a type casting function for any column of numerical data stored as a
string.

def int_conv(data,col_name):
```

```
    #first we remove the $ sign for the typecasting to work.
    data[col_name] = data[col_name].map(lambda col: re.sub('[^0-9]','', col))

    #then we convert/typecast.
    data[col_name] = data[col_name].astype(int)
    return data[col_name]

# Define a function to deal with duplicates.
def remove_dup(data):
    data.drop_duplicates(keep = 'first', inplace = True)
    return data

# Define a function that gives a Summary of Statistics
def Stat_summary(data):
    return data.describe()
```

In [64]:

```
# Now cleaning the budget_df("tn.movie_budgets.csv.gz")

#Starting with 'production_budget'
int_conv(budget_df,'production_budget')
```

Out[64]:

```
id
1     425000000
2     410600000
3     350000000
4     330600000
5     317000000
        ...
78        7000
79        6000
80        5000
81        1400
82        1100
Name: production_budget, Length: 5782, dtype: int64
```

In [65]:

```
#Type casting 'domestic_gross'

int_conv(budget_df,'domestic_gross')
```

Out[65]:

```
id
1     760507625
2     241063875
3      42762350
4     459005868
5     620181382
        ...
78            0
79        48482
80         1338
81            0
82       181041
Name: domestic_gross, Length: 5782, dtype: int64
```

In [66]:

```
# Typecasting 'worldwide_gross'

int_conv(budget_df,'worldwide_gross')
```

Out[66]:

```
id
1     2776345279
2     1045663875
3      149762350
```

```
4     1403013963
5     1316721747
         ...
78             0
79        240495
80          1338
81             0
82        181041
Name: worldwide_gross, Length: 5782, dtype: int64
```

In [67]:

```
# Checking if the non-numerical symbols were removed.

budget_df.head()
```

Out[67]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross
1	Dec 18, 2009	Avatar	425000000	760507625	2776345279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875
3	Jun 7, 2019	Dark Phoenix	350000000	42762350	149762350
4	May 1, 2015	Avengers: Age of Ultron	330600000	459005868	1403013963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747

In [68]:

```
# Type Casting from object to int64, Succesfull.
get_info(budget_df)
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5782 entries, 1 to 82
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   int64 
 3   domestic_gross     5782 non-null   int64 
 4   worldwide_gross    5782 non-null   int64 
dtypes: int64(3), object(2)
memory usage: 271.0+ KB
```

In [69]:

```
#convert date to a date time format to make it easier to make new columns based on year a
nd column.
budget_df['release_date'] = pd.to_datetime(budget_df['release_date'])

#checking to comfirm the change was succesfull
budget_df['release_date'].head()
```

Out[69]:

```
id
1   2009-12-18
2   2011-05-20
3   2019-06-07
4   2015-05-01
5   2017-12-15
Name: release_date, dtype: datetime64[ns]
```

tmdb.movies.csv.gz(tmdb_df)

The tmdb_df Data Frame has the following issues;

Deal with Duplicates.

What are genre_ids, what do those numbers represent for now they are too ambiguous.

but after researching from there website i now have their meanings.

[{"genres":[{"id":28,"name":"Action"},{"id":12,"name":"Adventure"},{"id":16,"name":"Animation"},{"id":35,"name":"Comedy"},{"id":80,"name":"Crime"},{"id":99,"name":"Documentary"},{"id":18,"name":"Drama"},{"id":10751,"name":"Family"},{"id":14,"name":"Fantasy"},{"id":36,"name":"History"},{"id":27,"name":"Horror"},{"id":10402,"name":"Music"},{"id":9648,"name":"Mystery"},{"id":10749,"name":"Romance"},{"id":878,"name":"Science Fiction"},{"id":10770,"name":"TV Movie"},{"id":53,"name":"Thriller"},{"id":10752,"name":"War"},{"id":37,"name":"Western"}]}]

In [70]:

```
# Removing the Duplicates

remove_dup(tmdb_df)

# Checking if the Duplicates were succesfully removed
get_duplicate(tmdb_df)
```

Out[70]:

```
False    25497
dtype: int64
```

In [71]:

```
#dropping rows with an empty genre_id ([]) as they dont serve any function without the genre_id.

tmdb_df = tmdb_df[tmdb_df.genre_ids != '[]']
```

im.db.SQL

movie_basics_df

No duplacated rows detected.

missing values observed

runtime_minutes
genres
original_title

Movie_basics has 146144 row entries and 6 columns.

The column names are not ambiguous.

In [72]:

```
#dealing with missing values by dropping all rows with missing data.
q = """
SELECT *
FROM movie_basics
WHERE runtime_minutes IS NOT NULL and genres IS NOT NULL and original_title IS NOT NULL
"""

movie_basics = pd.read_sql(q,conn)
```

```
movie_basics
```

Out[72]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
4	tt0111414	A Thin Life	A Thin Life	2018	75.0	Comedy
...	...	...	...	...	...	...
112227	tt9916160	Drømmeland	Drømmeland	2019	72.0	Documentary
112228	tt9916170	The Rehearsal	O Ensaio	2019	51.0	Drama
112229	tt9916186	Illenau - die Geschichte einer ehemaligen Heil...	Illenau - die Geschichte einer ehemaligen Heil...	2017	84.0	Documentary
112230	tt9916190	Safeguard	Safeguard	2019	90.0	Drama,Thriller
112231	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama

112232 rows × 6 columns

In [73]:

```
r = """
SELECT AVG(runtime_minutes) AS avg_runtime, start_year
FROM movie_basics
WHERE runtime_minutes IS NOT NULL and genres IS NOT NULL and original_title IS NOT NULL
GROUP BY start_year
ORDER BY start_year ASC
"""

yearly_runtime_trends = pd.read_sql(r,conn)

yearly_runtime_trends.set_index(['start_year'], inplace=True)
yearly_runtime_trends.head()
```

Out[73]:

start_year	avg_runtime
2010	85.682222
2011	86.610304
2012	89.407513
2013	85.100166
2014	84.584180

In [74]:

```
#CHECKING FOR MISSING VALUES

get_info(movie_basics)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112232 entries, 0 to 112231
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype
---  ------           --------------   -----
 0   movie_id         112232 non-null  object
 1   primary_title    112232 non-null  object
```

```
 2   original_title   112232 non-null  object
 3   start_year       112232 non-null  int64
 4   runtime_minutes  112232 non-null  float64
 5   genres           112232 non-null  object
dtypes: float64(1), int64(1), object(4)
memory usage: 5.1+ MB
```

In [75]:

```
#Checking for Outliers now.
w = """
SELECT movie_id,COUNT(runtime_minutes),runtime_minutes

FROM movie_basics

WHERE runtime_minutes IS NOT NULL

GROUP BY runtime_minutes
ORDER BY runtime_minutes DESC



"""
runtime_movies = pd.read_sql(w,conn)
runtime_movies.head(20)
```

Out[75]:

	movie_id	COUNT(runtime_minutes)	runtime_minutes
0	tt8273150	1	51420.0
1	tt2659636	1	14400.0
2	tt7492094	1	6017.0
3	tt5068890	1	6000.0
4	tt5136218	1	5460.0
5	tt5240738	1	4980.0
6	tt1735956	1	4200.0
7	tt6150204	1	4080.0
8	tt1674154	1	3450.0
9	tt3837350	1	3077.0
10	tt5135246	1	2905.0
11	tt1866307	1	2400.0
12	tt7321476	1	2160.0
13	tt7467634	1	1834.0
14	tt1745901	2	1800.0
15	tt1885195	1	1669.0
16	tt5942280	1	1559.0
17	tt2008009	2	1440.0
18	tt1277455	1	1320.0
19	tt7156814	1	1260.0

From the above array, we can see that the top 20 movies are over a thousand minutes...

WOW

The largest is 51420 minutes...That is about 35 days.

Let us cut from 500 minutes.

In [76]:

```
J = """
SELECT *
FROM movie_basics
WHERE movie_id = 'tt8273150'
"""
Outlier = pd.read_sql(J,conn)
Outlier
```

Out[76]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	**tt8273150**	**Logistics**	**Logistics**	**2012**	**51420.0**	**Documentary**

In [77]:

```
w = """
SELECT runtime_minutes,movie_id

FROM movie_basics

WHERE runtime_minutes IS NOT NULL and genres IS NOT NULL and original_title IS NOT NULL a
nd runtime_minutes < 500



"""
runtime_movies = pd.read_sql(w,conn)
runtime_movies.tail() #AAAH perfect.
```

Out[77]:

	runtime_minutes	movie_id
112174	**72.0**	**tt9916160**
112175	**51.0**	**tt9916170**
112176	**84.0**	**tt9916186**
112177	**90.0**	**tt9916190**
112178	**123.0**	**tt9916538**

Movie_ratings

The table contains 73856 entries and 3 columns. It does not have any missing data or duplicates.

It is ready for EDA

In [78]:

```
# Joining movie basics with movie ratings to add more relevance to the dataframe.

w = """
SELECT movie_id,genres,averagerating,numvotes,AVG(averagerating) AS avg_rates,SUM(numvote
s) AS TTL_votes
FROM movie_basics
JOIN movie_ratings
USING(movie_id)
WHERE runtime_minutes IS NOT NULL and genres IS NOT NULL
GROUP BY genres
ORDER BY avg_rates
"""
joined_movie = pd.read_sql(w,conn)

#to ensure genres is the index.
joined_movie
```

Out[78]:

	movie_id	genres	averagerating	numvotes	avg_rates	TTL_votes
0	tt5161302	Comedy,Musical,Sport	1.4	28	1.4	28
1	tt3718824	Adult,Horror	2.0	128	2.0	128
2	tt3140634	Adventure,Crime,Romance	2.3	9	2.3	9
3	tt4656810	History,Sci-Fi,Thriller	2.3	227	2.3	227
4	tt8463476	Crime,Music	2.4	88	2.4	88
...	...	...	...	...	...	...
901	tt4477888	Documentary,News,Sport	8.8	25	8.8	25
902	tt9060598	Drama,Short	8.8	8	8.8	8
903	tt2896176	Game-Show	9.0	7	9.0	7
904	tt3856476	Documentary,Family,Musical	9.3	19	9.3	19
905	tt4135932	Comedy,Documentary,Fantasy	9.4	5	9.4	5

906 rows × 6 columns

In [79]:

```
#making a Dataframe to use for corvariance

k = """
SELECT runtime_minutes,averagerating
FROM movie_basics
JOIN movie_ratings
USING(movie_id)
WHERE runtime_minutes IS NOT NULL and genres IS NOT NULL and runtime_minutes < 500
"""
runtime_corr = pd.read_sql(k,conn)

runtime_corr.head()
```

Out[79]:

	runtime_minutes	averagerating
0	175.0	7.0
1	114.0	7.2
2	122.0	6.9
3	80.0	6.5
4	83.0	8.1

DATA ANALYSIS

budget_df

In [80]:

```
# Adding new column for release year.

budget_df['release_year'] = pd.DatetimeIndex(budget_df['release_date']).year

#Excellent it has worked.
budget_df.head()
```

Out[80]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	release_year

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	release_year
id	2009-12-18	Avatar	425000000	760507625	2776345279	2009
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	2011
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	2019
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	2015
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	2017

In [81]:

```
#Adding new column for Release month
budget_df['release_month'] = pd.DatetimeIndex(budget_df['release_date']).month

#Excellent it has worked.
budget_df.head()
```

Out[81]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	release_year	release_month
1	2009-12-18	Avatar	425000000	760507625	2776345279	2009	12
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	2011	5
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	2019	6
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	2015	5
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	2017	12

In [82]:

```
budget_df.head()
```

Out[82]:

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	release_year	release_month
1	2009-12-18	Avatar	425000000	760507625	2776345279	2009	12
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	2011	5
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	2019	6
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	2015	5
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	2017	12

In [83]:

```
#making a new variable Budget_analyse to store an version of budget_df which has been gro
uped by year and then
#summed.
Budget_yearly = budget_df.groupby('release_year').sum()

Budget_yearly
```

Out[83]:

release_year	production_budget	domestic_gross	worldwide_gross	release_month

release_year	production_budget	domestic_gross	worldwide_gross	release_month
1915	110000	10000000	11000000	2
1916	585907	8000000	8000000	21
1920	100000	3000000	3000000	9
1925	4145000	20000000	31000000	23
1927	2000000	0	0	8
...	...	...	...	...
2016	8973240000	11042828402	28768152741	1443
2017	8405163000	10453395075	28429629005	1136
2018	6883857000	10551784370	26094444899	1017
2019	3533510000	2867619395	6676825346	335
2020	282000000	0	0	26

96 rows × 4 columns

In [84]:

```
#making two new columns to get the profits

Budget_yearly['domestic_profit'] = Budget_yearly['domestic_gross'] - Budget_yearly['produ
ction_budget']
Budget_yearly['worlwide_profit'] = Budget_yearly['worldwide_gross'] - Budget_yearly['prod
uction_budget']
Budget_yearly

#dropping release_month,domestic_gross,worldwide_gross and id so that I can use the Budge
te_analyse to plot
#multiple line graphs in one graph
#where the  columns will be noise.
Budget_yearly.drop(['release_month','domestic_gross','worldwide_gross'],axis = 1, inplac
e= True)
```

In [85]:

```
#Making a new variable called Budget_analyse_1 to store the budget_df which has been grou
ped by ('release_month')
#and then meaned.
Budget_monthly = budget_df.groupby('release_month').mean()

Budget_monthly.head()
```

Out[85]:

release_month	production_budget	domestic_gross	worldwide_gross	release_year
1	2.084349e+07	2.394962e+07	4.656382e+07	2003.489914
2	2.804642e+07	3.541465e+07	7.154453e+07	2004.579082
3	3.078208e+07	3.857299e+07	8.063337e+07	2005.542553
4	2.380283e+07	2.732840e+07	5.992026e+07	2005.138767
5	4.713520e+07	6.669795e+07	1.622680e+08	2003.653563

In [86]:

```
Budget_monthly['domestic_profit'] = Budget_monthly['domestic_gross'] - Budget_monthly['pr
oduction_budget']
Budget_monthly['worlwide_profit'] = Budget_monthly['worldwide_gross'] - Budget_monthly['
production_budget']
Budget_monthly

#dropping the id and release year to remove noise
```

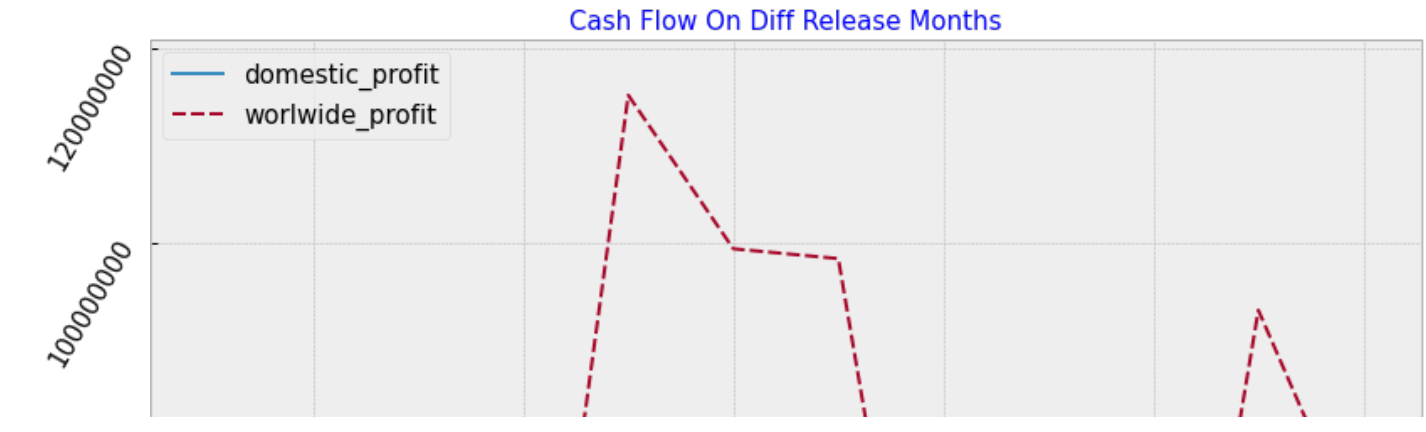
```
Budget_monthly.drop(['release_year','domestic_gross','production_budget','worldwide_gross
'], inplace = True, axis = 1)
Budget_monthly
```

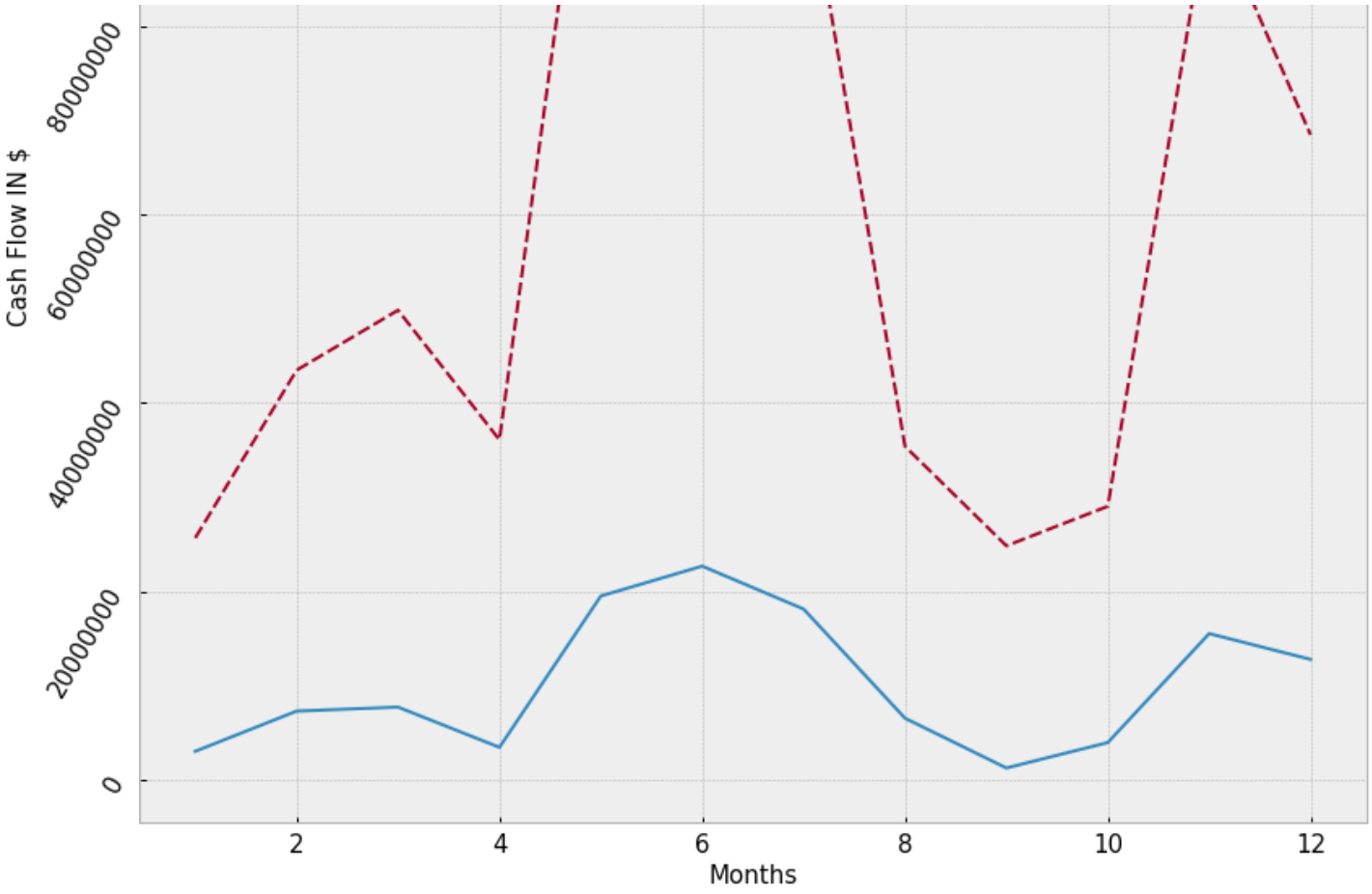
Out[86]:

release_month	domestic_profit	worlwide_profit
1	3.106128e+06	2.572033e+07
2	7.368234e+06	4.349811e+07
3	7.790907e+06	4.985129e+07
4	3.525568e+06	3.611743e+07
5	1.956275e+07	1.151328e+08
6	2.272879e+07	9.942391e+07
7	1.818188e+07	9.841746e+07
8	6.612111e+06	3.542232e+07
9	1.336985e+06	2.488078e+07
10	4.030837e+06	2.907190e+07
11	1.558112e+07	9.314157e+07
12	1.284921e+07	6.844157e+07

In [87]:

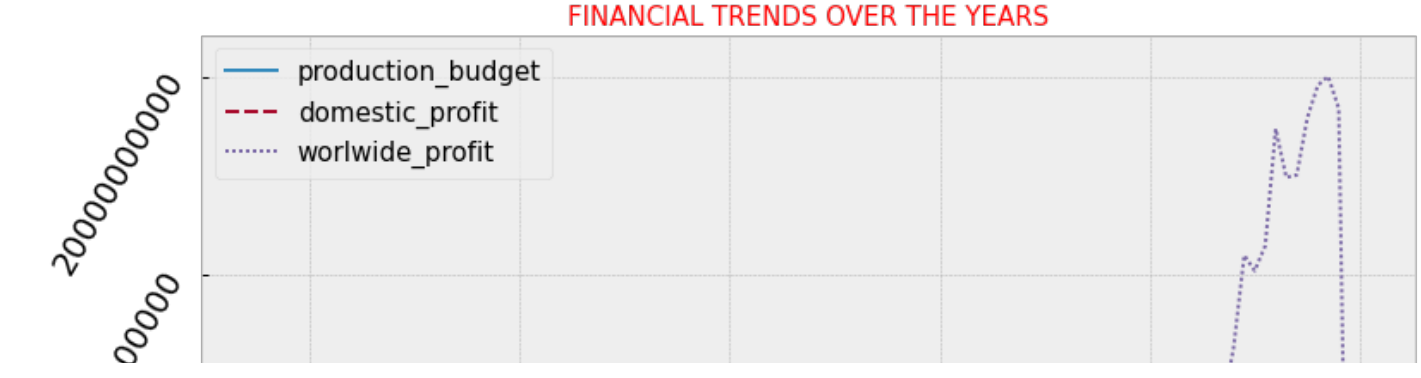
```
#plt to show the mean of cash flow depending on all the movies release months.

plt.style.use('seaborn-notebook')
plt.style.use('bmh')
fig,ax =plt.subplots(figsize = (15,15))

#Ensures the y axis numbers are not displayed in there exponential form
ax.get_yaxis().get_major_formatter().set_scientific(False)

sns.lineplot(data = Budget_monthly)
plt.title('Cash Flow On Diff Release Months',fontsize = 15, color = 'b')
plt.ylabel('Cash Flow IN $ ',fontsize = 15)
plt.xlabel('Months', fontsize = 15)
plt.yticks(rotation = 60,fontsize = 15)
plt.xticks(fontsize = 15)

# Changing color ot text in legend for visibility
leg = plt.legend(loc='upper left',fontsize = 15)
for text in leg.get_texts():
    text.set_color("black")

#This adjusts cropping of the graph
plt.subplots_adjust(top=0.8,left = 0.2)

#saving the plt
ax.figure.savefig('Cash Flow On Diff Release Months.png');
```

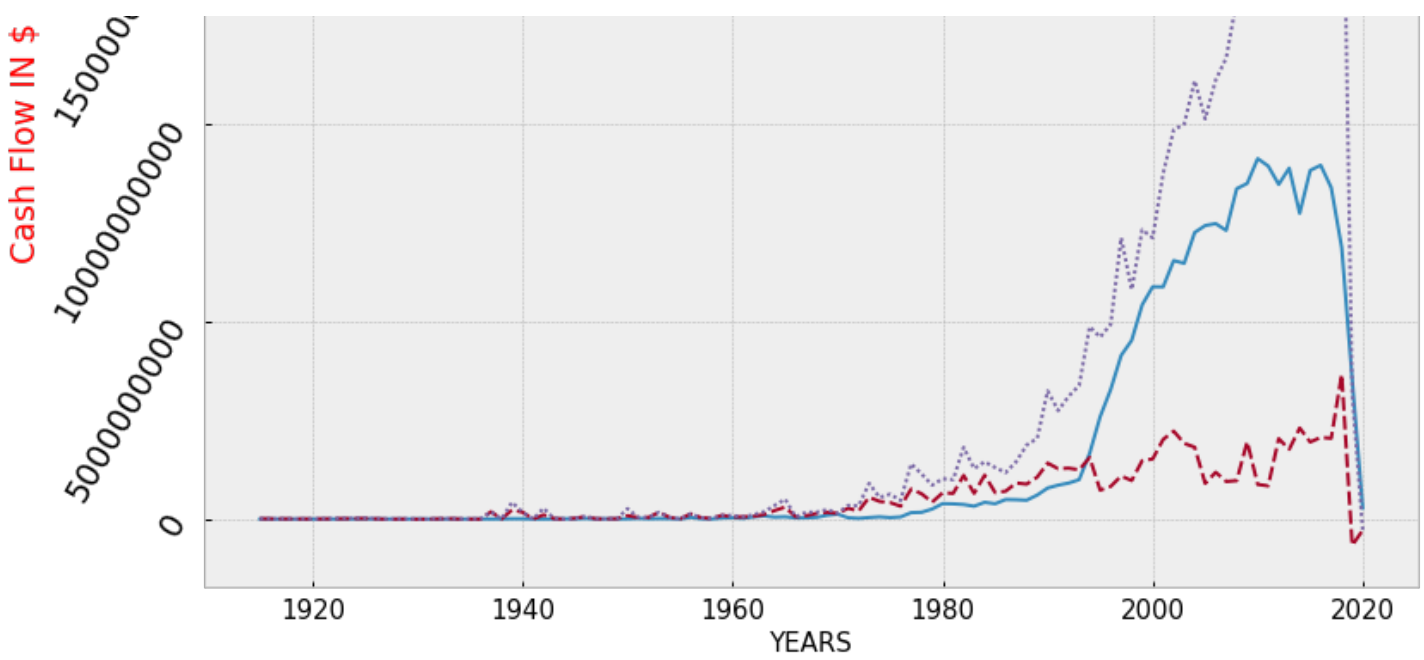




In [88]:

```
#plt to show what trend of worldwide_gross and domestic gross over the years.summed per y
ear.


plt.style.use('seaborn-notebook')
plt.style.use('bmh')
fig,ax =plt.subplots(figsize = (14,10))
ax.get_yaxis().get_major_formatter().set_scientific(False)
sns.lineplot(data = Budget_yearly)
plt.title('FINANCIAL TRENDS OVER THE YEARS',fontsize = 15,color = 'r')
plt.ylabel('Cash Flow IN $ ',fontsize = 19,color = 'r')
plt.xlabel('YEARS', fontsize = 15)
plt.yticks(rotation = 60,fontsize = 19)
plt.xticks(fontsize = 15)
plt.legend(fontsize = 15)
#This adjusts cropping of the graph
plt.subplots_adjust(top=0.85,left = 0.2)

# Changing color ot text in legend for visibility
leg = plt.legend(loc='upper left',fontsize = 15)
for text in leg.get_texts():
    text.set_color("black")


#saving the plt
ax.figure.savefig('FINANCIAL TRENDS OVER THE YEARS.png');
```





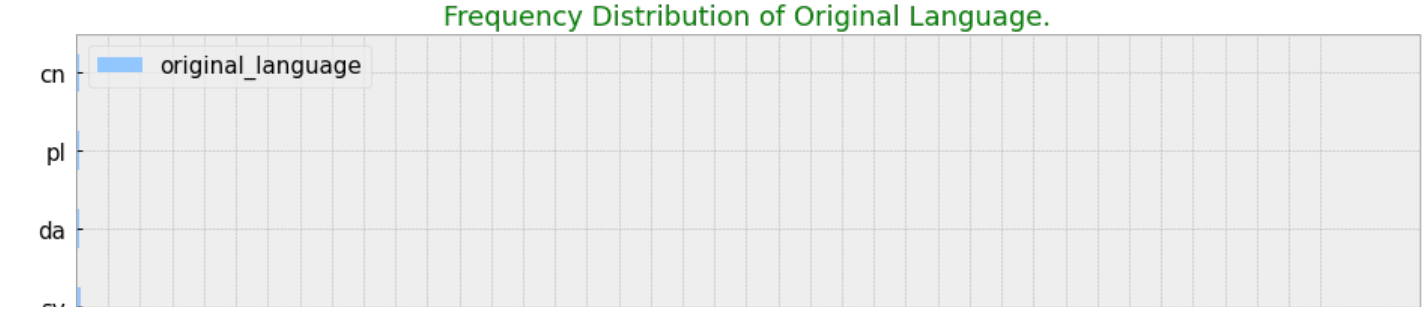
DATA ANALYSIS OF tmdb.movies

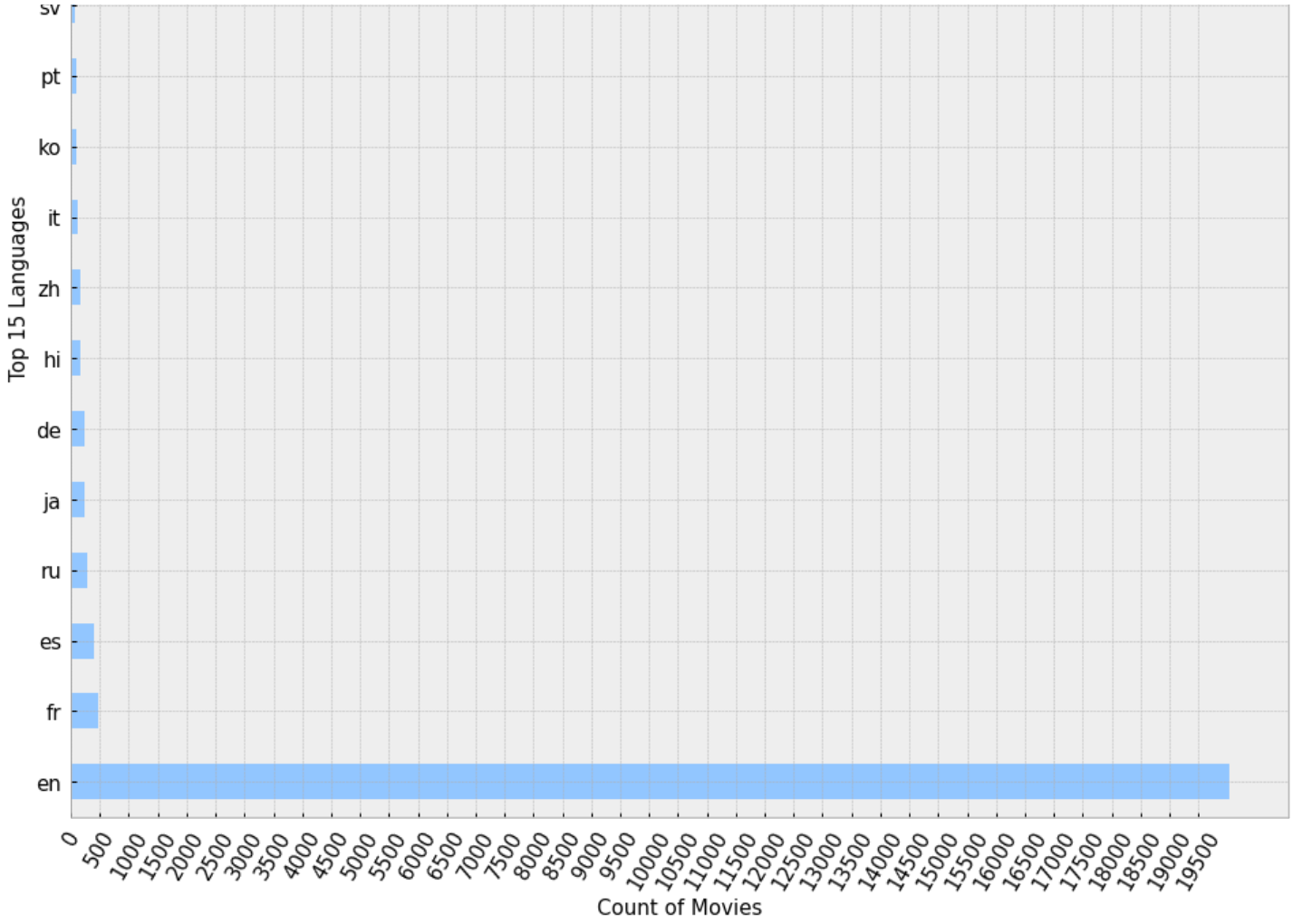
In [89]:

```
#Making a new dataframe (analise_df) to hold the value_count of 'original_language'
#looking at the bar graph for the top 15 frequency distribution of original languages.

#nlargest limits the rows based on the largest

#getting the frequency of original language occurance in the data.

analise_df = tmdb_df['original_language'].value_counts().nlargest(15)
```

In [90]:

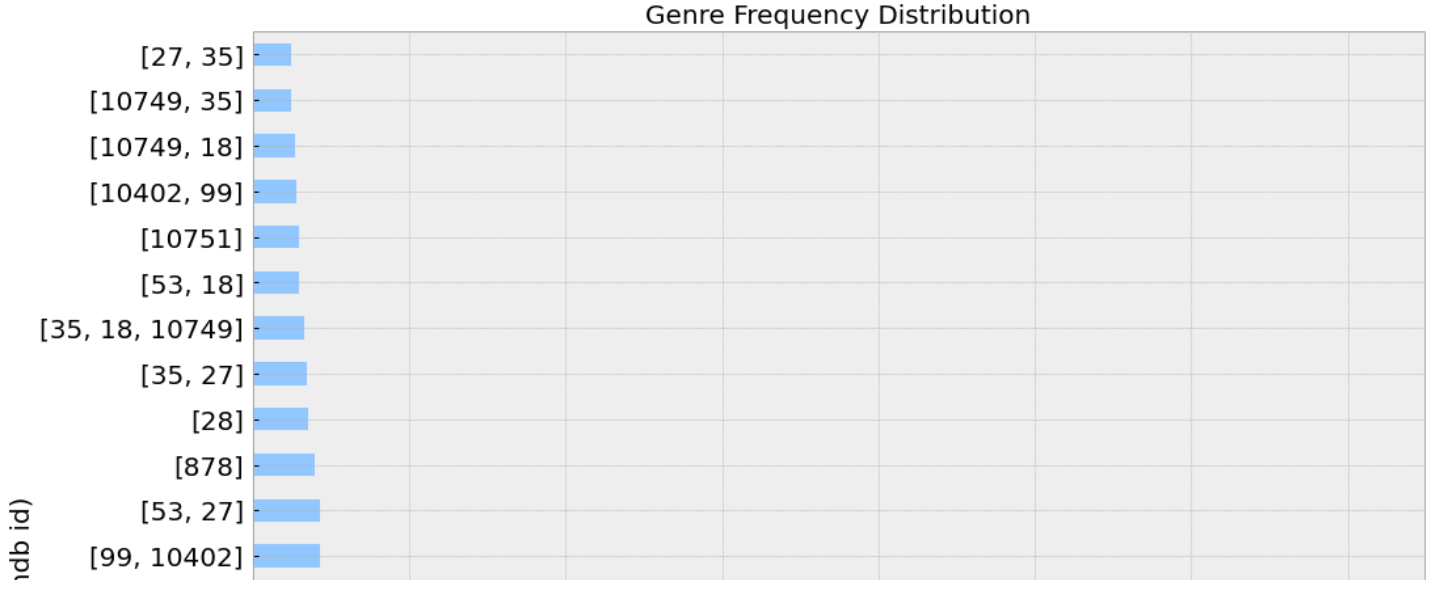
```
# Making a bargraph to visualise The frequency distribution of movies based on their Orig
inal languages.
plt.style.use('seaborn-pastel')
fig,ax = plt.subplots(figsize=(16,16))
analise_df.plot(kind = 'barh')
plt.xlabel('Count of Movies', fontsize = 15)
plt.ylabel('Top 15 Languages', fontsize = 15)
plt.title('Frequency Distribution of Original Language.', fontsize = 18, color = 'g')
plt.yticks(fontsize = 15)
#To make the incremental grids visible to add readability
plt.xticks(range(0,20000,500),fontsize = 15, rotation = 60)

# Changing color ot text in legend for visibility
leg = plt.legend(loc='upper left',fontsize = 15)
for text in leg.get_texts():
    text.set_color("black")

#This adjusts cropping of the graph
plt.subplots_adjust(top=0.8);

#save plt for presentation
ax.figure.savefig('Frequency Distribution of Original Language.png')
```

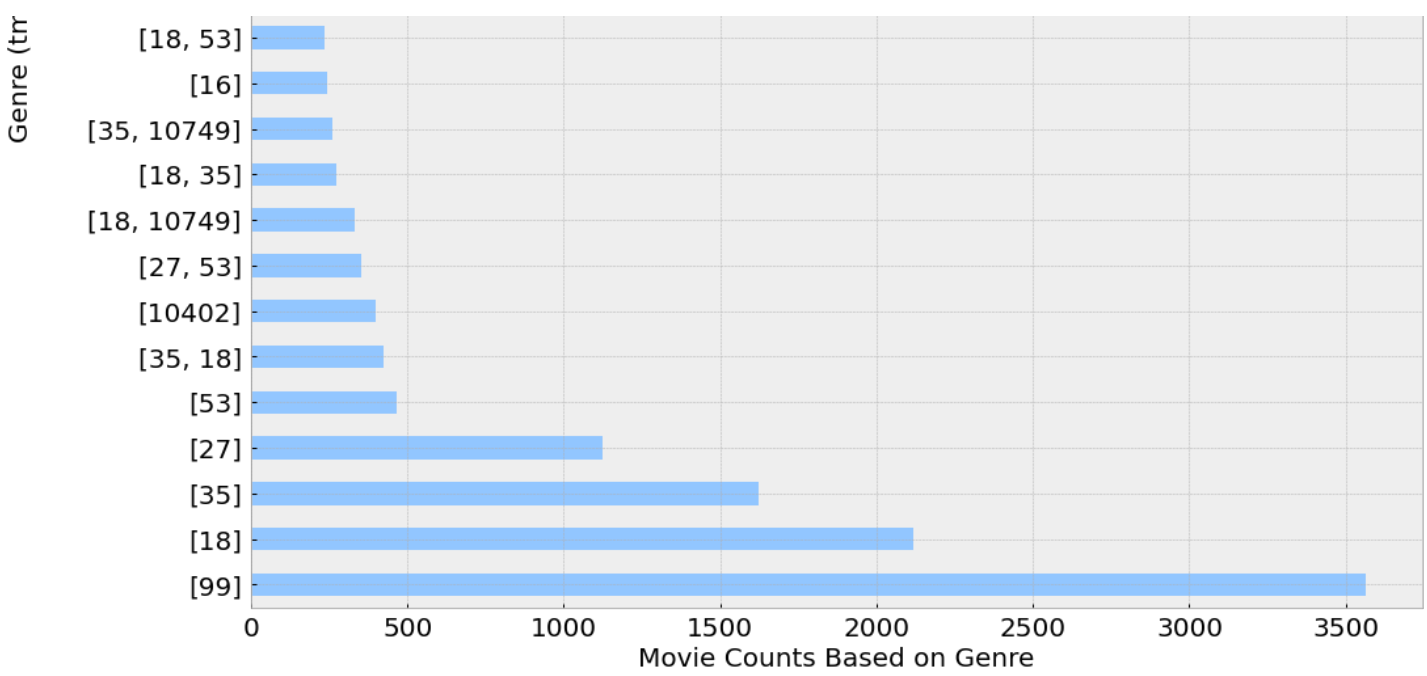




In [91]:

```
# Making a new variable ,analyse_df2 to hold a the imdb_df but grouped by genre ids follo
wed by a value count
#to get the frequency distribution of various genres.
analyse_df2 = tmdb_df['genre_ids'].value_counts().nlargest(25)


fig,ax = plt.subplots(figsize=(16,16))
analyse_df2.plot(kind = 'barh')
plt.xlabel('Movie Counts Based on Genre', fontsize = 20)
plt.ylabel('Genre (tmdb id)', fontsize = 20)
plt.title('Genre Frequency Distribution', fontsize = 20)
plt.yticks(fontsize = 20)
plt.xticks(fontsize = 20)

#save plt for presentation
ax.figure.savefig('Genre Frequency Distribution.png');
```





In [92]:

```
#Introducing another variable 'analyse_df3' to save the tmdb_df which has been groupedby
#original_language and then sumed and sorted by  the sum of popularity.

analyse_df3 = tmdb_df.groupby('original_language').sum().nlargest(15, 'popularity')
```

In [93]:

```
analyse_df3
```

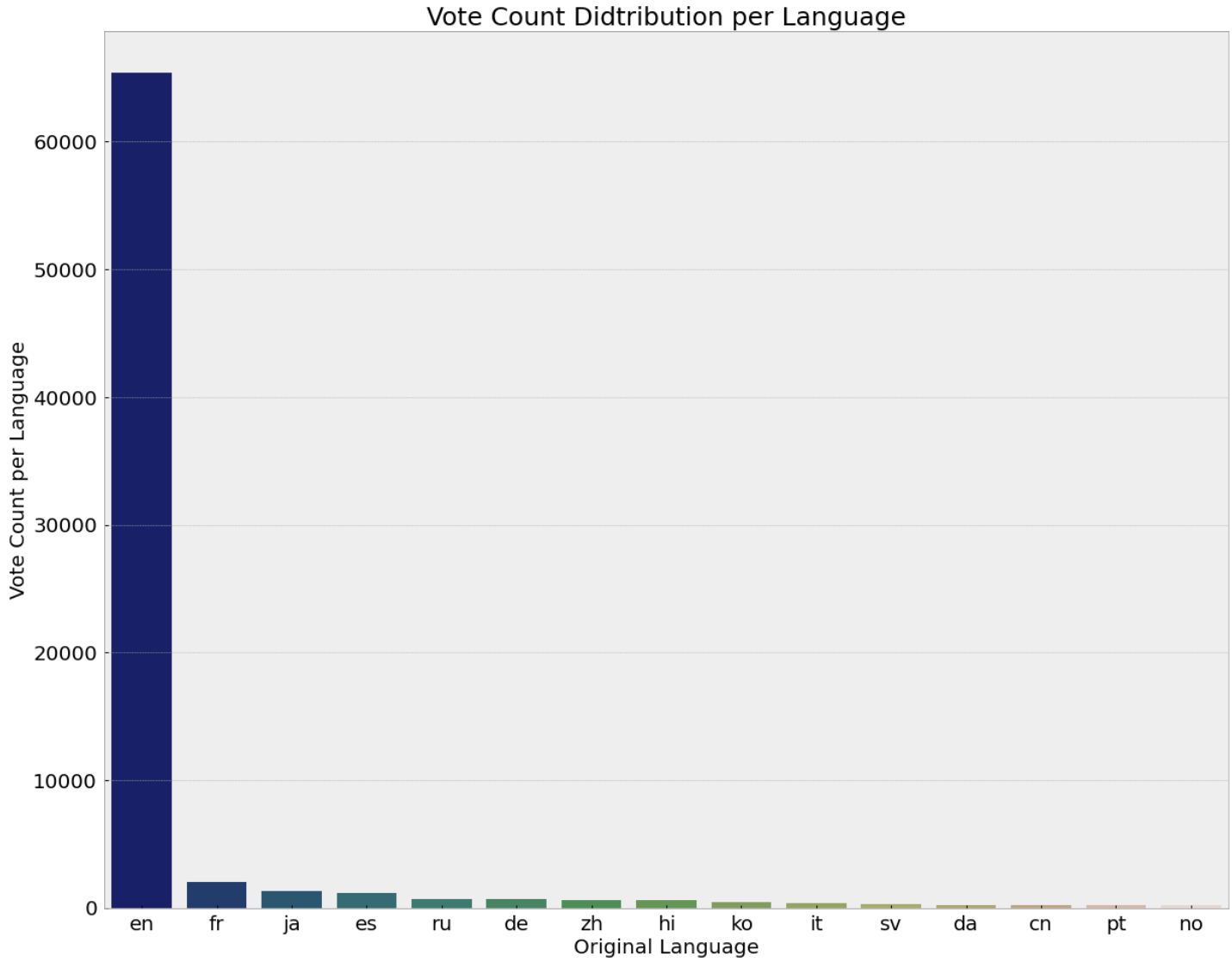
Out[93]:

original_language	id	popularity	vote_average	vote_count
en	5965885942	65358.018	118880.5	4310126
fr	106790129	2014.987	2901.2	69613
ja	63790796	1322.284	1615.5	40354
es	113744413	1162.910	2580.5	26406
ru	63352043	688.413	1540.8	4739
de	49666040	660.884	1370.7	12337
zh	52629409	632.511	1049.2	5719
hi	38892199	599.721	1014.6	7829
ko	25273453	427.452	623.2	10930
it	24295420	346.938	659.4	14810
sv	11661965	313.738	438.8	9170
da	10345170	224.532	332.4	7719
cn	10301620	220.277	290.9	5832
pt	24894746	217.726	561.5	3772
no	10127951	191.142	291.9	3722

In [94]:

```
#Making a bargraph for the languages based on the vote count they have recieved.

fig,ax = plt.subplots(figsize=(20,16))
sns.barplot(x = analyse_df3.index, y = analyse_df3['popularity'], palette='gist_earth')
```

```
plt.xlabel('Original Language', fontsize = 20)
plt.ylabel('Vote Count per Language', fontsize = 20)
plt.xticks(fontsize = 20)
plt.yticks(fontsize = 20)
plt.title('Vote Count Didtribution per Language', fontsize = 25)

#save plt for presentation
ax.figure.savefig('Vote Count Didtribution per Language');
```



In [95]:

```
#Assigning the tmdb_df which has been grouped by genre_id and sumed and sorted by popular
ity
#as analyse_df4
analyse_df4 = tmdb_df.groupby('genre_ids').sum().nlargest(50, 'popularity')

analyse_df4
```

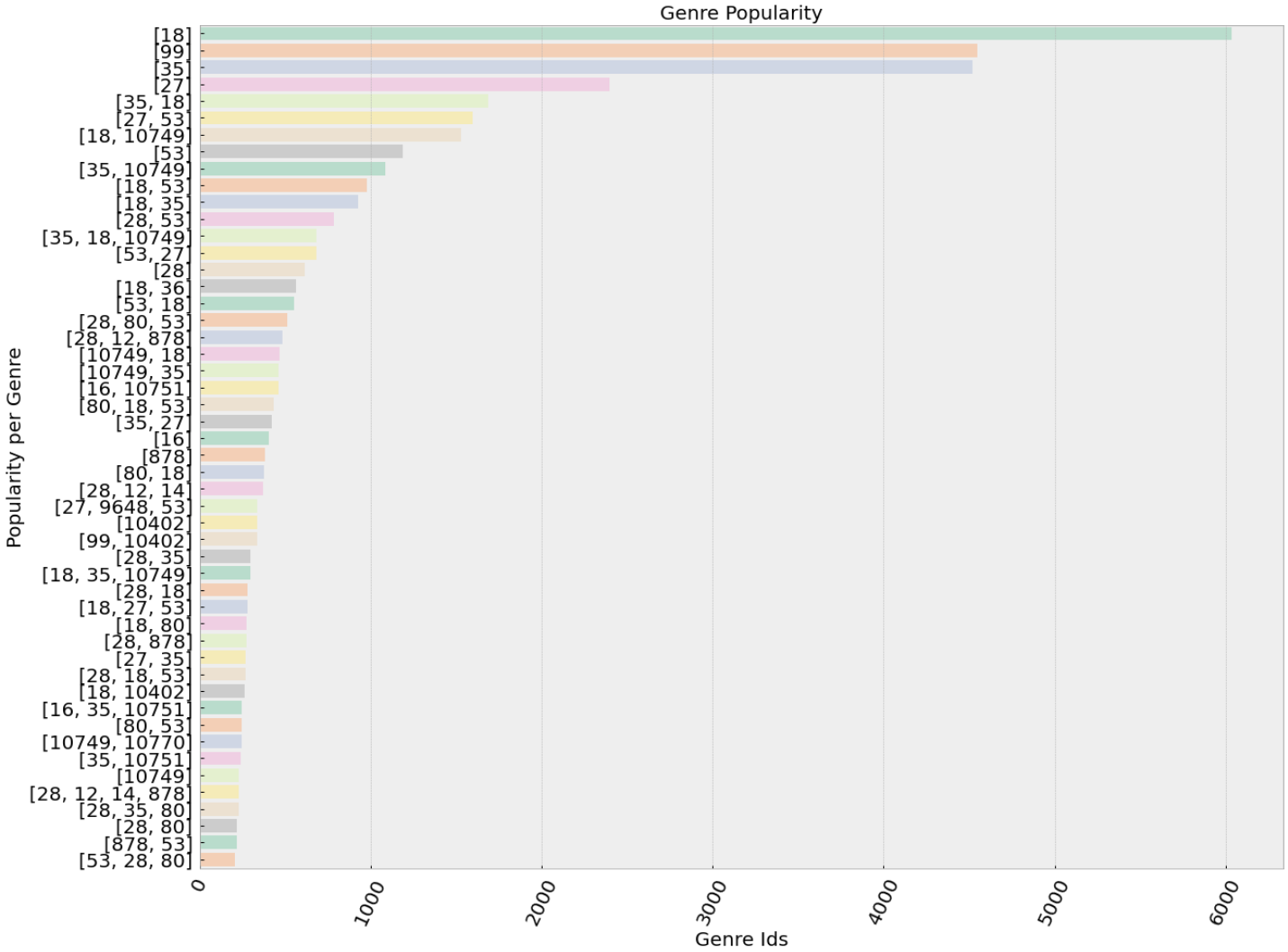
Out[95]:

genre_ids	id	popularity	vote_average	vote_count
[18]	593625587	6033.005	13223.2	201294
[99]	1124617764	4549.187	24208.2	36694
[35]	470535855	4518.355	9597.2	172424
[27]	374893115	2398.314	4999.5	44487
[35, 18]	115179657	1685.699	2644.1	75260
[27, 53]	92160620	1594.486	1695.8	82877
[18, 10749]	72415236	1527.800	2040.9	86415

[53]	153955594	1186.971	2418.5	18699
genre_ids	id	popularity	vote_average	vote_count
[35, 10749]	52873555	1087.869	1476.7	59471
[18, 53]	61554529	975.372	1387.8	50169
[18, 35]	77579452	929.750	1650.6	45018
[28, 53]	23681447	782.553	603.9	54459
[35, 18, 10749]	38154483	682.731	1001.2	46964
[53, 27]	70764182	682.593	992.6	18021
[28]	57940234	617.113	962.5	17807
[18, 36]	22383174	564.534	569.8	50996
[53, 18]	46718511	550.266	823.7	24486
[28, 80, 53]	13780134	511.767	331.8	45592
[28, 12, 878]	6886672	481.678	178.2	134627
[10749, 18]	42311055	468.397	815.0	27513
[10749, 35]	34356228	461.334	694.3	20977
[16, 10751]	27257290	459.313	642.0	26423
[80, 18, 53]	19879937	433.572	440.8	24609
[35, 27]	51063500	419.806	880.3	11691
[16]	80822313	404.803	1522.3	3736
[878]	70481930	384.135	1010.5	7064
[80, 18]	27287256	379.039	560.0	18476
[28, 12, 14]	7326585	371.613	145.9	72107
[27, 9648, 53]	13294506	337.543	266.2	23905
[10402]	101476737	336.399	2804.8	1369
[99, 10402]	61057591	336.187	1517.5	5067
[28, 35]	15752548	296.490	333.4	28623
[18, 35, 10749]	10219570	294.590	414.7	21894
[28, 18]	20005132	279.542	410.3	7640
[18, 27, 53]	17903222	279.020	342.1	10977
[18, 80]	15889857	273.868	331.5	20807
[28, 878]	20138362	272.118	314.9	31337
[27, 35]	37790226	270.040	599.3	4805
[28, 18, 53]	10104135	265.686	246.0	22514
[18, 10402]	16221494	263.196	379.9	22108
[16, 35, 10751]	9688486	248.141	257.8	34020
[80, 53]	9601641	247.586	226.1	11277
[10749, 10770]	39254053	246.341	526.4	1254
[35, 10751]	16369778	237.853	401.8	5279
[10749]	33781619	229.055	534.2	4941
[28, 12, 14, 878]	1427566	227.769	55.3	73313
[28, 35, 80]	7424230	227.337	182.7	24425
[28, 80]	10791479	218.734	224.4	21054
[878, 53]	11456461	214.866	196.6	10358
[53, 28, 80]	5882033	203.631	108.7	15967

In [96]:

```
# A bar graph showing the popularity of the varios genre
fig,ax = plt.subplots(figsize=(20,16))
sns.barplot(y = analyse_df4.index, x = analyse_df4['popularity'], palette='Pastel2')

plt.xlabel('Genre Ids', fontsize = 20)
plt.ylabel('Popularity per Genre', fontsize = 20)
plt.xticks(fontsize = 20, rotation = 65)
plt.yticks(fontsize = 20)
plt.title('Genre Popularity', fontsize = 20)

ax.figure.savefig('Genre Popularity.png');
```



DATA ANALYSIS OF `movie_basics`

In [97]:

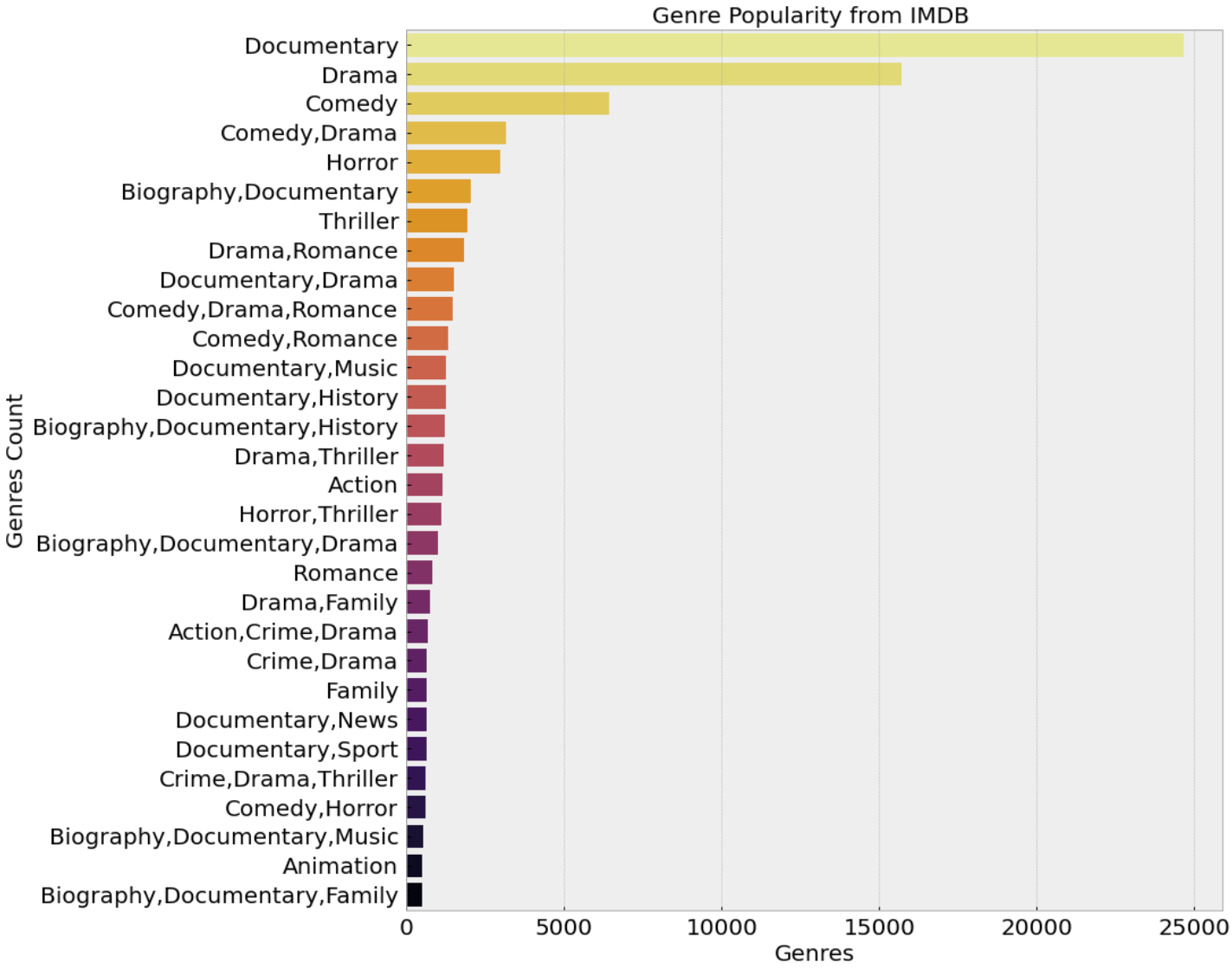
```
# grouping data based on genres

movie_b_analysis = movie_basics.groupby('genres').count().nlargest(30, 'movie_id')

movie_b_analysis.head()
```

Out[97]:

genres	movie_id	primary_title	original_title	start_year	runtime_minutes
Documentary	24672	24672	24672	24672	24672
Drama	15725	15725	15725	15725	15725
Comedy	6413	6413	6413	6413	6413
Comedy,Drama	3163	3163	3163	3163	3163
Horror	2975	2975	2975	2975	2975

In [98]:

```
fig,ax = plt.subplots(figsize=(20,16))
sns.barplot(y = movie_b_analysis.index, x = movie_b_analysis['movie_id'], palette='infer
no_r')

plt.xlabel('Genres', fontsize = 20)
plt.ylabel('Genres Count', fontsize = 20)
plt.xticks(fontsize = 20, rotation = 0)
plt.yticks(fontsize = 20)
plt.title('Genre Popularity from IMDB ', fontsize = 20)

#This adjusts cropping of the graph
plt.subplots_adjust(top=0.8, left = .4);
ax.figure.savefig('Genre Counts from IMDB.png');
```



In [99]:

```
#getting the top 30 genres based on there sum of total votes.

joined_for_sum_of_votes = joined_movie.nlargest(30, 'avg_rates')
joined_for_sum_of_votes.head()
```

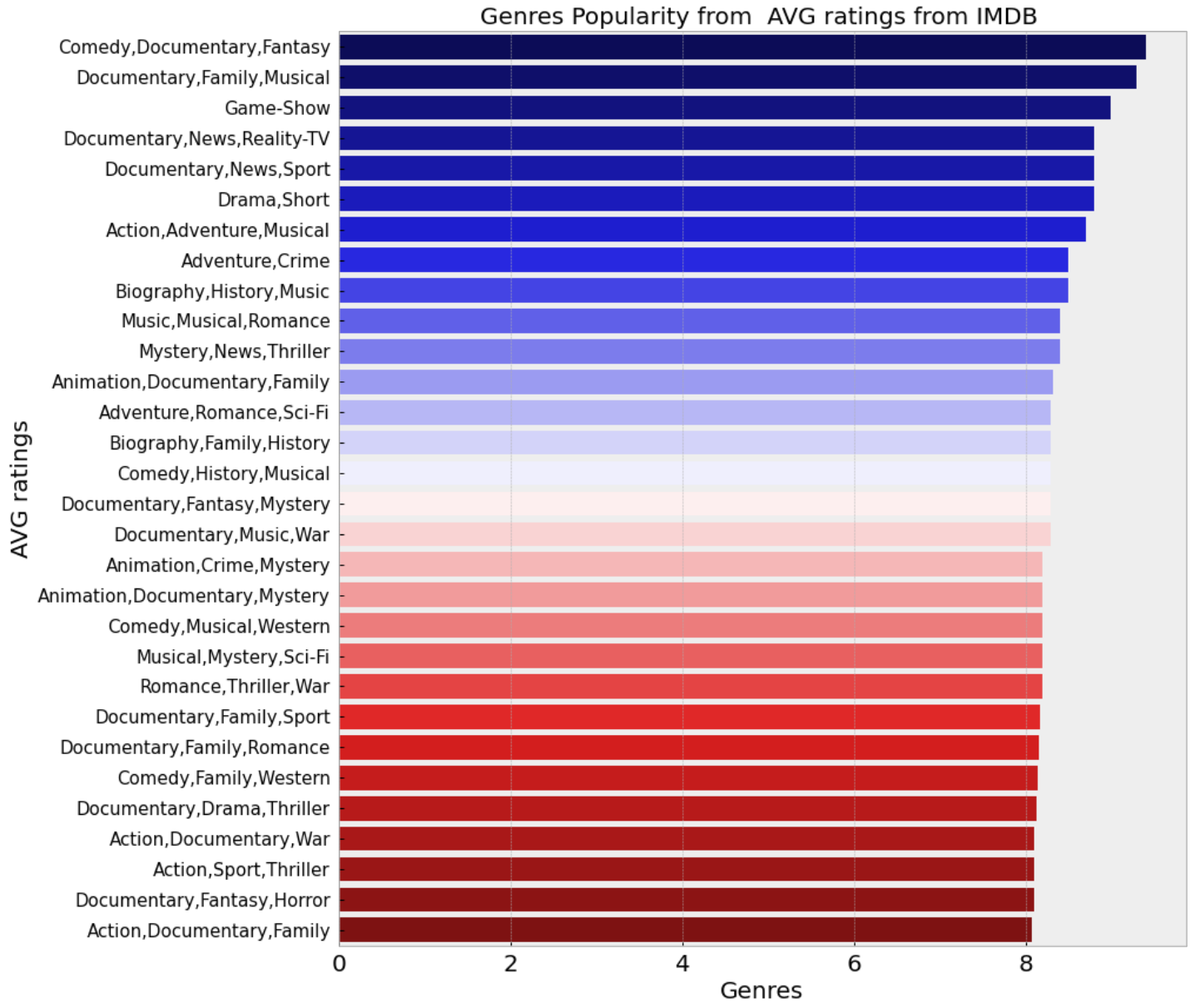
Out[99]:

	movie_id	genres	averagerating	numvotes	avg_rates	TTL_votes
905	tt4135932	Comedy,Documentary,Fantasy	9.4	5	9.4	5
904	tt3856476	Documentary,Family,Musical	9.3	19	9.3	19
903	tt2896176	Game-Show	9.0	7	9.0	7
900	tt3201538	Documentary,News,Reality-TV	8.8	8	8.8	8

901	tt4778838	Documentary,News,Sport	8.6	25	8.6	25

In [100]:

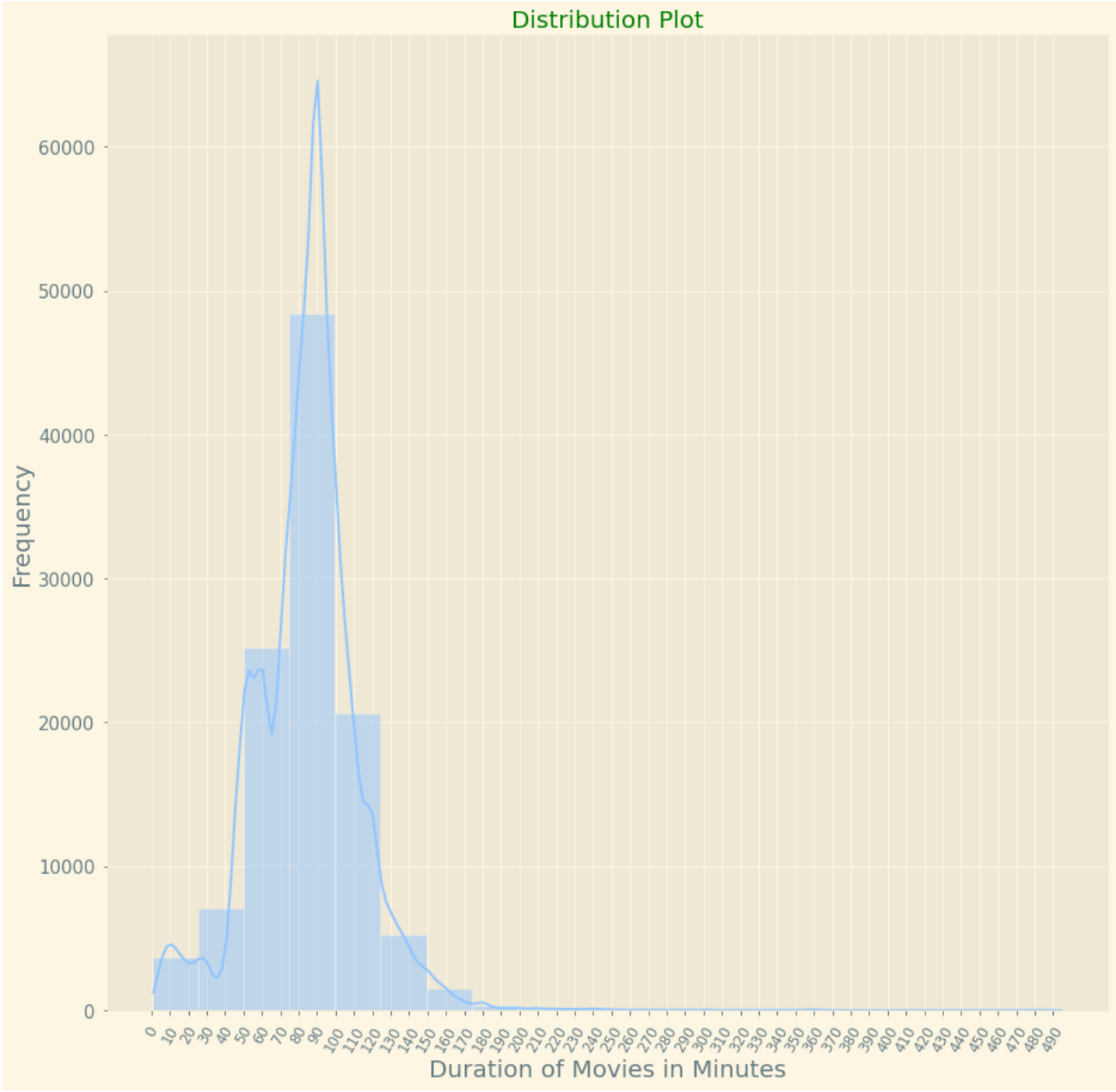
```
fig,ax = plt.subplots(figsize=(20,16))
sns.barplot(x = joined_for_sum_of_votes['avg_rates'], y = joined_for_sum_of_votes['genre
s'], palette='seismic')

plt.xlabel('Genres', fontsize = 20)
plt.ylabel('AVG ratings', fontsize = 20)
plt.xticks(fontsize = 20)
plt.yticks(fontsize = 15,rotation = 0)
plt.title('Genres Popularity from  AVG ratings from IMDB ', fontsize = 20)

#Ensures the y axis numbers are not displayed in there exponential form
ax.get_xaxis().get_major_formatter().set_scientific(False)

#This adjusts cropping of the graph
plt.subplots_adjust(top=0.8, left = .4);
ax.figure.savefig('Genre Popularity from AVG ratings (IMDB).png');
```



In [101]:

```
plt.style.use('Solarize_Light2')
plt.figure(figsize = (15,15))
sns.histplot(runtime_movies['runtime_minutes'],bins=20,kde = True)
plt.xticks(range(0,500,10),fontsize = 12, rotation = 60)
plt.yticks(fontsize = 15)
plt.xlabel('Duration of Movies in Minutes',fontsize = 20)
plt.ylabel('Frequency',fontsize = 20)
```

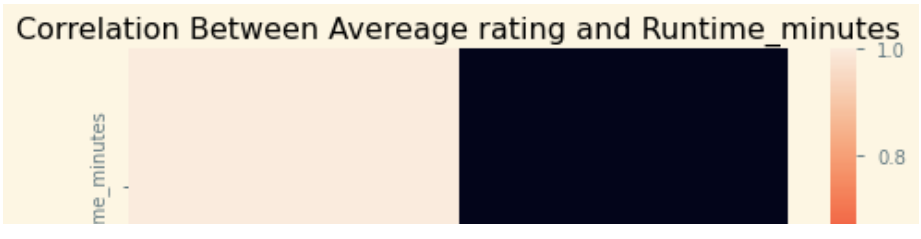
```
plt.title('Distribution Plot',fontsize = 20,color = 'g')
plt.show()

ax.figure.savefig('Distribution Plot Of Movie Lenght In Minutes');
```

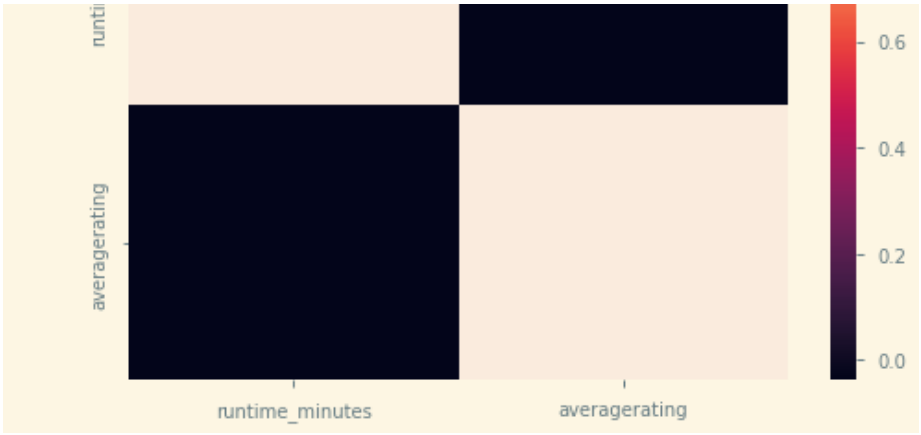


In [102]:

```
#Correlation between runtime and ratings
Correlation = runtime_corr.corr()
#fig, ax = plt.subplots(figsize = (15,15))
sns.heatmap(Correlation);
Correlation_ = Correlation_ = runtime_corr['runtime_minutes'].corr(runtime_corr['average rating'])
print(Correlation_)
ax.figure.savefig('Correlation between Average rating and Runtime.')
plt.title('Correlation Between Avereage rating and Runtime_minutes');
```

```
-0.03788858926752379
```

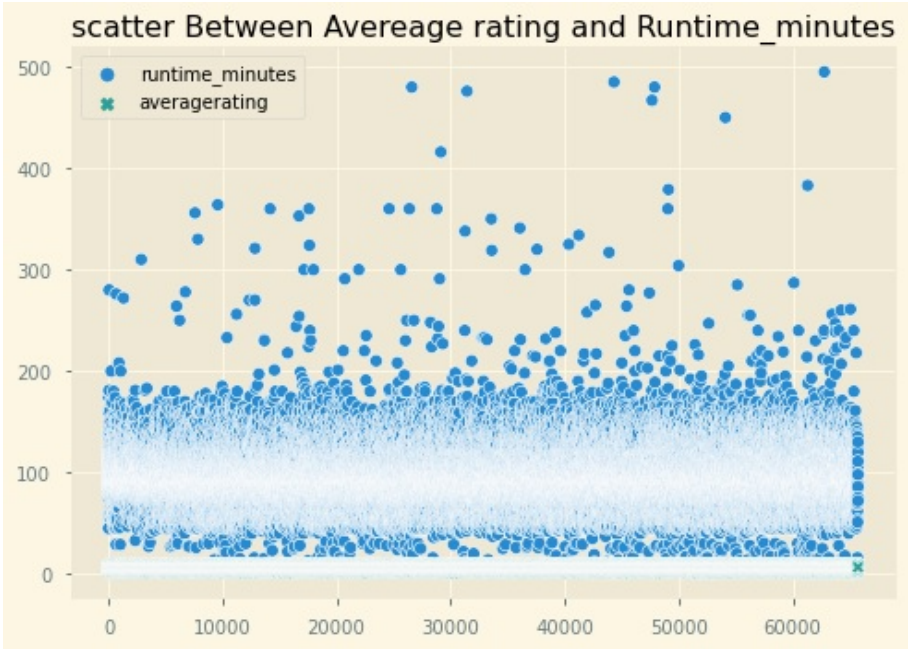




In [103]:

```
#Correlation between runtime and ratings
Correlation = runtime_corr.corr()
#fig, ax = plt.subplots(figsize = (15,15))
sns.scatterplot(data = runtime_corr);
Correlation_ = Correlation_ = runtime_corr['runtime_minutes'].corr(runtime_corr['average
rating'])
print(Correlation_)
ax.figure.savefig('Correlation between Average rating and Runtime.')
plt.title('scatter Between Avereage rating and Runtime_minutes');
```

```
-0.03788858926752379
```



In [104]:

```
#using yearly_runtime_trends to plot a line plot of runtime fluctuations over the years.

plt.style.use('seaborn-notebook')
plt.style.use('bmh')
fig,ax =plt.subplots(figsize = (14,10))
#ax.get_yaxis().get_major_formatter().set_scientific(False)
sns.lineplot(data = yearly_runtime_trends)
plt.title('RUNTIME TRENDS OVER THE YEARS',fontsize = 15,color = 'r')
plt.ylabel('MINUTES ',fontsize = 19,color = 'r')
plt.xlabel('YEARS', fontsize = 15)
plt.yticks(rotation = 60,fontsize = 19)
plt.xticks(fontsize = 15)
plt.legend(fontsize = 15)
#This adjusts cropping of the graph
plt.subplots_adjust(top=0.85,left = 0.2)

# Changing color ot text in legend for visibility
leg = plt.legend(loc='upper left',fontsize = 15)
for text in leg.get_texts():
```

```
    text.set_color("black")


#saving the plt
ax.figure.savefig('RUNTIME TRENDS OVER THE YEARS');
```