Final Project Submission

Please fill out:

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- Student pace: full time
- Scheduled project review date/time: October 7th, 2022
- Instructor name: Joseph Mata
- Blog post URL: https://troykhendrix22.blogspot.com/ (https://troykhendrix22.blogspot.com/)

Project Overview

In this project I was assigned the task to help Microsoft get into the film industry by using exploratory data analysis, also known as "EDA", to convince potential sharetakers that not only would this be a great industry to invest in but also show the value of what being in the industry is all about. I came up with three proposals that could help guide this company in the right direction of success.

Business Problem

Microsoft, one of the largest and most successful tech companies in the world has decided to take its talents elsewhere, the film industry. I was designated to introduce data and make insights on what makes other film companies successful and how Microsoft can use these insights to get started on the right foot in the film industry.

Data

In this project I used the data from The Numbers, Disney, and IMDB which contained multiple columns of data including genres, worldwide gross, domestic gross, and information on disney's box office transactions over the years.

Loading the datasets and displaying columns and rows

In [2]:
```
import pandas as pd
import csv
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import numpy as np
import sqlite3
conn = sqlite3.Connection('zippedData/im.db')
```

In [56]:
```
imdb_tables = """
SELECT name FROM sqlite_master WHERE type='table'
"""
pd.read_sql(imdb_tables, conn)

```

Out[56]:

	name
0	movie_basics
1	directors
2	known_for
3	movie_akas
4	movie_ratings
5	persons
6	principals
7	writers

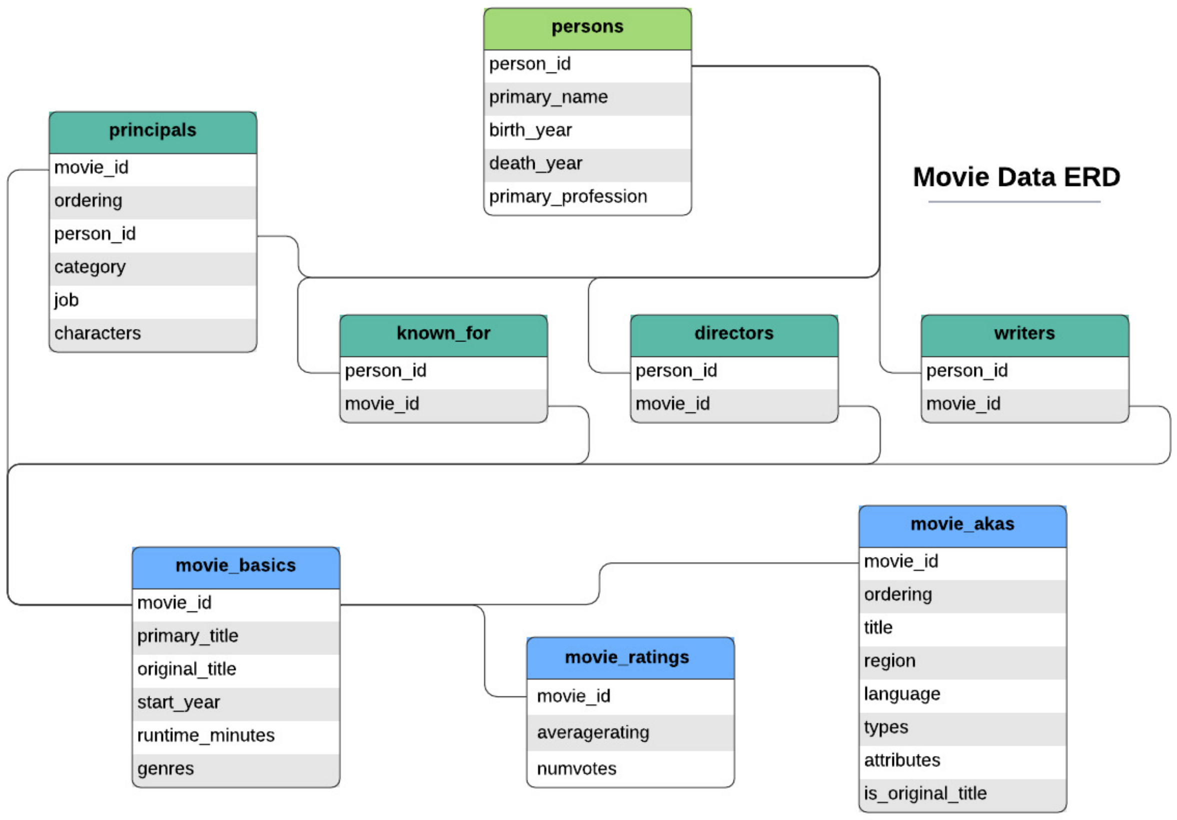
In [12]:
```
movie_basics = pd.read_sql("""
SELECT * FROM movie_basics""", conn)

movie_basics
```

Out[12]:

	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
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 6 columns



In [7]:
```
df_gross = pd.read_csv('./zippedData/bom.movie_gross.csv.gz')
df_gross
```

Out[7]:

	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 Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010
...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	NaN	2018
3383	Edward II (2018 re-release)	FM	4800.0	NaN	2018
3384	El Pacto	Sony	2500.0	NaN	2018
3385	The Swan	Synergetic	2400.0	NaN	2018
3386	An Actor Prepares	Grav.	1700.0	NaN	2018

3387 rows × 5 columns

In [8]:
```
df_gross.info()
```

```
<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
```

- Can see in columns: studio, domestic_gross, and foreign_gross all have null values that will need to be cleaned
- Data types: 1 float, 1 int, 3 objects

In [29]:

```
df_disney = pd.read_csv('./zippedData/disney_plus_titles.csv')
df_disney
```

Out[29]:

	show_id	type	title	director	cast	country	date_added	release_year
0	s1	Movie	Duck the Halls: A Mickey Mouse Christmas Special	Alonso Ramirez Ramos, Dave Wasson	Chris Diamantopoulos, Tony Anselmo, Tress MacN...	NaN	November 26, 2021	2016
1	s2	Movie	Ernest Saves Christmas	John Cherry	Jim Varney, Noelle Parker, Douglas Seale	NaN	November 26, 2021	1988
2	s3	Movie	Ice Age: A Mammoth Christmas	Karen Disher	Raymond Albert Romano, John Leguizamo, Denis L...	United States	November 26, 2021	2011
3	s4	Movie	The Queen Family Singalong	Hamish Hamilton	Darren Criss, Adam Lambert, Derek Hough, Alexa...	NaN	November 26, 2021	2021
4	s5	TV Show	The Beatles: Get Back	NaN	John Lennon, Paul McCartney, George Harrison, ...	NaN	November 25, 2021	2021
...	...	...	...	...	...	...	...	...
1445	s1446	Movie	X-Men Origins: Wolverine	Gavin Hood	Hugh Jackman, Liev Schreiber, Danny Huston, wi...	United States, United Kingdom	June 4, 2021	2009
1446	s1447	Movie	Night at the Museum: Battle of the Smithsonian	Shawn Levy	Ben Stiller, Amy Adams, Owen Wilson, Hank Azar...	United States, Canada	April 2, 2021	2009
1447	s1448	Movie	Eddie the Eagle	Dexter Fletcher	Tom Costello, Jo Hartley, Keith Allen, Dickon ...	United Kingdom, Germany, United States	December 18, 2020	2016
1448	s1449	Movie	Bend It Like Beckham	Gurinder Chadha	Parminder Nagra, Keira Knightley, Jonathan Rhy...	United Kingdom, Germany, United States	September 18, 2020	2003
1449	s1450	Movie	Captain Sparky vs. The Flying Saucers	Mark Waring	Charlie Tahan	United States	April 1, 2020	2012

1450 rows × 12 columns

In [10]:
```
df_movie_info = pd.read_table('./zippedData/rt.movie_info.tsv.gz')
df_movie_info
```

Out[10]:

	id	synopsis	rating	genre	director	writer	theater
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9
4	7	NaN	NR	Drama|Romance	Rodney Bennett	Giles Cooper	
...	...	...	...	...	...	...	
1555	1996	Forget terrorists or hijackers -- there's a ha...	R	Action and Adventure|Horror|Mystery and Suspense	NaN	NaN	Aug 18
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 23
1557	1998	Based on a novel by Richard Powell, when the l...	G	Classics|Comedy|Drama|Musical and Performing Arts	Gordon Douglas	NaN	Jan 1
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr 1
1559	2000	Suspended from the force, Paris cop Hubert is ...	R	Action and Adventure|Art House and Internation...	NaN	Luc Besson	Sep 27

1560 rows × 12 columns

In [11]:
```
df_movie_info.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1560 entries, 0 to 1559
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   id            1560 non-null   int64 
 1   synopsis      1498 non-null   object
 2   rating        1557 non-null   object
 3   genre         1552 non-null   object
 4   director      1361 non-null   object
 5   writer        1111 non-null   object
 6   theater_date  1201 non-null   object
 7   dvd_date      1201 non-null   object
 8   currency      340 non-null    object
 9   box_office    340 non-null    object
 10  runtime       1530 non-null   object
 11  studio        494 non-null    object
dtypes: int64(1), object(11)
memory usage: 146.4+ KB
```

In [12]:
```
df_movie_info.isna().sum()
```

Out[12]:
```
id                 0
synopsis          62
rating             3
genre              8
director         199
writer           449
theater_date     359
dvd_date         359
currency        1220
box_office      1220
runtime           30
studio          1066
dtype: int64
```

- almost entire data set dirty. null values all throughout
- only 1 int and the rest are objects

In [13]:
```
df_reviews = pd.read_table('zippedData/rt.reviews.tsv.gz', encoding = '
df_reviews
```

Out[13]:

	id	review	rating	fresh	critic	top_critic	publisher	date
0	3	A distinctly gallows take on contemporary fina...	3/5	fresh	PJ Nabarro	0	Patrick Nabarro	November 10, 2018
1	3	It's an allegory in search of a meaning that n...	NaN	rotten	Annalee Newitz	0	io9.com	May 23, 2018
2	3	... life lived in a bubble in financial dealin...	NaN	fresh	Sean Axmaker	0	Stream on Demand	January 4, 2018
3	3	Continuing along a line introduced in last yea...	NaN	fresh	Daniel Kasman	0	MUBI	November 16, 2017
4	3	... a perverse twist on neorealism...	NaN	fresh	NaN	0	Cinema Scope	October 12, 2017
...	...	...	...	...	...	...	...	...
54427	2000	The real charm of this trifle is the deadpan c...	NaN	fresh	Laura Sinagra	1	Village Voice	September 24, 2002
54428	2000	NaN	1/5	rotten	Michael Szymanski	0	Zap2it.com	September 21, 2005
54429	2000	NaN	2/5	rotten	Emanuel Levy	0	EmanuelLevy.Com	July 17, 2005
54430	2000	NaN	2.5/5	rotten	Christopher Null	0	Filmcritic.com	September 7, 2003
54431	2000	NaN	3/5	fresh	Nicolas Lacroix	0	Showbizz.net	November 12, 2002

54432 rows × 8 columns

In [14]:
```
df_reviews.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 54432 entries, 0 to 54431
Data columns (total 8 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   id          54432 non-null  int64 
 1   review      48869 non-null  object
 2   rating      40915 non-null  object
 3   fresh       54432 non-null  object
 4   critic      51710 non-null  object
 5   top_critic  54432 non-null  int64 
 6   publisher   54123 non-null  object
 7   date        54432 non-null  object
dtypes: int64(2), object(6)
memory usage: 3.3+ MB
```

In [15]:
```
df_reviews.date = pd.to_datetime(df_reviews.date)
```

In [16]:
```
date2 = df_reviews[df_reviews.date.dt.year >= 2017]
date2
```

Out[16]:

	id	review	rating	fresh	critic	top_critic	publisher	date
0	3	A distinctly gallows take on contemporary fina...	3/5	fresh	PJ Nabarro	0	Patrick Nabarro	2018-11-10
1	3	It's an allegory in search of a meaning that n...	NaN	rotten	Annalee Newitz	0	io9.com	2018-05-23
2	3	... life lived in a bubble in financial dealin...	NaN	fresh	Sean Axmaker	0	Stream on Demand	2018-01-04
3	3	Continuing along a line introduced in last yea...	NaN	fresh	Daniel Kasman	0	MUBI	2017-11-16
4	3	... a perverse twist on neorealism...	NaN	fresh	NaN	0	Cinema Scope	2017-10-12
...	...	...	...	...	...	...	...	...
54047	1993	With Life With Mikey, there's a little bit of ...	NaN	fresh	Malcolm Johnson	0	Hartford Courant	2018-06-08
54058	1995	A god awful committee made action film that fa...	NaN	rotten	Felix Vasquez	0	Cinema Crazed	2017-04-23
54175	1996	This is a good-looking film, and Jackson is ju...	B	fresh	Joel Siegel	0	Good Morning America	2018-01-04
54348	1999	The Sandlot almost does for baseball what A Ch...	NaN	fresh	Malcolm Johnson	0	Hartford Courant	2018-05-30
54349	1999	Though all but the two lead children are medio...	NaN	fresh	Quentin Curtis	0	Independent on Sunday	2017-12-12

5653 rows × 8 columns

- Null values in 5 out of the 8 columns.
- includes 2 int, 6 objects

In [17]:
```
df_movies = pd.read_csv('./zippedData/tmdb.movies.csv.gz')
df_movies
```

Out[17]:

	Unnamed: 0	genre_ids	id	original_language	original_title	popularity	release_date
0	0	[12, 14, 10751]	12444	en	Harry Potter and the Deathly Hallows: Part 1	33.533	2010-11-19
1	1	[14, 12, 16, 10751]	10191	en	How to Train Your Dragon	28.734	2010-03-26
2	2	[12, 28, 878]	10138	en	Iron Man 2	28.515	2010-05-07
3	3	[16, 35, 10751]	862	en	Toy Story	28.005	1995-11-22
4	4	[28, 878, 12]	27205	en	Inception	27.920	2010-07-16
...	...	...	...	...	...	...	...
26512	26512	[27, 18]	488143	en	Laboratory Conditions	0.600	2018-10-13
26513	26513	[18, 53]	485975	en	_EXHIBIT_84xxx_	0.600	2018-05-01
26514	26514	[14, 28, 12]	381231	en	The Last One	0.600	2018-10-01
26515	26515	[10751, 12, 28]	366854	en	Trailer Made	0.600	2018-06-22
26516	26516	[53, 27]	309885	en	The Church	0.600	2018-10-05

26517 rows × 10 columns

In [18]:
```
df_movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 26517 entries, 0 to 26516
Data columns (total 10 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Unnamed: 0         26517 non-null  int64  
 1   genre_ids          26517 non-null  object 
 2   id                 26517 non-null  int64  
 3   original_language  26517 non-null  object 
 4   original_title     26517 non-null  object 
 5   popularity         26517 non-null  float64
 6   release_date       26517 non-null  object 
 7   title              26517 non-null  object 
 8   vote_average       26517 non-null  float64
 9   vote_count         26517 non-null  int64  
dtypes: float64(2), int64(3), object(5)
memory usage: 2.0+ MB
```

- no null values
- 2 float, 3 int, 5 objects

In [64]:
```
df_budgets = pd.read_csv('./zippedData/tn.movie_budgets.csv.gz')
df_budgets
```

Out[64]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
2	3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
3	4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747
...	...	...	...	...	...	...
5777	78	Dec 31, 2018	Red 11	$7,000	$0	$0
5778	79	Apr 2, 1999	Following	$6,000	$48,482	$240,495
5779	80	Jul 13, 2005	Return to the Land of Wonders	$5,000	$1,338	$1,338
5780	81	Sep 29, 2015	A Plague So Pleasant	$1,400	$0	$0
5781	82	Aug 5, 2005	My Date With Drew	$1,100	$181,041	$181,041

5782 rows × 6 columns

In [70]:
```
df_budgets.head()
```

Out[70]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
2	3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
3	4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

- no null values
- 1 int and 5 objects

In [21]:
```
#Change release_date to a datetime type
df_movies.release_date = pd.to_datetime(df_movies.release_date)
```

In [22]:
```
#filter films that have happened within past 5 years 2012 - present
release_date = df_movies[df_movies.release_date.dt.year >= 2017]
release_date
```

Out[22]:

	Unnamed: 0	genre_ids	id	original_language	original_title	popularity	release_date
4535	4535	[99, 80, 36, 10770]	510653	en	Inside The Mob's Bloody Valentine	0.600	2017-03-15
14315	14315	[27, 53]	334536	en	The Blackcoat's Daughter	10.153	2017-03-31
14353	14353	[27]	354216	en	The Devil's Candy	9.291	2017-03-17
15238	15238	[99]	333851	en	Romeo Is Bleeding	2.087	2017-07-19
15280	15280	[35, 10751, 18]	426469	en	Growing Up Smith	1.981	2017-02-03
...	...	...	...	...	...	...	...
26512	26512	[27, 18]	488143	en	Laboratory Conditions	0.600	2018-10-13
26513	26513	[18, 53]	485975	en	_EXHIBIT_84xxx_	0.600	2018-05-01
26514	26514	[14, 28, 12]	381231	en	The Last One	0.600	2018-10-01
26515	26515	[10751, 12, 28]	366854	en	Trailer Made	0.600	2018-06-22
26516	26516	[53, 27]	309885	en	The Church	0.600	2018-10-05

5796 rows × 10 columns

In [23]:
```
#Change release_date to a datetime type
df_budgets.release_date = pd.to_datetime(df_budgets.release_date)
```

In [24]:
```
#filter films that haave happened within past 5 years 2017 - present
release_date2 = df_budgets[df_budgets.release_date.dt.year >= 2017]
release_date2
```

Out[24]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
2	3	2019-06-07	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747
6	7	2018-04-27	Avengers: Infinity War	$300,000,000	$678,815,482	$2,048,134,200
8	9	2017-11-17	Justice League	$300,000,000	$229,024,295	$655,945,209
11	12	2018-05-25	Solo: A Star Wars Story	$275,000,000	$213,767,512	$393,151,347
...	...	...	...	...	...	...
5571	72	2017-04-28	Sleight	$250,000	$3,930,990	$3,934,450
5645	46	2017-06-16	Arrowhead	$180,000	$0	$0
5685	86	2017-07-07	A Ghost Story	$100,000	$1,594,798	$2,769,782
5744	45	2017-01-27	Emily	$27,000	$3,547	$3,547
5777	78	2018-12-31	Red 11	$7,000	$0	$0

381 rows × 6 columns

Question 1: Which genre gives you the greatest ROI and what season gives you the best result?

In [5]:
```
df_budgets.head()
```

Out[5]:

	id	release_date	movie	production_budget	domestic_gross	worldwide_gross
0	1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
1	2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
2	3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
3	4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
4	5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [6]:

```
#Change format of columns and convert them to int
df_budgets['month'] = df_budgets['release_date'].str[:3]
df_budgets['year'] = df_budgets['release_date'].str[-4:]
df_budgets['budget'] = df_budgets['production_budget'].str.replace('$',
df_budgets['budget'] = df_budgets['budget'].str.replace(',','').astype(
df_budgets['domestic'] = df_budgets['domestic_gross'].str.replace('$','
df_budgets['domestic'] = df_budgets['domestic'].str.replace(',','').ast
df_budgets['worldwide'] = df_budgets['worldwide_gross'].str.replace('$'
df_budgets['worldwide'] = df_budgets['worldwide'].str.replace(',','').a
df_budgets['foreign'] = df_budgets['worldwide'] - df_budgets['domestic'
```

```
/var/folders/83/sb2tv79n3r11w7g4_w_37bmr0000gn/T/ipykernel_57176/42365601
01.py:4: FutureWarning: The default value of regex will change from True
to False in a future version. In addition, single character regular expre
ssions will *not* be treated as literal strings when regex=True.
  df_budgets['budget'] = df_budgets['production_budget'].str.replace
('$','')
/var/folders/83/sb2tv79n3r11w7g4_w_37bmr0000gn/T/ipykernel_57176/42365601
01.py:6: FutureWarning: The default value of regex will change from True
to False in a future version. In addition, single character regular expre
ssions will *not* be treated as literal strings when regex=True.
  df_budgets['domestic'] = df_budgets['domestic_gross'].str.replace
('$','')
/var/folders/83/sb2tv79n3r11w7g4_w_37bmr0000gn/T/ipykernel_57176/42365601
01.py:8: FutureWarning: The default value of regex will change from True
to False in a future version. In addition, single character regular expre
ssions will *not* be treated as literal strings when regex=True.
  df_budgets['worldwide'] = df_budgets['worldwide_gross'].str.replace
('$','')
```

In [7]:

```
df_budgets.rename({'movie':'title'},axis=1,inplace=True)
```

In [23]:

```
#Create a function to show the seasons in which each movie was created
def get_season(month):
    if month in ['Dec','Jan','Feb']:
        return 'Winter'
    elif month in ['Mar','Apr','May']:
        return 'Spring'
    elif month in ['Jun','Jul','Aug']:
        return 'Summer'
    else:
        return 'Fall'
```

In [9]:
```
#Filter columns to show movies made in 2012 and after to show data of m
bud_cols = ['title','year','month','budget','domestic','foreign','world
bud = df_budgets[bud_cols]
bud = bud[bud['year'].astype(int) >= 2012]
#Calculate ROI for domestic and worldwide gross by multiplying the tota
bud['roi_%_domestic'] = 100*(bud['domestic'] - bud['budget']) / bud['bu
bud['roi_%_worldwide'] = 100*(bud['worldwide'] - bud['budget']) / bud['
#Calculate Total Profit by subtracting worldwide gross and overall budg
bud['total_profit'] = bud['worldwide'] - bud['budget']
#Add new column Season to show when movie was made.
bud['Season'] = bud['month'].apply(get_season)
```

In [10]:
```
bud.head()
```

Out[10]:

	title	year	month	budget	domestic	foreign	worldwide	roi_%_domestic	roi_%_
2	Dark Phoenix	2019	Jun	350000000	42762350	107000000	149762350	-87.782186	
3	Avengers: Age of Ultron	2015	May	330600000	459005868	944008095	1403013963	38.840250	
4	Star Wars Ep. VIII: The Last Jedi	2017	Dec	317000000	620181382	696540365	1316721747	95.640815	
5	Star Wars Ep. VII: The Force Awakens	2015	Dec	306000000	936662225	1116648995	2053311220	206.098766	
6	Avengers: Infinity War	2018	Apr	300000000	678815482	1369318718	2048134200	126.271827	

In [328]:

```
movie_basics.info()
```

```
<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   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 [14]:

```
#Merged genres column to dataset
movie_basics.rename({'primary_title':'title'},axis=1,inplace=True)
basics_cols = ['title','genres']
imdb_filter = movie_basics[basics_cols]
merged_budgets = imdb_filter.merge(bud,on = 'title',how = 'right')
#drop duplicates on dataframe
merged_budgets = merged_budgets.drop_duplicates(subset = 'title', keep=
```

In [63]:
```
merged_budgets.tail(30)
```

Out[63]:

	title	genres	year	month	budget	domestic	foreign	worldwi
2269	Queen Crab	Action,Sci-Fi,Thriller	2015	Sep	75000	0	0	
2270	Happy Christmas	None	2014	Jul	70000	30312	0	303
2272	Supporting Characters	Comedy	2013	Jan	60000	4917	0	49
2273	The FP	Comedy	2012	Mar	60000	0	0	
2274	Hayride	Crime,Drama,Horror	2012	Dec	60000	0	0	
2275	The Dirties	Crime,Drama	2013	Oct	55000	0	0	
2276	Counting	Documentary	2015	Jul	50000	8374	0	83
2277	Down and Dangerous	Crime,Thriller	2014	Feb	50000	0	0	
2278	Bending Steel	Documentary	2015	Aug	50000	0	0	
2279	Run, Hide, Die	Horror,Thriller	2015	Sep	50000	0	0	
2280	The Image Revolution	Biography,Documentary	2014	Dec	50000	0	0	
2281	A True Story	Comedy	2013	Oct	45000	0	0	
2282	This Is Martin Bonner	Drama	2013	Jun	42000	0	0	
2283	Foreign Letters	Comedy,Drama	2012	Mar	40000	0	0	
2284	Her Cry: La Llorona Investigation	Horror	2013	Oct	35000	0	0	
2285	Happy 40th	Drama	2014	Dec	35000	0	0	
2286	Krisha	Drama	2016	Mar	30000	144822	0	1448
2287	Paraphobia	Comedy,Horror,Thriller	2013	Dec	30000	0	0	
2288	Emily	Drama	2017	Jan	27000	3547	0	35
2291	Exeter	Horror,Mystery,Thriller	2015	Sep	25000	0	489792	4897
2294	Ten	Drama	2015	Apr	25000	0	0	
2297	Dutch Kills	Crime,Drama,Thriller	2015	Dec	25000	0	0	
2298	Dry Spell	Comedy,Romance	2014	Dec	22000	0	0	
2299	All Superheroes Must Die	Sci-Fi,Thriller	2013	Jan	20000	0	0	
2300	The Front Man	Biography,Comedy,Documentary	2015	Apr	20000	0	0	

	title	genres	year	month	budget	domestic	foreign	worldwi
2301	Stories of Our Lives	Drama	2014	Dec	15000	0	0	
2302	Family Motocross	NaN	2015	May	10000	0	0	
2303	Newlyweds	Comedy,Drama	2012	Jan	9000	4584	0	45
2304	Red 11	Horror,Sci-Fi,Thriller	2018	Dec	7000	0	0	
2305	A Plague So Pleasant	Drama,Horror,Thriller	2015	Sep	1400	0	0	

In [17]:

```python
#create a set for all genres in the dataset
#clean genre column of all null values
genre_set = set()
genre_df = merged_budgets['genres'].dropna()
for genres in genre_df.values:
    genre_list = genres.split(',')
    new_genre_set = set(genre_list)
    genre_set = genre_set.union(new_genre_set)
genre_set = sorted(list(genre_set))
genre_set
```

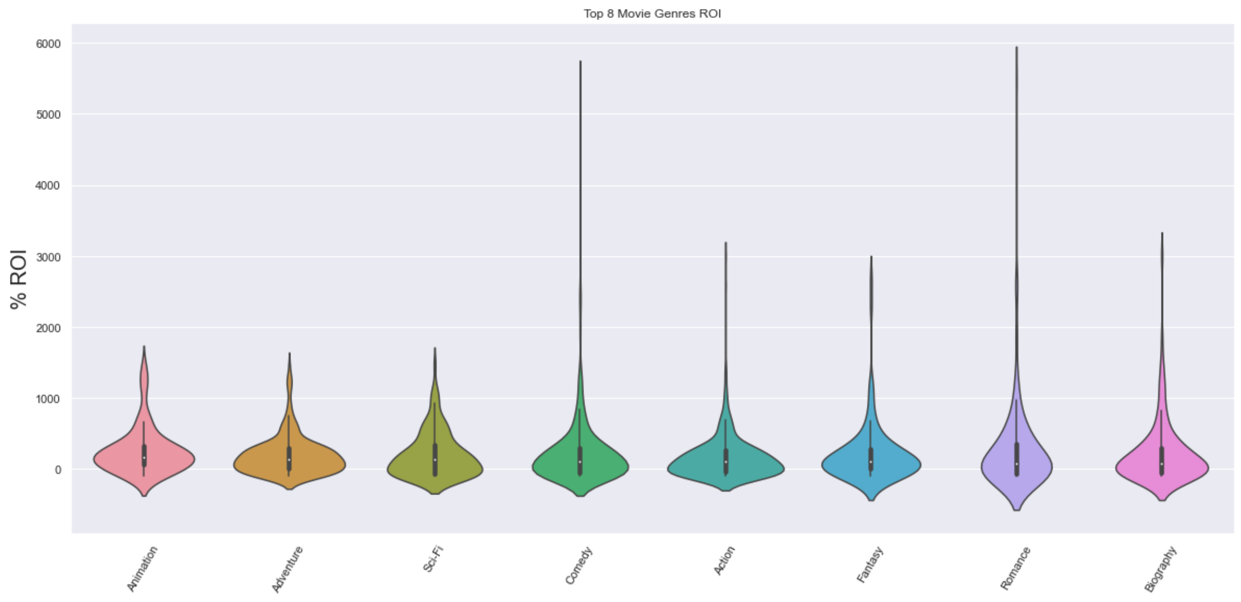
Out[17]:

```
['Action',
 'Adventure',
 'Animation',
 'Biography',
 'Comedy',
 'Crime',
 'Documentary',
 'Drama',
 'Family',
 'Fantasy',
 'History',
 'Horror',
 'Music',
 'Musical',
 'Mystery',
 'Romance',
 'Sci-Fi',
 'Sport',
 'Thriller',
 'War',
 'Western']
```

In [20]:
```
#Create new dataframe with set of all genres as column names
budgets_genre = pd.DataFrame()
profit_genre = pd.DataFrame()
#Merge all movies as values for each genre with ROI and Total Profit
for genre in genre_set:
    genre_df_new = merged_budgets[merged_budgets['genres'].str.contains
    budgets_genre = pd.concat([budgets_genre,genre_df_new['roi_%_worldw
    profit_genre = pd.concat([profit_genre,genre_df_new['total_profit']
budgets_genre.columns = genre_set
profit_genre.columns = genre_set
budgets_genre.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 1406 entries, 0 to 2065
Data columns (total 21 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   Action       377 non-null    float64
 1   Adventure    302 non-null    float64
 2   Animation    85 non-null     float64
 3   Biography    131 non-null    float64
 4   Comedy       434 non-null    float64
 5   Crime        212 non-null    float64
 6   Documentary  69 non-null     float64
 7   Drama        689 non-null    float64
 8   Family       68 non-null     float64
 9   Fantasy      101 non-null    float64
 10  History      48 non-null     float64
 11  Horror       186 non-null    float64
 12  Music        55 non-null     float64
 13  Musical      8 non-null      float64
 14  Mystery      115 non-null    float64
 15  Romance      155 non-null    float64
 16  Sci-Fi       128 non-null    float64
 17  Sport        28 non-null     float64
 18  Thriller     248 non-null    float64
 19  War          15 non-null     float64
 20  Western      9 non-null      float64
dtypes: float64(21)
memory usage: 241.7+ KB
```

In [42]:
```
#create new variable indexing top 8 values of genres
top_genre = budgets_genre[budgets_genre.median().sort_values(ascending=
#plot violin plot of top 8 genres
sns.set(rc={'figure.figsize':(20,9)})
sns.set_theme(style='darkgrid',context='notebook', palette='rocket')
genre_violin = sns.violinplot(data = top_genre)
plt.xticks(rotation = 60)
genre_violin.set_ylabel('% ROI', fontsize=20);
genre_violin.set_title('Top 8 Movie Genres ROI');
```

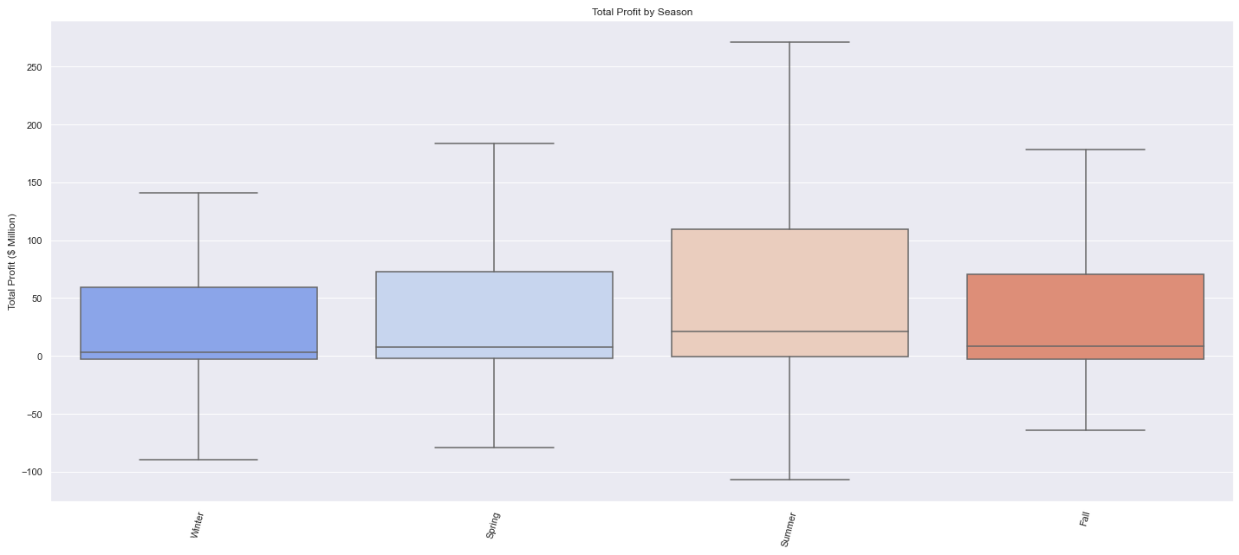


```

```

In [24]:
```
seasons = ['Winter','Spring','Summer','Fall']
flierprops = dict(marker='o', markerfacecolor='green', markersize=12,
                  linestyle='none')
season_bplot = sns.boxplot(data = merged_budgets,x='Season',y=merged_bu
                           flierprops=flierprops, showfliers=False ,ord


season_bplot.set_ylabel('Total Profit ($ Million)');
season_bplot.set_xlabel(None);
plt.xticks(rotation = 75)
season_bplot.set_title('Total Profit by Season');
plt.tight_layout()
```



- You can see due to the data given the total profit is much greater when a movie is released in summer months and secondly the fall months.

Question 2: What does our competition look like?

In [284]:
```
len(df_gross)
```

Out[284]:
```
3387
```

In [282]:
```
#Return the number of missing values. Dataset must be cleaned as foreig
df_gross.isna().sum() / len(df_gross)
```

Out[282]:
```
title             0.000000
studio            0.001476
domestic_gross    0.008267
foreign_gross     0.398583
year              0.000000
dtype: float64
```

In [285]:
```
df_gross["foreign_gross"] = df_gross["foreign_gross"].fillna(0)
#Filling in missing values of foregin gross
```

In [287]:
```
df_gross["foreign_gross"] = df_gross["foreign_gross"].str.replace(",",
df_gross["foreign_gross"] = df_gross["foreign_gross"].astype(float)
#Changing data type to float
```

In [288]:
```
df_gross = df_gross.dropna()
#dropping remaining rows

df_gross.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2007 entries, 0 to 3353
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           2007 non-null   object 
 1   studio          2007 non-null   object 
 2   domestic_gross  2007 non-null   float64
 3   foreign_gross   2007 non-null   float64
 4   year            2007 non-null   int64  
dtypes: float64(2), int64(1), object(2)
memory usage: 94.1+ KB
```

In [289]:
```
#Get the total gross by adding both foreign gross and domestic gross
df_gross["total_gross"] = df_gross["domestic_gross"] + df_gross["foreig
df_gross.head()
```

```
/var/folders/83/sb2tv79n3r11w7g4_w_37bmr0000gn/T/ipykernel_48536/7432538
0.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  df_gross["total_gross"] = df_gross["domestic_gross"] + df_gross["foreig
n_gross"]
```

Out[289]:

	title	studio	domestic_gross	foreign_gross	year	total_gross
0	Toy Story 3	BV	415000000.0	652000000.0	2010	1.067000e+09
1	Alice in Wonderland (2010)	BV	334200000.0	691300000.0	2010	1.025500e+09
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000.0	2010	9.603000e+08
3	Inception	WB	292600000.0	535700000.0	2010	8.283000e+08
4	Shrek Forever After	P/DW	238700000.0	513900000.0	2010	7.526000e+08

In [290]:
```
df_gross2 = df_gross.groupby("studio").sum().sort_values(
    by="total_gross", ascending = False)
df_gross2.head(8)
```

Out[290]:

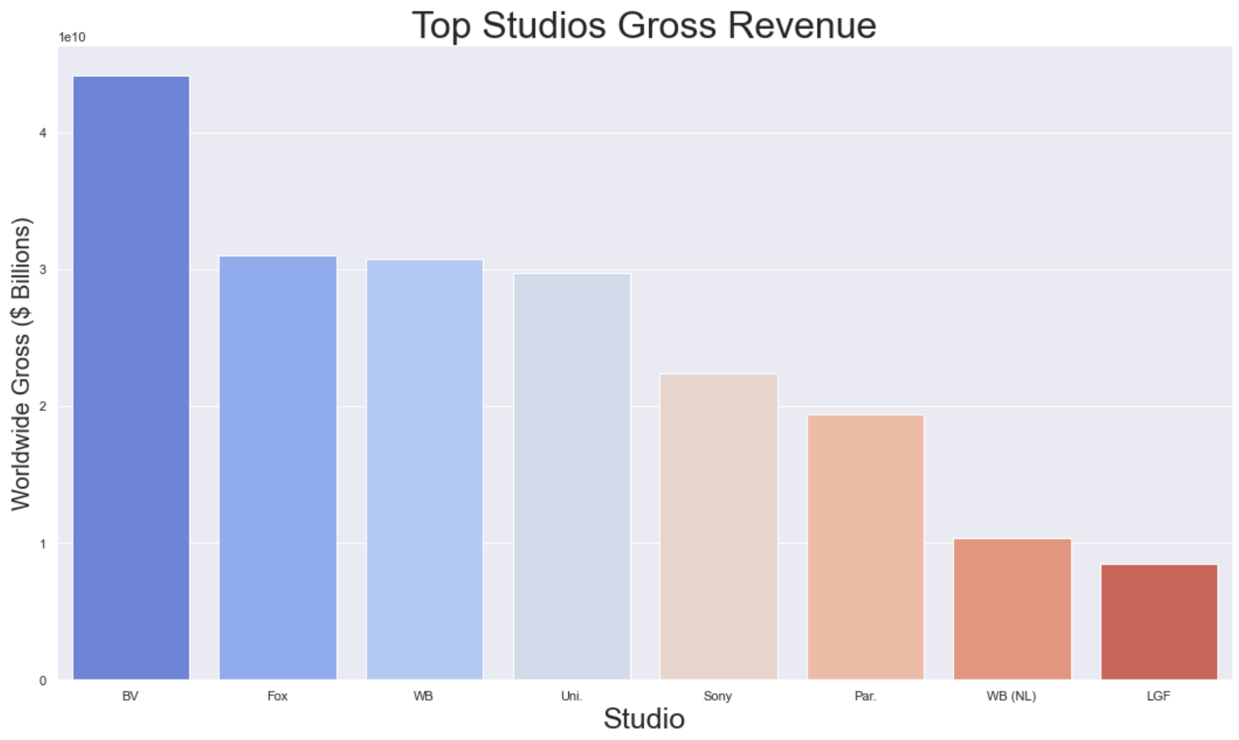
	domestic_gross	foreign_gross	year	total_gross
studio				
BV	1.839653e+10	2.579385e+10	209428	4.419038e+10
Fox	1.092450e+10	2.005587e+10	269857	3.098037e+10
WB	1.212360e+10	1.866790e+10	261801	3.079150e+10
Uni.	1.289204e+10	1.685477e+10	290029	2.974681e+10
Sony	8.459479e+09	1.394524e+10	211497	2.240472e+10
Par.	7.580813e+09	1.186338e+10	189311	1.944420e+10
WB (NL)	3.975100e+09	6.339000e+09	88628	1.031410e+10
LGF	3.991851e+09	4.475619e+09	175204	8.467471e+09

In [296]:
```
#index to show top 8 studios
top_8 = df_gross2[0:8]
top_8
```

Out[296]:

studio	domestic_gross	foreign_gross	year	total_gross
BV	1.839653e+10	2.579385e+10	209428	4.419038e+10
Fox	1.092450e+10	2.005587e+10	269857	3.098037e+10
WB	1.212360e+10	1.866790e+10	261801	3.079150e+10
Uni.	1.289204e+10	1.685477e+10	290029	2.974681e+10
Sony	8.459479e+09	1.394524e+10	211497	2.240472e+10
Par.	7.580813e+09	1.186338e+10	189311	1.944420e+10
WB (NL)	3.975100e+09	6.339000e+09	88628	1.031410e+10
LGF	3.991851e+09	4.475619e+09	175204	8.467471e+09

In [319]:
```
plt.figure(figsize = (18,10))
sns.barplot(y = top_8["total_gross"], x = top_8.index,
            palette="coolwarm")
plt.xlabel('Studio', fontsize=25)
plt.ylabel('Worldwide Gross ($ Billions)', fontsize=20)
plt.title("Top Studios Gross Revenue", fontsize=32)
plt.savefig("Studio_Gross")
```



- Based on the findings you can see that while Worldwide gross is measured in billions, the majority of top 8 studios all had a return of over a billion dollars. This gives us the confidence that this investment of Microsoft Movies is absolutely a project that can be of value.

Question 3: What type of content does our top competition (Disney) produce?

In [30]:
```
df_disney.head()
```

Out[30]:

	show_id	type	title	director	cast	country	date_added	release_year	rating
0	s1	Movie	Duck the Halls: A Mickey Mouse Christmas Special	Alonso Ramirez Ramos, Dave Wasson	Chris Diamantopoulos, Tony Anselmo, Tress MacN...	NaN	November 26, 2021	2016	TV-G
1	s2	Movie	Ernest Saves Christmas	John Cherry	Jim Varney, Noelle Parker, Douglas Seale	NaN	November 26, 2021	1988	PG
2	s3	Movie	Ice Age: A Mammoth Christmas	Karen Disher	Raymond Albert Romano, John Leguizamo, Denis L...	United States	November 26, 2021	2011	TV-G
3	s4	Movie	The Queen Family Singalong	Hamish Hamilton	Darren Criss, Adam Lambert, Derek Hough, Alexa...	NaN	November 26, 2021	2021	TV-PG
4	s5	TV Show	The Beatles: Get Back	NaN	John Lennon, Paul McCartney, George Harrison, ...	NaN	November 25, 2021	2021	NaN

In [31]:
```
#Rename column listed_in to Genre
df_disney.rename(columns = {"listed_in": "genre"}, inplace=True)
```

In [32]:
```
#drop any movie with a release_year before 2012
df_disney.drop(df_disney[df_disney['release_year'] < 2012].index, inpla
```

In [33]:
```
#check to make sure rename went through
df_disney.tail()
```

Out[33]:

	show_id	type	title	director	cast	country	date_added	release_year	ratin
1439	s1440	TV Show	Disney Kirby Buckets	NaN	Jacob Bertrand, Mekai Curtis, Cade Sutton, Oli...	United States	NaN	2014	TV-Y
1440	s1441	TV Show	Disney Mech-X4	NaN	Nathaniel Potvin, Raymond Cham, Kamran Lucas, ...	Canada	NaN	2016	TV-Y
1442	s1443	Movie	Tomorrowland	Brad Bird	George Clooney, Hugh Laurie, Britt Robertson, ...	United States, Spain, France, Canada, United K...	September 3, 2021	2015	P
1447	s1448	Movie	Eddie the Eagle	Dexter Fletcher	Tom Costello, Jo Hartley, Keith Allen, Dickon ...	United Kingdom, Germany, United States	December 18, 2020	2016	PG 1
1449	s1450	Movie	Captain Sparky vs. The Flying Saucers	Mark Waring	Charlie Tahan	United States	April 1, 2020	2012	TV-

In [34]:
```
df_disney.value_counts('type')
```

Out[34]:
```
type
Movie      406
TV Show    296
dtype: int64
```

In [35]:
```python
df_disney.value_counts('genre')
```

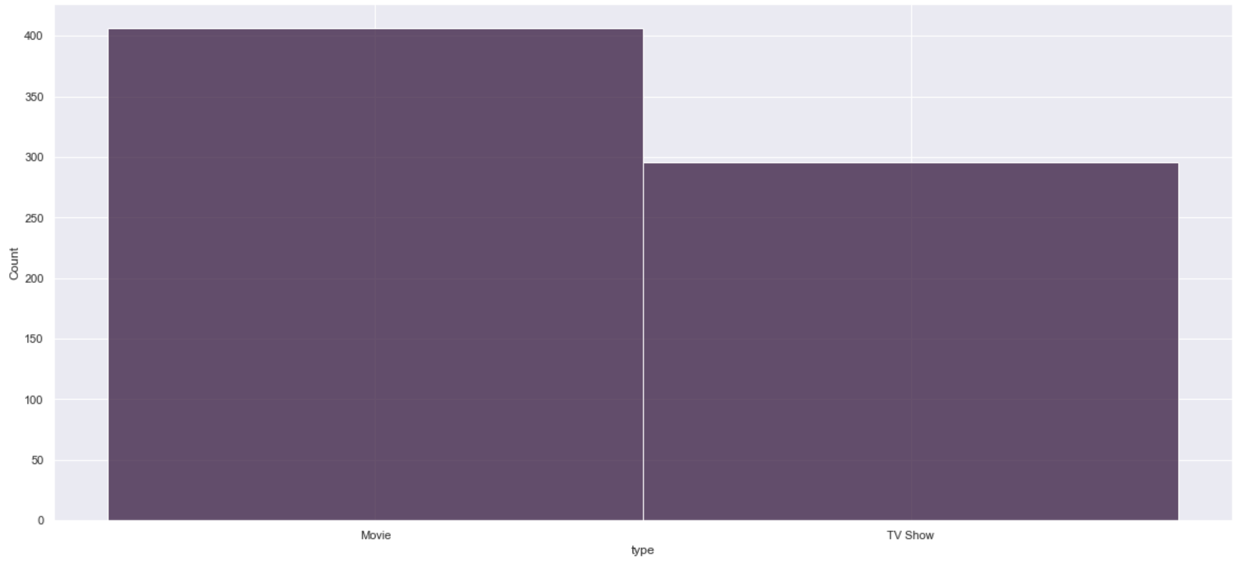
Out[35]:
```
genre
Action-Adventure, Animation, Comedy      45
Animals & Nature, Docuseries, Family     37
Animals & Nature, Documentary            34
Animation, Comedy, Family                34
Animals & Nature, Documentary, Family    21
                                         ..
Animation, Kids, Musical                  1
Animation, Kids, Police/Cop               1
Animation, Kids, Western                  1
Animation, Superhero                      1
Variety                                   1
Length: 222, dtype: int64
```

In [36]:
```python
#drop null values and splot genres so that they look neat
genre_split = ", ".join(df_disney['genre'].dropna()).split(", ")
#create new variable to show the values
count,value = pd.Series(genre_split).value_counts().values[0:10], pd.Se
#create a list of the genres and zip them all together
disney_genre = pd.DataFrame(list(zip(value,count)),columns=["genre","co
disney_genre
```

Out[36]:

	genre	count
0	Family	230
1	Animation	222
2	Action-Adventure	203
3	Comedy	178
4	Animals & Nature	145
5	Documentary	132
6	Docuseries	118
7	Fantasy	83
8	Coming of Age	70
9	Kids	63

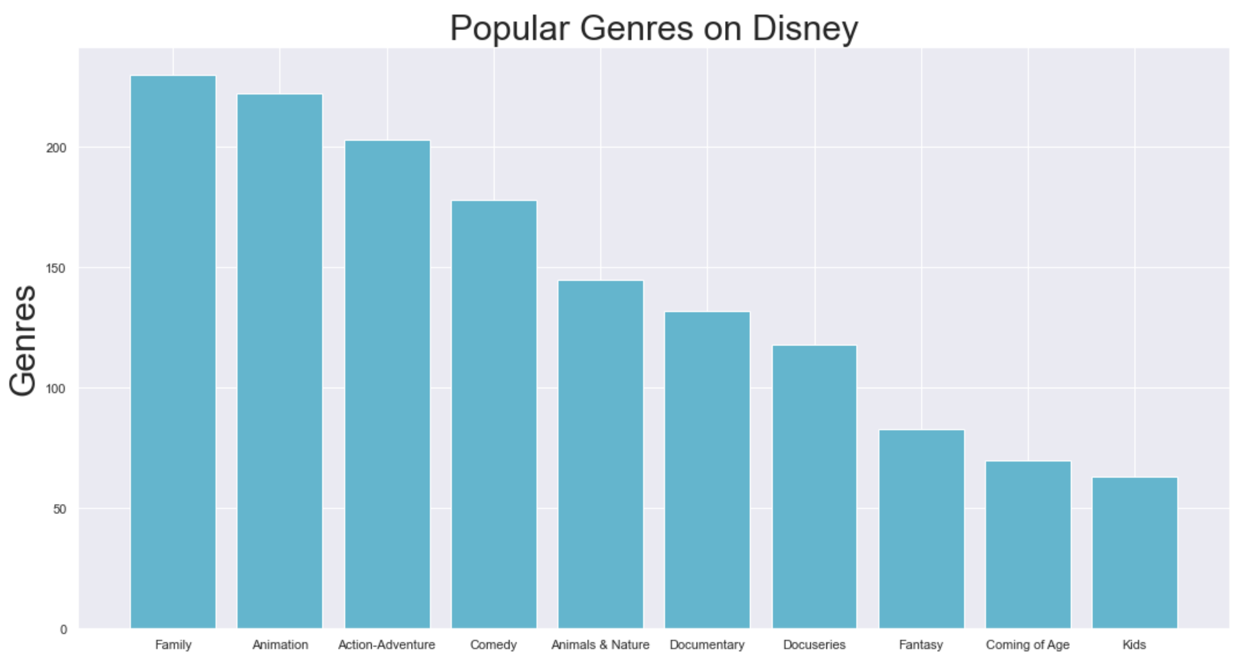
In [37]:
```
#make histogram showing differnce in movies vs. tv shows
sns.histplot(x = 'type', data = df_disney)
plt.show()
```



- This proves the number of movies are greater than the number of tv shows produced within the last 10 years. Movies are still the way to go in terms of production

In [55]:
```python
fig, ax = plt.subplots(figsize=(15,8))

# sets up bar plot
ax.bar(value, count, color = 'c')
ax.set_ylabel('Genres', fontsize = 30)
ax.set_title('Popular Genres on Disney', fontsize = 30)
plt.tight_layout()
plt.show()
```



- This graph shows Family, Animation, and Action-Adventure are the top 3 movie genres that also coincide with the data given through other charts

Recommendations and Next Steps

- Any futher analysis can show more accurate insights:

  ## Next Steps

  ### Show the difference in ratings between movies premiered on streaming platforms vs. theater

  This would provide Microsoft with the most accurate information on how cord cutting has become more popular over the years, especially after the pandemic. As we know people love convenience, streaming platforms have taken advantage of the movie industry by providing households with access to thousands of movies without them even leaving the comfort of their own home. Maybe this is something Microsoft can create as well to be just as or even more competitive as the big names out there including: Netflix, Disney+, Hulu, etc.

Include difference in the runtime of movies vs. ratings

Does a long movie necessarily mean it was a good movie? This would provide microsoft with the information needed to understand how to go about producing their own future "classics" and how long each movie would necessarily need to be in order to receive the best ratings.

Are limited series tv shows more popular?

Binge watching tv shows are now more poular than ever, but are they more popular than a movie? Showing the popularity in tv shows vs movies can give more of an understanding of where to start within the film industry. This can also provide the information of what genres of tv shows are most gravitating towards audiences.

Recommendations

Showing the ROI of the Top 8 movie genres have showed that Animation, Adventure and Sci-Fi are the top producing movie genres according to the data given. Big time movies like Star Wars can prove this point futher in which they have received profits in the billions.

Having the total profit by season allows us to see during which months do movies do well in. The data given shows that the total profit is much greater when a movie is released in summer months and secondly the fall months. With Microsoft planning its first release it is recommended to release during those seasons of the year according to the graph above.

You can also see through the information provided that the best studios(BV, Fox and Warner Bros) have the most competition due to the worldwide gross. Also diving deeper into Disney specifically shows the importance of movies vs. tv shows and what genres perform.

Microsoft also known for Xbox, has alot of games they produce that can only be played on that specific console. Why not come out with a movie or limited series that features a storyline of these games. This would also fit within the adventure, animation, and sci-fi recommendations above.

In [ ]:

```

```