# Introduction

In this project of my Data Analysis, I am investigating a TMDb movies database file which has collection of important detials of about 10k+ movies, including their details of budget, revenue, release dates, etc.

In [46]:
```
# Importing Pandas
import pandas as pd
import csv # read and write csv files
from datetime import datetime # operations to parse dates
import matplotlib.pyplot as plt
% matplotlib inline
import numpy as np
import seaborn as sns
```

# What can we say about the dataset?

- The columns `budget`, `revenue`, `budget_adj`, `revenue_adj` has not given us the currency but for this dataset we will assume that it is in dollars.
- The vote count for each movie is not similar, So we cannot calculate or assume that movie with highest votes or rating was more successful since the voters of each film vary.

# Questions to be Answered

- Q1 : Which movie had the greatest and least budget?
- Q2 : Which movie earns the most and least profit?
- Q3 : What is the average runtime of all movies?
- Q4 : In which year we had the most movies making profits?
- Q5: Which directer directed most films?
- Q6 : Which genre were more successful?
- Q7 : Which month released highest number of movies in all of the years? And which month made the most profit?

# Data Cleaning

Before answering the above questions we need a clean dataset which has columns and rows we need for calculations.

First, lets clean up the columns. We will only keep the columns we need and remove the rest of them.

Columns to delete - id, imdb_id, popularity, budget_adj, revenue_adj, homepage, keywords, overview, production_companies, vote_count and vote_average.

In [34]:
```
#reading tmdb csv file and storing that to a variable
tmdb = pd.read_csv('tmdb-movies.csv')

#calling out first 100 rows (excluding headers) of tmdb database
tmdb.head(101)


#lets give a list of movies that needs to be deleted
del_col = [ 'id', 'imdb_id', 'popularity', 'budget_adj', 'revenue_adj',
'homepage', 'keywords', 'overview', 'production_companies', 'vote_count'
, 'vote_average']


#deleting the columns from the database
movie_data = tmdb.drop(del_col, 1)
#now take a look at this new dataset
movie_data.head()
```

Out[34]:

| | budget | revenue | original_title | cast | director | tagline | runtime |
|---|---|---|---|---|---|---|---|
| **0** | 150000000 | 1513528810 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrow | The park is open. | 124 |
| **1** | 150000000 | 378436354 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller | What a Lovely Day. | 120 |
| **2** | 110000000 | 295238201 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwentke | One Choice Can Destroy You | 119 |
| **3** | 200000000 | 2068178225 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrams | Every generation has a story. | 136 |
| **4** | 190000000 | 1506249360 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wan | Vengeance Hits Home | 137 |

In [36]:
```
# Describing TMDB Data
movie_data.describe()
```

Out[36]:

| | budget | revenue | runtime | release_year |
|---|---|---|---|---|
| **count** | 1.086600e+04 | 1.086600e+04 | 10866.000000 | 10866.000000 |
| **mean** | 1.462570e+07 | 3.982332e+07 | 102.070863 | 2001.322658 |
| **std** | 3.091321e+07 | 1.170035e+08 | 31.381405 | 12.812941 |
| **min** | 0.000000e+00 | 0.000000e+00 | 0.000000 | 1960.000000 |
| **25%** | 0.000000e+00 | 0.000000e+00 | 90.000000 | 1995.000000 |
| **50%** | 0.000000e+00 | 0.000000e+00 | 99.000000 | 2006.000000 |
| **75%** | 1.500000e+07 | 2.400000e+07 | 111.000000 | 2011.000000 |
| **max** | 4.250000e+08 | 2.781506e+09 | 900.000000 | 2015.000000 |

In [37]:
```
# Perform operations to inspect data
# types and look for instances of missing or possibly errant data.
movie_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 10 columns):
budget            10866 non-null int64
revenue           10866 non-null int64
original_title    10866 non-null object
cast              10790 non-null object
director          10822 non-null object
tagline           8042 non-null object
runtime           10866 non-null int64
genres            10843 non-null object
release_date      10866 non-null object
release_year      10866 non-null int64
dtypes: int64(4), object(6)
memory usage: 849.0+ KB
```

In [38]:
```
sum(movie_data.duplicated())
```

Out[38]: 1

In [39]:
```
movie_data.drop_duplicates(inplace=True)
```

In [40]:
```
movie_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10865 entries, 0 to 10865
Data columns (total 10 columns):
budget            10865 non-null int64
revenue           10865 non-null int64
original_title    10865 non-null object
cast              10789 non-null object
director          10821 non-null object
tagline           8041 non-null object
runtime           10865 non-null int64
genres            10842 non-null object
release_date      10865 non-null object
release_year      10865 non-null int64
dtypes: int64(4), object(6)
memory usage: 933.7+ KB
```

In [41]:
```
movie_data.isnull().sum()
```

Out[41]:
```
budget              0
revenue             0
original_title      0
cast               76
director           44
tagline          2824
runtime             0
genres             23
release_date        0
release_year        0
dtype: int64
```

In [42]:
```
movie_data.describe()
```

Out[42]:

| | budget | revenue | runtime | release_year |
|---|---|---|---|---|
| **count** | 1.086500e+04 | 1.086500e+04 | 10865.000000 | 10865.000000 |
| **mean** | 1.462429e+07 | 3.982690e+07 | 102.071790 | 2001.321859 |
| **std** | 3.091428e+07 | 1.170083e+08 | 31.382701 | 12.813260 |
| **min** | 0.000000e+00 | 0.000000e+00 | 0.000000 | 1960.000000 |
| **25%** | 0.000000e+00 | 0.000000e+00 | 90.000000 | 1995.000000 |
| **50%** | 0.000000e+00 | 0.000000e+00 | 99.000000 | 2006.000000 |
| **75%** | 1.500000e+07 | 2.400000e+07 | 111.000000 | 2011.000000 |
| **max** | 4.250000e+08 | 2.781506e+09 | 900.000000 | 2015.000000 |

In [43]:
```
movie_data.head()
```

Out[43]:

| | budget | revenue | original_title | cast | director | tagline | runtime |
|---|---|---|---|---|---|---|---|
| **0** | 150000000 | 1513528810 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrow | The park is open. | 124 |
| **1** | 150000000 | 378436354 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller | What a Lovely Day. | 120 |
| **2** | 110000000 | 295238201 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwentke | One Choice Can Destroy You | 119 |
| **3** | 200000000 | 2068178225 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrams | Every generation has a story. | 136 |
| **4** | 190000000 | 1506249360 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wan | Vengeance Hits Home | 137 |

In [44]:
```
movie_data.drop_duplicates(keep = 'first', inplace = True)
```

We had total 10865 movies in total.We had one duplicate copy of a movie. Now we have 10864 movies.

Now, lets figure out which movies have a value of '0' in their budget or revenue, and then deleting those movies from database.

In [47]:
```
#giving list of column names that needs to be checked
check_row = ['budget', 'revenue']

#this will replace the value of '0' to NaN of columns given in the list
movie_data[check_row] = movie_data[check_row].replace(0, np.NaN)

#now we will drop any row which has NaN values in any of the column of t
he list (check_row)
movie_data.dropna(subset = check_row, inplace = True)
```

In [48]:
```
movie_data
```

Out[48]:

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **0** | 150000000.0 | 1.513529e+09 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrow | T c |
| **1** | 150000000.0 | 3.784364e+08 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller | M D |
| **2** | 110000000.0 | 2.952382e+08 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwentke | D |
| **3** | 200000000.0 | 2.068178e+09 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrams | B h |
| **4** | 190000000.0 | 1.506249e+09 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wan | V H |
| **5** | 135000000.0 | 5.329505e+08 | The Revenant | Leonardo DiCaprio\|Tom Hardy\|Will Poulter\|Domhn... | Alejandro GonzÃ¡lez IÃ±Ã¡rritu | ( r f |
| **6** | 155000000.0 | 4.406035e+08 | Terminator Genisys | Arnold Schwarzenegger\|Jason Clarke\|Emilia Clar... | Alan Taylor | R |
| **7** | 108000000.0 | 5.953803e+08 | The Martian | Matt Damon\|Jessica Chastain\|Kristen Wiig\|Jeff ... | Ridley Scott | R |
| **8** | 74000000.0 | 1.156731e+09 | Minions | Sandra Bullock\|Jon Hamm\|Michael Keaton\|Allison... | Kyle Balda\|Pierre Coffin | B h b |
| **9** | 175000000.0 | 8.537086e+08 | Inside Out | Amy Poehler\|Phyllis Smith\|Richard Kind\|Bill Ha... | Pete Docter | M v y |
| **10** | 245000000.0 | 8.806746e+08 | Spectre | Daniel Craig\|Christoph Waltz\|LÃ©a Seydoux\|Ralp... | Sam Mendes | A E |
| **11** | 176000003.0 | 1.839877e+08 | Jupiter Ascending | Mila Kunis\|Channing Tatum\|Sean Bean\|Eddie Redm... | Lana Wachowski\|Lilly Wachowski | B u |

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **12** | 15000000.0 | 3.686941e+07 | Ex Machina | Domhnall Gleeson\|Alicia Vikander\|Oscar Isaac\|S... | Alex Garland | T r t s |
| **13** | 88000000.0 | 2.436371e+08 | Pixels | Adam Sandler\|Michelle Monaghan\|Peter Dinklage\|... | Chris Columbus | C |
| **14** | 280000000.0 | 1.405036e+09 | Avengers: Age of Ultron | Robert Downey Jr.\|Chris Hemsworth\|Mark Ruffalo... | Joss Whedon | A C |
| **15** | 44000000.0 | 1.557601e+08 | The Hateful Eight | Samuel L. Jackson\|Kurt Russell\|Jennifer Jason ... | Quentin Tarantino | N u a r |
| **16** | 48000000.0 | 3.257714e+08 | Taken 3 | Liam Neeson\|Forest Whitaker\|Maggie Grace\|Famke... | Olivier Megaton | I |
| **17** | 130000000.0 | 5.186022e+08 | Ant-Man | Paul Rudd\|Michael Douglas\|Evangeline Lilly\|Cor... | Peyton Reed | H C |
| **18** | 95000000.0 | 5.423514e+08 | Cinderella | Lily James\|Cate Blanchett\|Richard Madden\|Helen... | Kenneth Branagh | M t |
| **19** | 160000000.0 | 6.505234e+08 | The Hunger Games: Mockingjay - Part 2 | Jennifer Lawrence\|Josh Hutcherson\|Liam Hemswor... | Francis Lawrence | T f |
| **20** | 190000000.0 | 2.090357e+08 | Tomorrowland | Britt Robertson\|George Clooney\|Raffey Cassidy\|... | Brad Bird | I v i |
| **21** | 30000000.0 | 9.170983e+07 | Southpaw | Jake Gyllenhaal\|Rachel McAdams\|Forest Whitaker... | Antoine Fuqua | E |
| **22** | 110000000.0 | 4.704908e+08 | San Andreas | Dwayne Johnson\|Alexandra Daddario\|Carla Gugino... | Brad Peyton | A s e i |
| **23** | 40000000.0 | 5.696515e+08 | Fifty Shades of Grey | Dakota Johnson\|Jamie Dornan\|Jennifer Ehle\|Eloi... | Sam Taylor-Johnson | A |

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **24** | 28000000.0 | 1.333465e+08 | The Big Short | Christian Bale\|Steve Carell\|Ryan Gosling\|Brad ... | Adam McKay | T s |
| **25** | 150000000.0 | 6.823301e+08 | Mission: Impossible - Rogue Nation | Tom Cruise\|Jeremy Renner\|Simon Pegg\|Rebecca Fe... | Christopher McQuarrie | D T D M |
| **26** | 68000000.0 | 2.158636e+08 | Ted 2 | Mark Wahlberg\|Seth MacFarlane\|Amanda Seyfried\|... | Seth MacFarlane | T A |
| **27** | 81000000.0 | 4.038021e+08 | Kingsman: The Secret Service | Taron Egerton\|Colin Firth\|Samuel L. Jackson\|Mi... | Matthew Vaughn | M r |
| **28** | 20000000.0 | 8.834647e+07 | Spotlight | Mark Ruffalo\|Michael Keaton\|Rachel McAdams\|Lie... | Tom McCarthy | B B s |
| **29** | 61000000.0 | 3.112569e+08 | Maze Runner: The Scorch Trials | Dylan O'Brien\|Kaya Scodelario\|Thomas Brodie-Sa... | Wes Ball | T J B |
| **...** | ... | ... | ... | ... | ... | . |
| **10690** | 8200000.0 | 1.632143e+08 | The Sound of Music | Julie Andrews\|Christopher Plummer\|Eleanor Park... | Robert Wise | T s V |
| **10691** | 14000000.0 | 1.117219e+08 | Doctor Zhivago | Omar Sharif\|Julie Christie\|Geraldine Chaplin\|R... | David Lean | T t f I |
| **10692** | 5600000.0 | 2.995000e+07 | Those Magnificent Men in Their Flying Machines... | Stuart Whitman\|Sarah Miles\|James Fox\|Alberto S... | Ken Annakin | c f F h |
| **10716** | 20000000.0 | 1.200000e+07 | The Greatest Story Ever Told | Max von Sydow\|Michael Anderson Jr.\|Carroll Bak... | George Stevens | M |
| **10724** | 7000000.0 | 8.197449e+07 | On Her Majesty's Secret Service | George Lazenby\|Diana Rigg\|Telly Savalas\|Gabrie... | Peter R. Hunt | F F B |

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **10725** | 6000000.0 | 1.023089e+08 | Butch Cassidy and the Sundance Kid | Paul Newman\|Robert Redford\|Katharine Ross\|Stro... | George Roy Hill | N r r |
| **10727** | 3600000.0 | 4.478505e+07 | Midnight Cowboy | Dustin Hoffman\|Jon Voight\|Sylvia Miles\|John Mc... | John Schlesinger | V h M C |
| **10728** | 6244087.0 | 6.386410e+05 | The Wild Bunch | Ernest Borgnine\|William Holden\|Robert Ryan\|Edm... | Sam Peckinpah | I t h r |
| **10755** | 6000000.0 | 1.818138e+08 | Grease | John Travolta\|Olivia Newton-John\|Stockard Chan... | Randal Kleiser | C V |
| **10756** | 20000000.0 | 1.878840e+08 | Jaws 2 | Roy Scheider\|Lorraine Gary\|Murray Hamilton\|Jos... | Jeannot Szwarc | J t s i |
| **10757** | 650000.0 | 5.500000e+07 | Dawn of the Dead | David Emge\|Ken Foree\|Scott H. Reiniger\|Gaylen ... | George A. Romero | V r h v |
| **10758** | 55000000.0 | 3.002180e+08 | Superman | Marlon Brando\|Gene Hackman\|Christopher Reeve\|N... | Richard Donner | Y M |
| **10759** | 300000.0 | 7.000000e+07 | Halloween | Donald Pleasence\|Jamie Lee Curtis\|P.J. Soles\|N... | John Carpenter | T C |
| **10760** | 2700000.0 | 1.410000e+08 | Animal House | John Belushi\|Tim Matheson\|John Vernon\|Verna Bl... | John Landis | I a r |
| **10762** | 15000000.0 | 5.000000e+07 | The Deer Hunter | Robert De Niro\|John Cazale\|John Savage\|Christo... | Michael Cimino | C i p c |
| **10770** | 2300000.0 | 3.500000e+07 | Midnight Express | Brad Davis\|Irene Miracle\|Bo Hopkins\|Randy Quai... | Alan Parker | V i e E |

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **10771** | 4000000.0 | 3.047142e+07 | The Lord of the Rings | Christopher Guard\|William Squire\|Michael Schol... | Ralph Bakshi | |
| **10775** | 7920000.0 | 1.456008e+07 | Death on the Nile | Peter Ustinov\|Mia Farrow\|Simon MacCorkindale\|L... | John Guillermin | |
| **10777** | 11.0 | 1.100000e+01 | F.I.S.T. | Sylvester Stallone\|Rod Steiger\|Peter Boyle\|Mel... | Norman Jewison | |
| **10778** | 5000000.0 | 7.230000e+06 | Force 10 from Navarone | Harrison Ford\|Robert Shaw\|Barbara Bach\|Edward ... | Guy Hamilton | |
| **10779** | 12000000.0 | 2.276508e+07 | Convoy | Kris Kristofferson\|Ali MacGraw\|Ernest Borgnine... | Sam Peckinpah | |
| **10780** | 3500000.0 | 2.404653e+07 | Invasion of the Body Snatchers | Donald Sutherland\|Brooke Adams\|Leonard Nimoy\|V... | Philip Kaufman | |
| **10788** | 24000000.0 | 2.104905e+07 | The Wiz | Diana Ross\|Michael Jackson\|Nipsey Russell\|Ted ... | Sidney Lumet | |
| **10791** | 6800000.0 | 2.651836e+07 | Damien: Omen II | William Holden\|Lee Grant\|Jonathan Scott-Taylor... | Don Taylor\|Mike Hodges | |
| **10793** | 1000000.0 | 3.713768e+06 | Watership Down | John Hurt\|Richard Briers\|Michael Graham Cox\|Jo... | Martin Rosen | |
| **10822** | 7500000.0 | 3.373669e+07 | Who's Afraid of Virginia Woolf? | Elizabeth Taylor\|Richard Burton\|George Segal\|S... | Mike Nichols | |
| **10828** | 3000000.0 | 1.300000e+07 | Torn Curtain | Paul Newman\|Julie Andrews\|Lila Kedrova\|HansjÃ¶... | Alfred Hitchcock | |
| **10829** | 4653000.0 | 6.000000e+06 | El Dorado | John Wayne\|Robert Mitchum\|James Caan\|Charlene ... | Howard Hawks | |

| | budget | revenue | original_title | cast | director | |
|---|---|---|---|---|---|---|
| **10835** | 12000000.0 | 2.000000e+07 | The Sand Pebbles | Steve McQueen\|Richard Attenborough\|Richard Cre... | Robert Wise | T s c |
| **10848** | 5115000.0 | 1.200000e+07 | Fantastic Voyage | Stephen Boyd\|Raquel Welch\|Edmond O'Brien\|Donal... | Richard Fleischer | A S V T |

3854 rows × 10 columns

As you saw in the previous dataset from having 10k+ rows and 21 columns we have now come down to 3854 rows and 10 columns. These many columns are needed for analysis and we have all the rows that have valid values for our calculations.

Now as we are done with cleaning the dataset, let's move on to data wrangling phase.

# Data Wrangling

Now first lets check if we have any movie with a runtime value of 0. If we have any, we will replace with NaN.

And then we need to convert the 'release_date' column to date format

In [49]:
```
#replacing 0 with NaN of runtime column of the dataframe
movie_data['runtime'] = movie_data['runtime'].replace(0, np.NaN)

#calling the column which need to be formatted in datetime and storing t
hose values in them
movie_data.release_date = pd.to_datetime(movie_data['release_date'])

#showing the dataset
movie_data.head()
```

Out[49]:

| | budget | revenue | original_title | cast | director | tagline | runti |
|---|---|---|---|---|---|---|---|
| **0** | 150000000.0 | 1.513529e+09 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrow | The park is open. | 124 |
| **1** | 150000000.0 | 3.784364e+08 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller | What a Lovely Day. | 120 |
| **2** | 110000000.0 | 2.952382e+08 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwentke | One Choice Can Destroy You | 119 |
| **3** | 200000000.0 | 2.068178e+09 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrams | Every generation has a story. | 136 |
| **4** | 190000000.0 | 1.506249e+09 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wan | Vengeance Hits Home | 137 |

As you see, the 'release_date' column has been changed to date format. (year-month-day)

Lets see if all the columns are in the format that we want for our calculations.

In [50]:
```
movie_data.dtypes
```

Out[50]:
```
budget                   float64
revenue                  float64
original_title            object
cast                      object
director                  object
tagline                   object
runtime                    int64
genres                    object
release_date      datetime64[ns]
release_year               int64
dtype: object
```

As we can see we have float values for 'budget' and 'revenue' columns, since we dont need float but in int datatype, lets convert them.

In [51]:
```
#applymap function changes the columns data type to the type 'argument'
 we pass
change_coltype = ['budget', 'revenue']

movie_data[change_coltype] = movie_data[change_coltype].applymap(np.int6
4)
#shwoing the datatypes of all columns
movie_data.dtypes
```

Out[51]:
```
budget                    int64
revenue                   int64
original_title           object
cast                     object
director                 object
tagline                  object
runtime                   int64
genres                   object
release_date     datetime64[ns]
release_year              int64
dtype: object
```

Now all columns are in the desired format.

Since the values in the column 'budget' and 'revenue' shows us in Currency of US (as assumed earlier), lets change the name of these columns for convenience.

In [52]:
```
movie_data.rename(columns = {'budget' : 'budget_(in_US$)', 'revenue' :
'revenue_(in_US$)'}, inplace = True)
```

In [53]:
```
movie_data
```

Out[53]:

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **0** | 150000000 | 1513528810 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trev |
| **1** | 150000000 | 378436354 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George M |
| **2** | 110000000 | 295238201 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwentk |
| **3** | 200000000 | 2068178225 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrar |
| **4** | 190000000 | 1506249360 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wa |
| **5** | 135000000 | 532950503 | The Revenant | Leonardo DiCaprio\|Tom Hardy\|Will Poulter\|Domhn... | Alejandro GonzÃ¡lez IÃ±Ã¡rritu |
| **6** | 155000000 | 440603537 | Terminator Genisys | Arnold Schwarzenegger\|Jason Clarke\|Emilia Clar... | Alan Taylo |
| **7** | 108000000 | 595380321 | The Martian | Matt Damon\|Jessica Chastain\|Kristen Wiig\|Jeff ... | Ridley Sc |
| **8** | 74000000 | 1156730962 | Minions | Sandra Bullock\|Jon Hamm\|Michael Keaton\|Allison... | Kyle Balda\|Pie Coffin |
| **9** | 175000000 | 853708609 | Inside Out | Amy Poehler\|Phyllis Smith\|Richard Kind\|Bill Ha... | Pete Doct |
| **10** | 245000000 | 880674609 | Spectre | Daniel Craig\|Christoph Waltz\|LÃ©a Seydoux\|Ralp... | Sam Men |
| **11** | 176000003 | 183987723 | Jupiter Ascending | Mila Kunis\|Channing Tatum\|Sean Bean\|Eddie Redm... | Lana Wachows Wachows |

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **12** | 15000000 | 36869414 | Ex Machina | Domhnall Gleeson\|Alicia Vikander\|Oscar Isaac\|S... | Alex Garl |
| **13** | 88000000 | 243637091 | Pixels | Adam Sandler\|Michelle Monaghan\|Peter Dinklage\|... | Chris Columbus |
| **14** | 280000000 | 1405035767 | Avengers: Age of Ultron | Robert Downey Jr.\|Chris Hemsworth\|Mark Ruffalo... | Joss Whe |
| **15** | 44000000 | 155760117 | The Hateful Eight | Samuel L. Jackson\|Kurt Russell\|Jennifer Jason ... | Quentin Tarantino |
| **16** | 48000000 | 325771424 | Taken 3 | Liam Neeson\|Forest Whitaker\|Maggie Grace\|Famke... | Olivier Me |
| **17** | 130000000 | 518602163 | Ant-Man | Paul Rudd\|Michael Douglas\|Evangeline Lilly\|Cor... | Peyton R |
| **18** | 95000000 | 542351353 | Cinderella | Lily James\|Cate Blanchett\|Richard Madden\|Helen... | Kenneth Branagh |
| **19** | 160000000 | 650523427 | The Hunger Games: Mockingjay - Part 2 | Jennifer Lawrence\|Josh Hutcherson\|Liam Hemswor... | Francis Lawrence |
| **20** | 190000000 | 209035668 | Tomorrowland | Britt Robertson\|George Clooney\|Raffey Cassidy\|... | Brad Bird |
| **21** | 30000000 | 91709827 | Southpaw | Jake Gyllenhaal\|Rachel McAdams\|Forest Whitaker... | Antoine F |
| **22** | 110000000 | 470490832 | San Andreas | Dwayne Johnson\|Alexandra Daddario\|Carla Gugino... | Brad Peyt |
| **23** | 40000000 | 569651467 | Fifty Shades of Grey | Dakota Johnson\|Jamie Dornan\|Jennifer Ehle\|Eloi... | Sam Tayl Johnson |

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **24** | 28000000 | 133346506 | The Big Short | Christian Bale\|Steve Carell\|Ryan Gosling\|Brad ... | Adam Mc |
| **25** | 150000000 | 682330139 | Mission: Impossible - Rogue Nation | Tom Cruise\|Jeremy Renner\|Simon Pegg\|Rebecca Fe... | Christoph McQuarri |
| **26** | 68000000 | 215863606 | Ted 2 | Mark Wahlberg\|Seth MacFarlane\|Amanda Seyfried\|... | Seth MacFarla |
| **27** | 81000000 | 403802136 | Kingsman: The Secret Service | Taron Egerton\|Colin Firth\|Samuel L. Jackson\|Mi... | Matthew Vaughn |
| **28** | 20000000 | 88346473 | Spotlight | Mark Ruffalo\|Michael Keaton\|Rachel McAdams\|Lie... | Tom McC |
| **29** | 61000000 | 311256926 | Maze Runner: The Scorch Trials | Dylan O'Brien\|Kaya Scodelario\|Thomas Brodie-Sa... | Wes Ball |
| **...** | ... | ... | ... | ... | ... |
| **10690** | 8200000 | 163214286 | The Sound of Music | Julie Andrews\|Christopher Plummer\|Eleanor Park... | Robert W |
| **10691** | 14000000 | 111721910 | Doctor Zhivago | Omar Sharif\|Julie Christie\|Geraldine Chaplin\|R... | David Lea |
| **10692** | 5600000 | 29950000 | Those Magnificent Men in Their Flying Machines... | Stuart Whitman\|Sarah Miles\|James Fox\|Alberto S... | Ken Anna |
| **10716** | 20000000 | 12000000 | The Greatest Story Ever Told | Max von Sydow\|Michael Anderson Jr.\|Carroll Bak... | George Stevens |
| **10724** | 7000000 | 81974493 | On Her Majesty's Secret Service | George Lazenby\|Diana Rigg\|Telly Savalas\|Gabrie... | Peter R. H |

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **10725** | 6000000 | 102308889 | Butch Cassidy and the Sundance Kid | Paul Newman\|Robert Redford\|Katharine Ross\|Stro... | George R |
| **10727** | 3600000 | 44785053 | Midnight Cowboy | Dustin Hoffman\|Jon Voight\|Sylvia Miles\|John Mc... | John Schlesing |
| **10728** | 6244087 | 638641 | The Wild Bunch | Ernest Borgnine\|William Holden\|Robert Ryan\|Edm... | Sam Pecl |
| **10755** | 6000000 | 181813770 | Grease | John Travolta\|Olivia Newton-John\|Stockard Chan... | Randal Kl |
| **10756** | 20000000 | 187884007 | Jaws 2 | Roy Scheider\|Lorraine Gary\|Murray Hamilton\|Jos... | Jeannot Szwarc |
| **10757** | 650000 | 55000000 | Dawn of the Dead | David Emge\|Ken Foree\|Scott H. Reiniger\|Gaylen ... | George A Romero |
| **10758** | 55000000 | 300218018 | Superman | Marlon Brando\|Gene Hackman\|Christopher Reeve\|N... | Richard D |
| **10759** | 300000 | 70000000 | Halloween | Donald Pleasence\|Jamie Lee Curtis\|P.J. Soles\|N... | John Carp |
| **10760** | 2700000 | 141000000 | Animal House | John Belushi\|Tim Matheson\|John Vernon\|Verna Bl... | John Lan |
| **10762** | 15000000 | 50000000 | The Deer Hunter | Robert De Niro\|John Cazale\|John Savage\|Christo... | Michael C |
| **10770** | 2300000 | 35000000 | Midnight Express | Brad Davis\|Irene Miracle\|Bo Hopkins\|Randy Quai... | Alan Park |

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **10771** | 4000000 | 30471420 | The Lord of the Rings | Christopher Guard\|William Squire\|Michael Schol... | Ralph Bal |
| **10775** | 7920000 | 14560084 | Death on the Nile | Peter Ustinov\|Mia Farrow\|Simon MacCorkindale\|L... | John Guil |
| **10777** | 11 | 11 | F.I.S.T. | Sylvester Stallone\|Rod Steiger\|Peter Boyle\|Mel... | Norman Jewison |
| **10778** | 5000000 | 7230000 | Force 10 from Navarone | Harrison Ford\|Robert Shaw\|Barbara Bach\|Edward ... | Guy Ham |
| **10779** | 12000000 | 22765081 | Convoy | Kris Kristofferson\|Ali MacGraw\|Ernest Borgnine... | Sam Pecl |
| **10780** | 3500000 | 24046533 | Invasion of the Body Snatchers | Donald Sutherland\|Brooke Adams\|Leonard Nimoy\|V... | Philip Kau |
| **10788** | 24000000 | 21049053 | The Wiz | Diana Ross\|Michael Jackson\|Nipsey Russell\|Ted ... | Sidney Lu |
| **10791** | 6800000 | 26518355 | Damien: Omen II | William Holden\|Lee Grant\|Jonathan Scott-Taylor... | Don Taylor\|Mik Hodges |
| **10793** | 1000000 | 3713768 | Watership Down | John Hurt\|Richard Briers\|Michael Graham Cox\|Jo... | Martin Ro |
| **10822** | 7500000 | 33736689 | Who's Afraid of Virginia Woolf? | Elizabeth Taylor\|Richard Burton\|George Segal\|S... | Mike Nich |
| **10828** | 3000000 | 13000000 | Torn Curtain | Paul Newman\|Julie Andrews\|Lila Kedrova\|HansjÃ¶... | Alfred Hitchcock |
| **10829** | 4653000 | 6000000 | El Dorado | John Wayne\|Robert Mitchum\|James Caan\|Charlene ... | Howard H |

| | budget_(in_US$) | revenue_(in_US$) | original_title | cast | di |
|---|---|---|---|---|---|
| **10835** | 12000000 | 20000000 | The Sand Pebbles | Steve McQueen\|Richard Attenborough\|Richard Cre... | Robert W |
| **10848** | 5115000 | 12000000 | Fantastic Voyage | Stephen Boyd\|Raquel Welch\|Edmond O'Brien\|Donal... | Richard Fleischer |

3854 rows × 10 columns

In [54]:
```
#To calculate profit of each movie, we need to substract the budget from
 the revenue of each movie
movie_data.insert(2, 'profit', movie_data['revenue_(in_US$)'] - movie_da
ta['budget_(in_US$)'])

#for just in case situations or for convenience, we change the data type
 to int
movie_data['profit'] = movie_data['profit'].apply(np.int64)

#showing the dataset
movie_data.head()
```

Out[54]:

| | budget_(in_US$) | revenue_(in_US$) | profit | original_title | cast | direc |
|---|---|---|---|---|---|---|
| **0** | 150000000 | 1513528810 | 1363528810 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrc |
| **1** | 150000000 | 378436354 | 228436354 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller |
| **2** | 110000000 | 295238201 | 185238201 | Insurgent | Shailene Woodley\|Theo James\|Kate Winslet\|Ansel... | Robert Schwen |
| **3** | 200000000 | 2068178225 | 1868178225 | Star Wars: The Force Awakens | Harrison Ford\|Mark Hamill\|Carrie Fisher\|Adam D... | J.J. Abrams |
| **4** | 190000000 | 1506249360 | 1316249360 | Furious 7 | Vin Diesel\|Paul Walker\|Jason Statham\|Michelle ... | James Wan |

Since now we have the columns, rows and format of the dataset in right way, its time to investigate the data for the questions asked.

# Q1 : Which movie had the greatest and least budget?

In [59]:
```
def highest_lowest(column_name):

    #highest
    #taking the index value of the highest number in profit column
    highest_id = movie_data[column_name].idxmax()
    #calling by index number,storing that row info to a variable
    highest_details = pd.DataFrame(movie_data.loc[highest_id])

    #lowest
    #same processing as above
    lowest_id = movie_data[column_name].idxmin()
    lowest_details = pd.DataFrame(movie_data.loc[lowest_id])

    #concatenating two dataframes
    two_in_one_data = pd.concat([highest_details, lowest_details], axis
= 1)

    return two_in_one_data
```

In [60]:
```
highest_lowest('budget_(in_US$)')
```

Out[60]:

| | 2244 | 2618 |
|---|---|---|
| **budget_(in_US$)** | 425000000 | 1 |
| **revenue_(in_US$)** | 11087569 | 100 |
| **profit** | -413912431 | 99 |
| **original_title** | The Warrior's Way | Lost & Found |
| **cast** | Kate Bosworth\|Jang Dong-gun\|Geoffrey Rush\|Dann... | David Spade\|Sophie Marceau\|Ever Carradine\|Step... |
| **director** | Sngmoo Lee | Jeff Pollack |
| **tagline** | Assassin. Hero. Legend. | A comedy about a guy who would do anything to ... |
| **runtime** | 100 | 95 |
| **genres** | Adventure\|Fantasy\|Action\|Western\|Thriller | Comedy\|Romance |
| **release_date** | 2010-12-02 00:00:00 | 1999-04-23 00:00:00 |
| **release_year** | 2010 | 1999 |

Ans : The Warrior's Way

# Q2 : Which movie earns the most and least profit?

In [58]:
```
#calling the function and passing the argument
highest_lowest('profit')
```

Out[58]:

| | 1386 | 2244 |
|---|---|---|
| **budget_(in_US$)** | 237000000 | 425000000 |
| **revenue_(in_US$)** | 2781505847 | 11087569 |
| **profit** | 2544505847 | -413912431 |
| **original_title** | Avatar | The Warrior's Way |
| **cast** | Sam Worthington\|Zoe Saldana\|Sigourney Weaver\|S... | Kate Bosworth\|Jang Dong-gun\|Geoffrey Rush\|Dann... |
| **director** | James Cameron | Sngmoo Lee |
| **tagline** | Enter the World of Pandora. | Assassin. Hero. Legend. |
| **runtime** | 162 | 100 |
| **genres** | Action\|Adventure\|Fantasy\|Science Fiction | Adventure\|Fantasy\|Action\|Western\|Thriller |
| **release_date** | 2009-12-10 00:00:00 | 2010-12-02 00:00:00 |
| **release_year** | 2009 | 2010 |

Ans : Avatar with $2781505847

# Q3 : What is the average runtime of all movies?

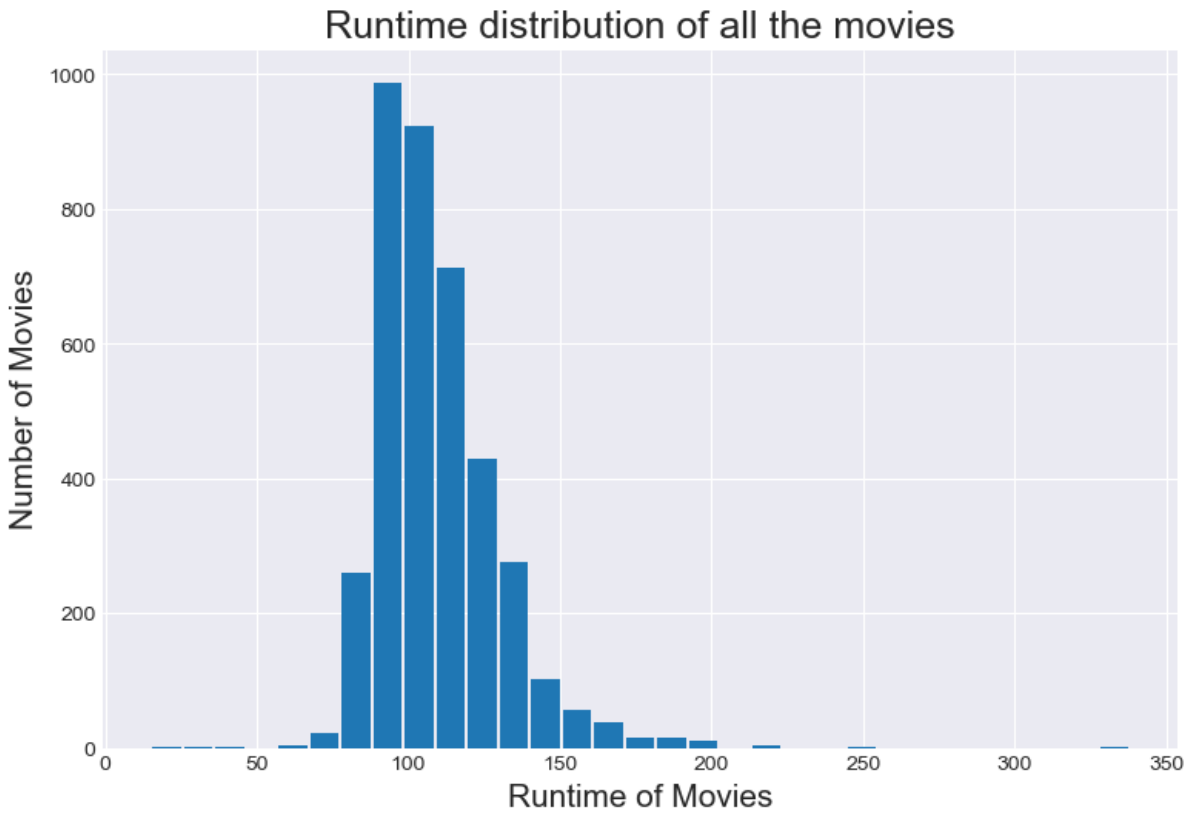
In [61]:
```
def average_func(column_name):

    return movie_data[column_name].mean()
```

In [62]:
```
average_func('runtime')
```

Out[62]:
```
109.22029060716139
```

Ans : 109.22029060716139

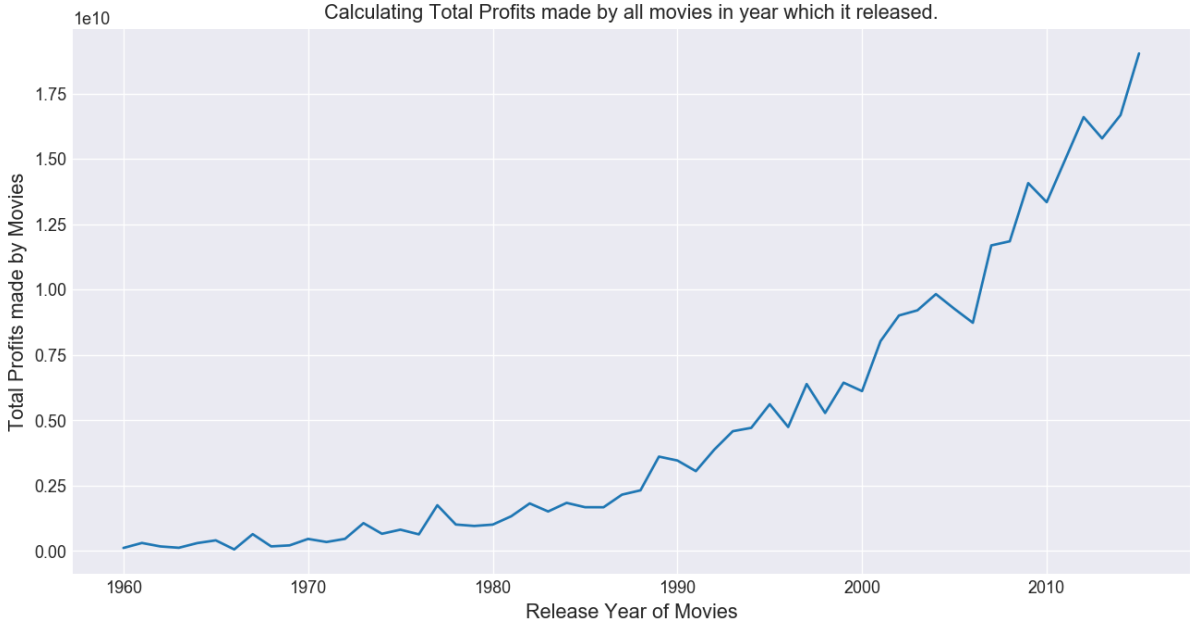
In [63]:
```
#plotting a histogram of runtime of movies

#gives styles to bg plot
sns.set_style('darkgrid')

#chaging the label size, this will change the size of all plots that we
 plot from now!
plt.rc('xtick', labelsize = 10)
plt.rc('ytick', labelsize = 10)

#giving the figure size(width, height)
plt.figure(figsize=(9,6), dpi = 100)
#x-axis label name
plt.xlabel('Runtime of Movies', fontsize = 15)
#y-axis label name
plt.ylabel('Number of Movies', fontsize=15)
#title of the graph
plt.title('Runtime distribution of all the movies', fontsize=18)

#giving a histogram plot
plt.hist(movie_data['runtime'], rwidth = 0.9, bins =31)
#displays the plot
plt.show()
```




Opinion : as you can see the tallest bar here is time interval between 85-100 min(approx) and around 1000 movies out of 3855 movies have the runtime between these time intervals. So we can also say from this graph that mode time of movies is around 85-110 min, has the highest concentration of data points around this time interval. The distribution of this graph is positively skewed or right skewed!

# Q4 : In which year we had the most movies making profits?

In [68]:
```
profits_each_year = movie_data.groupby('release_year')['profit'].sum()

#giving the figure size(width, height)
plt.figure(figsize=(12,6), dpi = 130)

#labeling x-axis
plt.xlabel('Release Year of Movies', fontsize = 12)
#labeling y-axis
plt.ylabel('Total Profits made by Movies', fontsize = 12)
#title of a the plot
plt.title('Calculating Total Profits made by all movies in year which it
 released.')

#plotting what needs to be plotted
plt.plot(profits_each_year)

#showing the plot
plt.show()

#shows which year made the highest profit
profits_each_year.idxmax()
```




Out[68]: 2015

Opinion : Before i explain lets understand what the y axis shows us. Each values in the y-axis is been multiplied to '1e10' (as shown above the plot). Since the profits of movies are high, having 9+ digits, cannot fit the axis. So for example at the year 2010, the y-aixs value is around 1.35, which means that the profit at that year made by al movies released in that year is 1.35x1e10 = 13500000000 which is 13.5 billion dollars.

The year 2015, shows us the highest peak, having the highest profit than in any year, of more than 18 billion dollars. This graph doesn't exactly prove us that every year pass by, the profits of movies will increase but when we see in terms of decades it does show significant uprise in profits. At the year 2000, profits were around 8 biilion dollars, but in just 15 years it increased by 10+ biilion dollars. Last 15 years had a significant rise in profits compared to any other decades as we can see in the graph.

Not every year had same amount of movies released, the year 2015 had the most movie releases than in any other year. The more old the movies, the more less releases at that year (atleast this is what the dataset shows us).

This dataset also doesn't show all the movies that has been released in each year. If it would the graph might would show some different trend.

Also to note, In the dataset, there were also movies that had negative profits which drags down the the profits of other movies in those years. So we are not just calculating the movies which made profits, but also which went in loss! The highest profit making movie Avatar in 2009 alone drags the profit up by 2.5 billion dollars out of 14 billion dollars

In [69]:
```
#storing the values in the the form of DataFrame just to get a clean and
 better visual output
profits_each_year = pd.DataFrame(profits_each_year)
profits_each_year.tail()
```

Out[69]:

| | profit |
|---|---|
| **release_year** | |
| **2011** | 14966694704 |
| **2012** | 16596845507 |
| **2013** | 15782743325 |
| **2014** | 16676201357 |
| **2015** | 19032145273 |

# Q5: Which directer directed most films?

In [70]:
```
def extract_data(column_name):
    #will take a column, and separate the string by '|'
    all_data = profit_movie_data[column_name].str.cat(sep = '|')

    #giving pandas series and storing the values separately
    all_data = pd.Series(all_data.split('|'))

    #this will us value in descending order
    count = all_data.value_counts(ascending = False)

    return count
```

In [72]:
```
#assinging new dataframe which holds values only of movies having profit
 $100k or more
profit_movie_data = movie_data.query('profit >= 50000000')

#reindexing new dataframe
profit_movie_data.index = range(len(profit_movie_data))
#will initialize dataframe from 1 instead of 0
profit_movie_data.index = profit_movie_data.index + 1

#showing the dataset
profit_movie_data.head(2)
```

Out[72]:

| | budget_(in_US$) | revenue_(in_US$) | profit | original_title | cast | director |
|---|---|---|---|---|---|---|
| **1** | 150000000 | 1513528810 | 1363528810 | Jurassic World | Chris Pratt\|Bryce Dallas Howard\|Irrfan Khan\|Vi... | Colin Trevorrow |
| **2** | 150000000 | 378436354 | 228436354 | Mad Max: Fury Road | Tom Hardy\|Charlize Theron\|Hugh Keays-Byrne\|Nic... | George Miller |

In [73]:
```
#this will variable will store the return value from a function
director_count = extract_data('director')
#shwoing top 5 values
director_count.head()
```

Out[73]:
```
Steven Spielberg    23
Robert Zemeckis     13
Clint Eastwood      12
Tim Burton          11
Ron Howard          10
dtype: int64
```

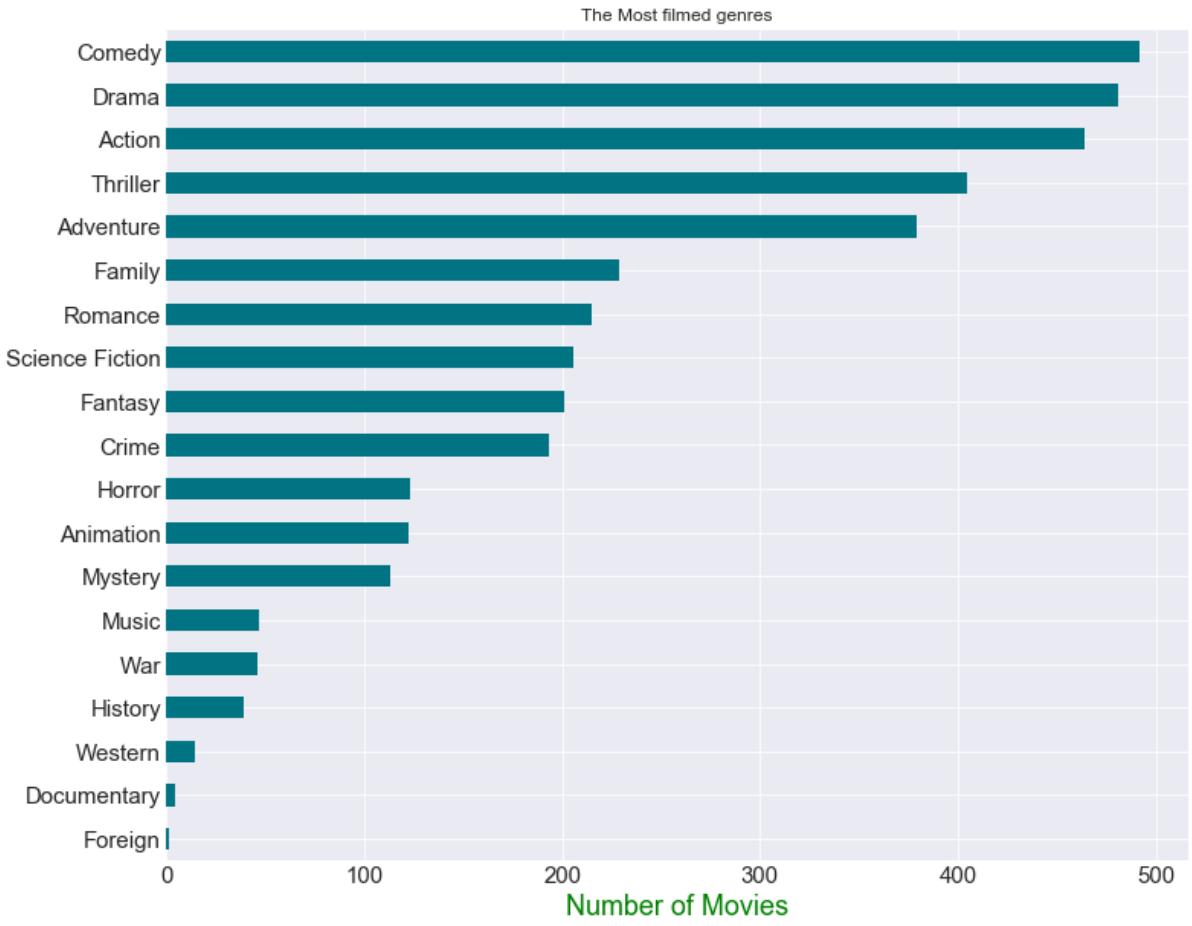
Opinion : 'Steven Spielberg' takes the crown! Directing 23 movies over $50M+ in profit, Also the other directors following along the list such as 'Robert Zemeckis', 'Clint Eastwood', 'Tim Burton' etc prove to be really great directors. Movies directed by these directors is more likely for a movie to make huge profits, the higher the movies they direct that earn huge profits, the higher the probability for a movie to go for success! Since we don't really know how many movies the directors directed in total in their lifetime, we can't say for sure that movies directed by above directors will always earn this much but gives us the idea that how much likely it is when it is directed by them.

# Q6 : Which genre were more successful?

In [74]:
```
#this will variable will store the return value from a function
genre_count = extract_data('genres')
#shwoing top 5 values
genre_count.head()
```

Out[74]:
```
Comedy       492
Drama        481
Action       464
Thriller     405
Adventure    379
dtype: int64
```

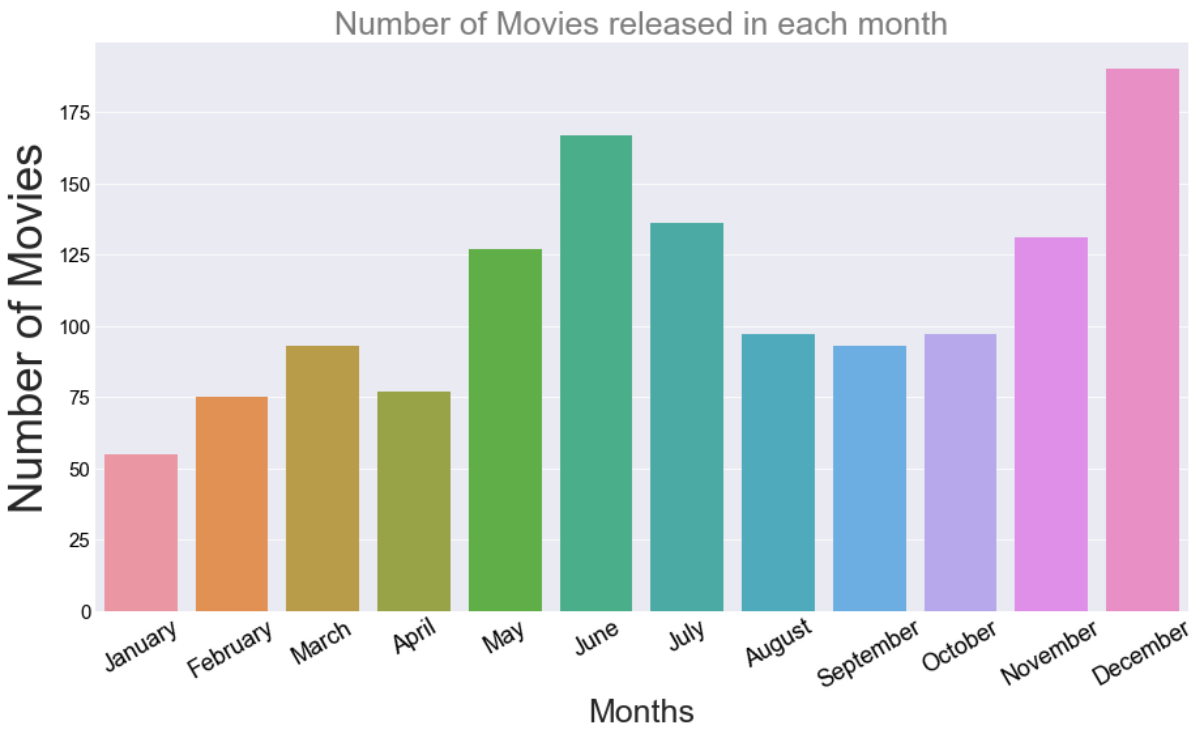
In [75]:
```
genre_count.sort_values(ascending = True, inplace = True)

#initializing plot
ax = genre_count.plot.barh(color = '#007482', fontsize = 15)

#giving a title
ax.set(title = 'The Most filmed genres')

#x-label
ax.set_xlabel('Number of Movies', color = 'g', fontsize = '18')

#giving the figure size(width, height)
ax.figure.set_size_inches(12, 10)

#shwoing the plot
plt.show()
```



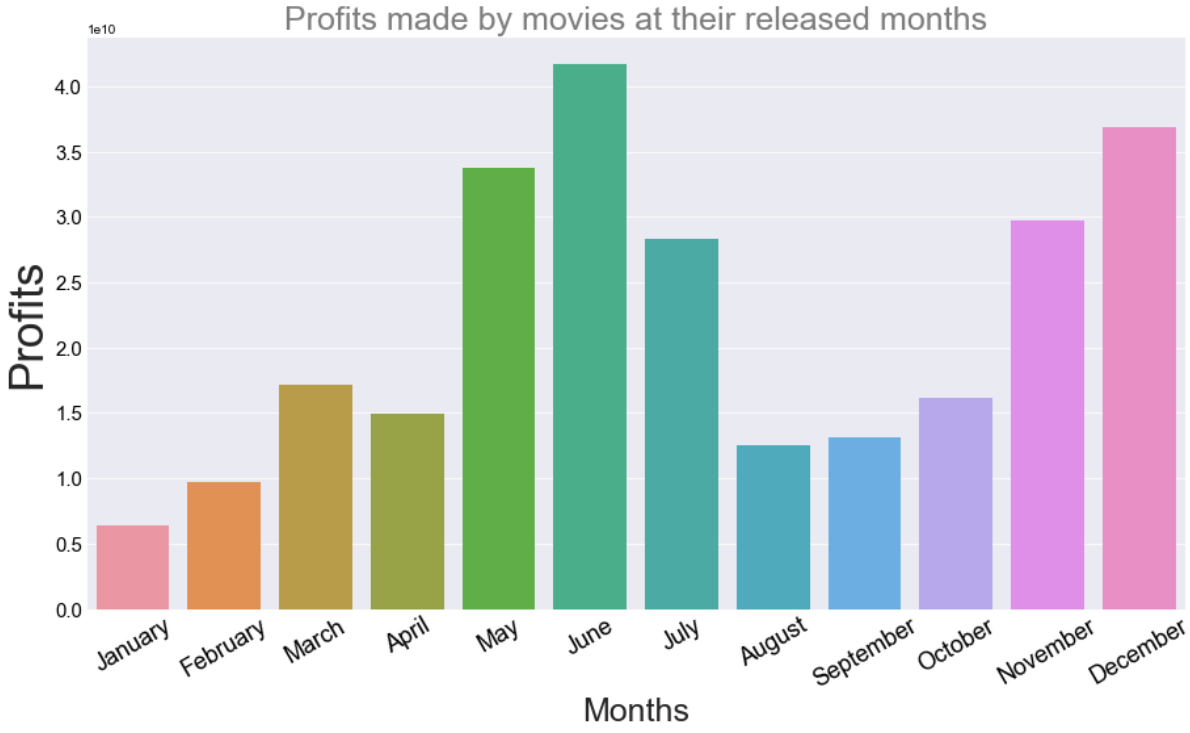

Opinion : Another amazing results. Action, Drama and Comedy genres are the most as visualized but Comedy takes the prize, about 492 movies have genres comedy which make $50M+ in profit. In comparison, even `Adventure` and `Thriller` really play the role.

# Q7 : Which month released highest number of movies in all of the years? And which month made the most profit?

In [84]:
```
####### Which month released highest number of movies in all of the year
s

#giving a new dataframe which gives 'release-date' as index
index_release_date = profit_movie_data.set_index('release_date')

#now we need to group all the data by month, since release date is in fo
rm of index, we extract month from it
groupby_index = index_release_date.groupby([(index_release_date.index.mo
nth)])

#this will give us how many movies are released in each month
monthly_movie_count = groupby_index.profit.count()

#converting table to a dataframe
monthly_movie_count= pd.DataFrame(monthly_movie_count)

#giving a list of months
month_list = ['January', 'February', 'March', 'April', 'May', 'June', 'J
uly', 'August', 'September', 'October', 'November', 'December']

monthly_movie_count_bar = sns.barplot(x = monthly_movie_count.index, y =
 monthly_movie_count.profit, data = monthly_movie_count)

#setting size of the graph
monthly_movie_count_bar.figure.set_size_inches(15,8)

#setting the title and customizing
monthly_movie_count_bar.axes.set_title('Number of Movies released in eac
h month',  fontsize = 25, alpha = 0.6)

#setting x-label
monthly_movie_count_bar.set_xlabel("Months",  fontsize = 25)
#setting y-label
monthly_movie_count_bar.set_ylabel("Number of Movies",  fontsize = 35)

#customizing axes values
monthly_movie_count_bar.tick_params(labelsize = 15, labelcolor="black")

#rotating the x-axis values to make it readable
monthly_movie_count_bar.set_xticklabels(month_list, rotation = 30, size
= 18)

#shows the plot
plt.show()
```


Number of Movies released in each month
Number of Movies
0
25
50
75
100
125
150
175
January
February
March
April
May
June
July
August
September
October
November
December
Months

In [85]:
```
######### which month made the most profit

#now since the data is grouped by month, we add 'profit' values to respe
ctive months, saving all this to a new var
monthly_profit = groupby_index.profit.sum()

#converting table to a dataframe
monthly_profit = pd.DataFrame(monthly_profit)

#giving seaborn bar plot to visualize the data
#giving values to our graph
monthly_profit_bar = sns.barplot(x = monthly_profit.index, y = monthly_p
rofit.profit, data = monthly_profit)

#setting size of the graph
monthly_profit_bar.figure.set_size_inches(15,8)

#setting the title and customizing
monthly_profit_bar.axes.set_title('Profits made by movies at their relea
sed months',fontsize = 25, alpha = 0.6)

#setting x-label
monthly_profit_bar.set_xlabel("Months", fontsize = 25)
#setting y-label
monthly_profit_bar.set_ylabel("Profits", fontsize = 35)

#customizing axes values
monthly_profit_bar.tick_params(labelsize = 15, labelcolor="black")

#rotating the x-axis values to make it readable
monthly_profit_bar.set_xticklabels(month_list, rotation = 30, size = 18)

#shows the plot
plt.show()
```



Opinion : Seeing the both visualizations of both graphs we see similar trend. Where there are more movie released there is more profit and vice versa but just not for one month i.e December. December is the month where most movie release but when compared to profits it ranks second. This means that december month has high release rate but less profit margin. The month of June where we have around 165 movie releases, which is second highest, is the highest in terms of making profits.

Also one more thing is we earlier finded which movie had made the most profit in our dataset, We came up with the answer of movie, 'Avatar', and the release month for this movie is in december, also the highest in loss movie had also released in december but that isn't being counted here. Knowing this that you have the highest release rate and highest profit making movie in same month of December but falls short in front of June month in terms of making profits makes me think that the month of June had movies with significant high profits where in december it didn't had that much high, making it short in terms of profit even though having the advantage of highest release rate.

This visualization doesn't prove us that if we release a movie in those months we will earn more $50M. It just makes us think that the chances are higher, again it depends on other influential factors, such as directors, story, cast etc.

# Conclusion

As i have answered the questions that i thought would be interesting to dig into, i want to wrap up all my findings in this way ....

Q. If i wanted to show one of the best and most profitable movie, who would i hire as director and cast, which genre would i choose and also at what month would i release the movie in?

Ans. I would..

Limitations - I want to make it clear, it's not 100 percent guaranteed solution that this formula is gonna work, meaning we are going to earn more than $50M! But it shows us that we have high probability of making high profits if we had similar characteristics as such. All these directors, actors, genres and released dates have a common trend of attraction. If we release a movie with these characteristics, it gives people high expectations from this movie. Thus attracting more people towards the movie but it ultimately comes down to story mainly and also other important influential factors. People having higher expectations gives us less probability of meeting their expectations. Even if the movie was worth, people's high expectations would lead in biased results ultimately effecting the profits. We also see this in real life specially in sequels of movies. This was just one example of an influantial factor that would lead to different results, there are many that have to be taken care of.There is no normalization or exchanges rate or currency conversion is considered during this analysis and our analysis is limited to the numerical values of revenue.Dropping missing or Null values from variables of our interest might skew our analysis and could show unintentional bias towards relationship being analyzed.

And that's my conclusion!

Reference : https://matplotlib.org/users/pyplot_tutorial.html (https://matplotlib.org/users/pyplot_tutorial.html) https://plot.ly/matplotlib/bar-charts/ (https://plot.ly/matplotlib/bar-charts/) http://cs231n.github.io/python-numpy-tutorial/ (http://cs231n.github.io/python-numpy-tutorial/) https://seaborn.pydata.org/ (https://seaborn.pydata.org/) https://docs.python.org/2/library/datetime.html (https://docs.python.org/2/library/datetime.html) https://stackoverflow.com/questions/11346283/renaming-columns-in-pandas (https://stackoverflow.com/questions/11346283/renaming-columns-in-pandas)