In [1]:

```
# Import standard packages
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline
```

In [2]:

```
# Importing data and changing axis for later join
basics = pd.read_csv("zippedData/imdb.title.basics.csv.gz")
basics.set_index("tconst", inplace = True)
basics = basics.drop("original_title", axis=1)
basics
```

Out[2]:

tconst	primary_title	start_year	runtime_minutes	genres
tt0063540	Sunghursh	2013	175.0	Action,Crime,Drama
tt0066787	One Day Before the Rainy Season	2019	114.0	Biography,Drama
tt0069049	The Other Side of the Wind	2018	122.0	Drama
tt0069204	Sabse Bada Sukh	2018	NaN	Comedy,Drama
tt0100275	The Wandering Soap Opera	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...
tt9916538	Kuambil Lagi Hatiku	2019	123.0	Drama
tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
tt9916706	Dankyavar Danka	2013	NaN	Comedy
tt9916730	6 Gunn	2017	116.0	NaN
tt9916754	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 4 columns

In [3]:

```
# Importing data and changing axis for later join
ratings = pd.read_csv("zippedData/imdb.title.ratings.csv.gz")
ratings.set_index("tconst", inplace = True)
ratings
```

Out[3]:

tconst	averagerating	numvotes
tt10356526	8.3	31
tt10384606	8.9	559
tt1042974	6.4	20
tt1043726	4.2	50352
tt1060240	6.5	21
...	...	...
tt9805820	8.1	25
tt9844256	7.5	24
tt9851050	4.7	14
tt9886934	7.0	5
tt9894098	6.3	128

73856 rows × 2 columns

In [4]:

```
# Importing data and changing axis for later join
names = pd.read_csv("zippedData/imdb.name.basics.csv.gz")
#Dropping unneccesary data
names = names.drop(["birth_year", "death_year", "primary_profession", "known_for_titles"], axis=1)
names.set_index("nconst", inplace = True)
names
```

Out[4]:

nconst	primary_name
nm0061671	Mary Ellen Bauder
nm0061865	Joseph Bauer
nm0062070	Bruce Baum
nm0062195	Axel Baumann
nm0062798	Pete Baxter
...	...
nm9990381	Susan Grobes
nm9990690	Joo Yeon So
nm9991320	Madeline Smith
nm9991786	Michelle Modigliani
nm9993380	Pegasus Envoyé

606648 rows × 1 columns

In [5]:

```
#Importing crew data
directors = pd.read_csv("zippedData/imdb.title.crew.csv.gz")
#exploding directors column
directors = directors.set_index(['tconst', 'writers']).apply(lambda x: x.str.split(',').explode()).reset_index()
#dropping writers column
directors = directors.drop("writers", axis=1).dropna()
#setting index for later merge
directors.set_index("directors", inplace = True)
#directors = directors.drop_duplicates()
directors
```

Out[5]:

directors	tconst
nm0899854	tt0285252
nm1940585	tt0462036
nm0151540	tt0835418
nm0089502	tt0878654
nm2291498	tt0878654
...	...
nm10122357	tt8999974
nm6711477	tt9001390
nm10123242	tt9001494
nm10123248	tt9001494
nm4993825	tt9004986

163535 rows × 1 columns

In [6]:

```
# Importing data and changing axis for later join
budgets = pd.read_csv("zippedData/bom.movie_gross.csv.gz")
budgets.set_index("title", inplace = True)
budgets
```

Out[6]:

title	studio	domestic_gross	foreign_gross	year
Toy Story 3	BV	415000000.0	652000000	2010
Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
Inception	WB	292600000.0	535700000	2010
Shrek Forever After	P/DW	238700000.0	513900000	2010
...	...	...	...	...
The Quake	Magn.	6200.0	NaN	2018
Edward II (2018 re-release)	FM	4800.0	NaN	2018
El Pacto	Sony	2500.0	NaN	2018
The Swan	Synergetic	2400.0	NaN	2018
An Actor Prepares	Grav.	1700.0	NaN	2018

3387 rows × 4 columns

In [7]:

```
# Importing data and changing axis for later join
altbudgets = pd.read_csv("zippedData/tn.movie_budgets.csv.gz")
altbudgets.set_index("movie", inplace = True)
altbudgets
```

Out[7]:

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

5782 rows × 5 columns

In [8]:

```
#Joining rating with basic movie info
mergedinfo=basics.join(ratings)
mergedinfo
```

Out[8]:

tconst	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes
tt0063540	Sunghursh	2013	175.0	Action,Crime,Drama	7.0	77.0
tt0066787	One Day Before the Rainy Season	2019	114.0	Biography,Drama	7.2	43.0
tt0069049	The Other Side of the Wind	2018	122.0	Drama	6.9	4517.0
tt0069204	Sabse Bada Sukh	2018	NaN	Comedy,Drama	6.1	13.0
tt0100275	The Wandering Soap Opera	2017	80.0	Comedy,Drama,Fantasy	6.5	119.0
...	...	...	...	...	...	...
tt9916538	Kuambil Lagi Hatiku	2019	123.0	Drama	NaN	NaN
tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary	NaN	NaN
tt9916706	Dankyavar Danka	2013	NaN	Comedy	NaN	NaN
tt9916730	6 Gunn	2017	116.0	NaN	NaN	NaN
tt9916754	Chico Albuquerque - Revelações	2013	NaN	Documentary	NaN	NaN

146144 rows × 6 columns

In [9]:

```
#Joining director list with name data
director_movies = directors.join(names, how="left").reset_index()
#Setting index for join
director_movies = director_movies.set_index("tconst")
director_movies = director_movies.rename(columns={"primary_name":"Director", "index":"nconst"})
#Joining the previously joined basic/rating data with the director names
director_movies = director_movies.join(mergedinfo)
director_movies
```

Out[9]:

tconst	nconst	Director	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes
tt0063540	nm0712540	Harnam Singh Rawail	Sunghursh	2013	175.0	Action,Crime,Drama	7.0	77.0
tt0066787	nm0002411	Mani Kaul	One Day Before the Rainy Season	2019	114.0	Biography,Drama	7.2	43.0
tt0069049	nm0000080	Orson Welles	The Other Side of the Wind	2018	122.0	Drama	6.9	4517.0
tt0069204	nm0611531	Hrishikesh Mukherjee	Sabse Bada Sukh	2018	NaN	Comedy,Drama	6.1	13.0
tt0100275	nm0749914	Raoul Ruiz	The Wandering Soap Opera	2017	80.0	Comedy,Drama,Fantasy	6.5	119.0
...	...	...	...	...	...	...	...	...
tt9916622	nm9272491	Ana Célia de Oliveira	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary	NaN	NaN
tt9916706	nm7764440	Kanchan Nayak	Dankyavar Danka	2013	NaN	Comedy	NaN	NaN
tt9916730	nm10538612	Kiran Gawade	6 Gunn	2017	116.0	NaN	NaN	NaN
tt9916754	nm8349149	Vinicius Augusto Bozzo	Chico Albuquerque - Revelações	2013	NaN	Documentary	NaN	NaN
tt9916754	nm9272490	Angela Gurgel	Chico Albuquerque - Revelações	2013	NaN	Documentary	NaN	NaN

163535 rows × 8 columns

In [10]:

```
#joining rating data with gross data
ratingvsgross = pd.DataFrame(mergedinfo)
ratingvsgross = ratingvsgross.set_index("primary_title")
ratingvsgross = budgets.join(ratingvsgross, how="inner")
#Dropping irrelevant data
ratingvsgross = ratingvsgross.drop(["studio", "year", "start_year", "runtime_minutes", "genres"], axis = 1)
ratingvsgross
```

Out[10]:

	domestic_gross	foreign_gross	averagerating	numvotes
'71	1300000.0	355000	7.2	46103.0
1,000 Times Good Night	53900.0	NaN	7.1	6848.0
10 Cloverfield Lane	72100000.0	38100000	7.2	260383.0
10 Years	203000.0	NaN	6.1	22484.0
1001 Grams	11000.0	NaN	6.3	1301.0
...	...	...	...	...
Zindagi Na Milegi Dobara	3100000.0	NaN	8.1	58912.0
Zombeavers	14900.0	NaN	4.8	14825.0
Zookeeper	80400000.0	89500000	5.2	52396.0
Zoolander 2	28800000.0	27900000	4.7	59914.0
Zootopia	341300000.0	682500000	8.0	383446.0

3366 rows × 4 columns

In [11]:

```
#This section explodes the genre column to find average rating across genres later
mergedinfo=basics.join(ratings) #See below
splitgenres = pd.DataFrame(data=mergedinfo)
splitgenres["genres"] = splitgenres["genres"].str.split(",") #For reasons I do not understand and cannot comprehend
#this line alters mergedinfo instead of splitgenres which causes errors when this cell is run more than once so I
#have to redefine mergedinfo at the start and end of the process. I have given up on finding another solution.
splitgenres = splitgenres.explode("genres")
mergedinfo=basics.join(ratings) #See above
splitgenres
```

Out[11]:

tconst	primary_title	start_year	runtime_minutes	genres	averagerating	numvotes
tt0063540	Sunghursh	2013	175.0	Action	7.0	77.0
tt0063540	Sunghursh	2013	175.0	Crime	7.0	77.0
tt0063540	Sunghursh	2013	175.0	Drama	7.0	77.0
tt0066787	One Day Before the Rainy Season	2019	114.0	Biography	7.2	43.0
tt0066787	One Day Before the Rainy Season	2019	114.0	Drama	7.2	43.0
...	...	...	...	...	...	...
tt9916538	Kuambil Lagi Hatiku	2019	123.0	Drama	NaN	NaN
tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary	NaN	NaN
tt9916706	Dankyavar Danka	2013	NaN	Comedy	NaN	NaN
tt9916730	6 Gunn	2017	116.0	NaN	NaN	NaN
tt9916754	Chico Albuquerque - Revelações	2013	NaN	Documentary	NaN	NaN

234958 rows × 6 columns

In [12]:

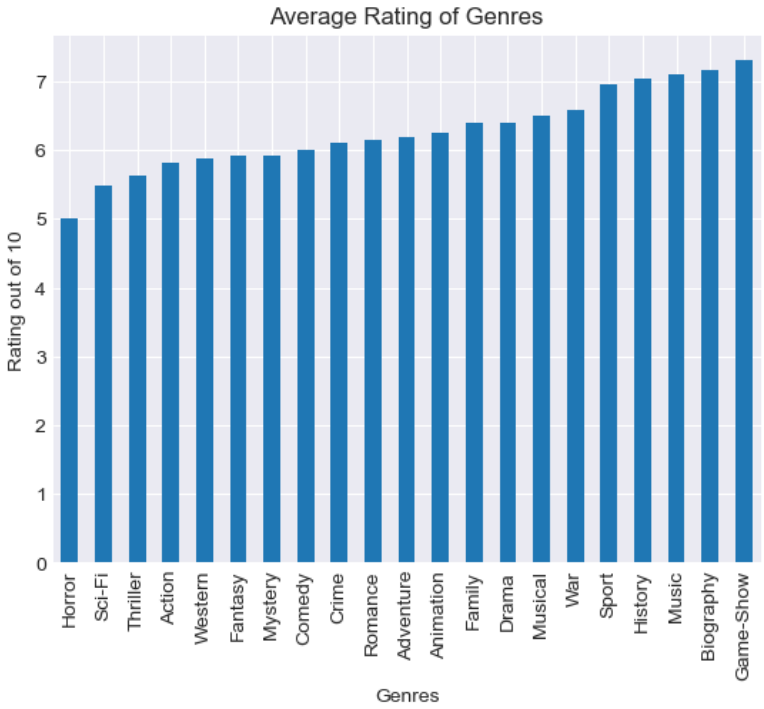
```
#Dropping NaNs/duplicates and grouping by average averagerating
genre_rating = pd.DataFrame(splitgenres.dropna(subset=["averagerating"]).drop_duplicates().groupby("genres")[["average
#Dropping genres with less than 1000 averave votes to eliminate outliers
genre_rating = genre_rating.drop(genre_rating[genre_rating.numvotes < 1000].index)
#Dropping numvotes column and sorting values for pretty graph
genre_rating = genre_rating.drop("numvotes", axis=1)
genre_rating = genre_rating.sort_values("averagerating")
genre_rating
```

Out[12]:

genres	averagerating
Horror	5.003440
Sci-Fi	5.489755
Thriller	5.639114
Action	5.810361
Western	5.868214
Fantasy	5.919473
Mystery	5.920401
Comedy	6.002689
Crime	6.115441
Romance	6.146608
Adventure	6.196201
Animation	6.248308
Family	6.394725
Drama	6.401559
Musical	6.498336
War	6.584291
Sport	6.961493
History	7.040956
Music	7.091972
Biography	7.162274
Game-Show	7.300000

In [13]:

```
#Pretty graph
plt.style.use('seaborn-darkgrid')
genre_rating.plot.bar(title = "Average Rating of Genres",
                      xlabel = "Genres",
                      ylabel = "Rating out of 10",
                      legend=False);
```



In [14]:

```
#Drops NaNs, then drops duplicates, then groups the directors by the average rating of movies they've worked on
#then drops any director with less than 50000 average ratings per movie to display only most pristine of directors
#and also eliminate outliers
director_rating = pd.DataFrame(director_movies.dropna(subset=["averagerating"]).drop_duplicates().groupby("Director")[
director_rating = director_rating.drop(director_rating[director_rating.numvotes < 50000].index)
director_rating = director_rating.sort_values("averagerating", ascending=False)
#Prettying up the headers
director_rating = director_rating.rename(columns={"averagerating":"Average Rating", "numvotes":"Number of Votes"})
director_rating.head(20)
```

Out[14]:

Director	Average Rating	Number of Votes
Quentin Tarantino	8.675000	4.138442e+05
Bob Persichetti	8.500000	2.108690e+05
Rodney Rothman	8.500000	2.108690e+05
Christopher Nolan	8.425000	1.248687e+06
Adrian Molina	8.400000	2.771940e+05
Lee Unkrich	8.350000	4.797060e+05
Anthony Russo	8.225000	5.904550e+05
Ronnie Del Carmen	8.200000	5.361810e+05
Malik Bendjelloul	8.200000	5.865400e+04
Mel Gibson	8.100000	3.669040e+05
Damián Szifron	8.100000	1.511230e+05
Spike Jonze	8.050000	2.338690e+05
Rajkumar Hirani	8.050000	8.924250e+04
Jared Bush	8.000000	3.834460e+05
Banksy	8.000000	5.872100e+04
Stephen Chbosky	8.000000	2.671515e+05
Tim Miller	8.000000	8.208470e+05
Damien Chazelle	7.966667	3.909983e+05
Wes Anderson	7.933333	3.445330e+05
Byron Howard	7.900000	3.749060e+05

In [15]:

```
#data cleaning
dom_gross_rating = pd.DataFrame(ratingvsgross.drop("foreign_gross", axis=1))
dom_gross_rating = dom_gross_rating.dropna().drop_duplicates()
#once again dropping values below a vote threshold for the sake of data visibility
dom_gross_rating = dom_gross_rating.drop(dom_gross_rating[dom_gross_rating.numvotes < 100000].index)
dom_gross_rating = dom_gross_rating.sort_values("numvotes", ascending=False)
dom_gross_rating
```

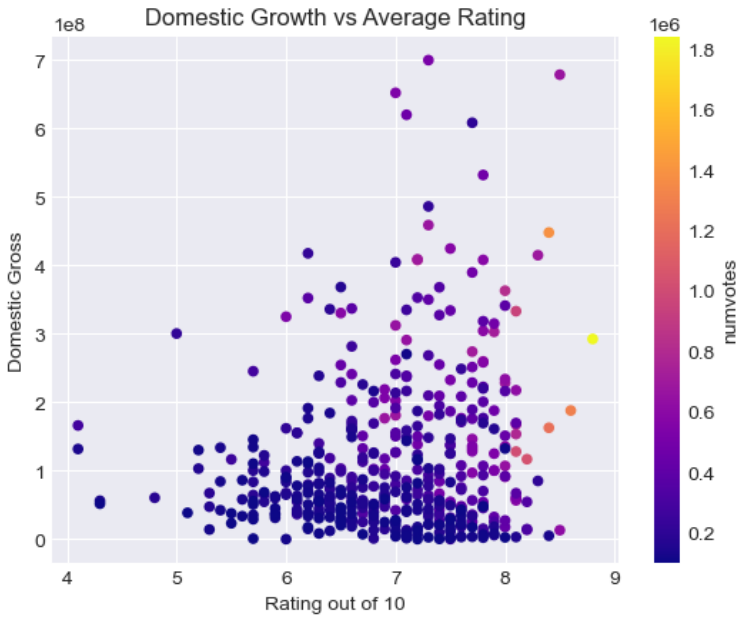
Out[15]:

	domestic_gross	averagerating	numvotes
Inception	292600000.0	8.8	1841066.0
The Dark Knight Rises	448100000.0	8.4	1387769.0
Interstellar	188000000.0	8.6	1299334.0
Django Unchained	162800000.0	8.4	1211405.0
The Wolf of Wall Street	116900000.0	8.2	1035358.0
...	...	...	...
Bad Moms	113300000.0	6.2	100952.0
Carol	12700000.0	7.2	100680.0
Sex Tape	38500000.0	5.1	100520.0
Pompeii	23200000.0	5.5	100467.0
Only God Forgives	779000.0	5.7	100318.0

454 rows × 3 columns

In [16]:

```
#Pretty graph
dom_gross_rating.plot.scatter("averagerating", "domestic_gross",
                              c = 'numvotes',
                              colormap = 'plasma',
                              title = "Domestic Growth vs Average Rating",
                              xlabel = "Rating out of 10",
                              ylabel = "Domestic Gross"
                              );
```



In [17]:

```
#cleaning
runtime = pd.DataFrame(mergedinfo).dropna(subset=["runtime_minutes"]).dropna(subset=["averagerating"])
#Cutting out anything longer than the Titanic
runtime = runtime.drop(runtime[runtime.runtime_minutes > 210].index)
#And anything shorter than an hour
runtime = runtime.drop(runtime[runtime.runtime_minutes < 60].index)
#And anything with too few votes
runtime = runtime.drop(runtime[runtime.numvotes < 10000].index)
runtime = runtime.sort_values("numvotes", ascending=False)
#I had to do this to get the graph to work, don't ask me why
runtime = runtime.rename(columns={"averagerating":"Average Rating", "runtime_minutes":"Runtime (Minutes)"})


runtime
```

Out[17]:

tconst	primary_title	start_year	Runtime (Minutes)	genres	Average Rating	numvotes
tt1375666	Inception	2010	148.0	Action,Adventure,Sci-Fi	8.8	1841066.0
tt1345836	The Dark Knight Rises	2012	164.0	Action,Thriller	8.4	1387769.0
tt0816692	Interstellar	2014	169.0	Adventure,Drama,Sci-Fi	8.6	1299334.0
tt1853728	Django Unchained	2012	165.0	Drama,Western	8.4	1211405.0
tt0848228	The Avengers	2012	143.0	Action,Adventure,Sci-Fi	8.1	1183655.0
...	...	...	...	...	...	...
tt1422020	Dog Pound	2010	91.0	Drama	7.0	10025.0
tt1657299	The Decoy Bride	2011	89.0	Comedy,Drama,Romance	6.2	10018.0
tt6097798	Radius	2017	93.0	Sci-Fi,Thriller	6.2	10008.0
tt2776878	Thank You for Your Service	2017	109.0	Biography,Drama,War	6.5	10006.0
tt1734110	No One Killed Jessica	2011	136.0	Biography,Crime,Drama	7.2	10000.0

2673 rows × 6 columns

In [18]:

```
runtime.plot.scatter("Runtime (Minutes)", "Average Rating",
                             c = 'numvotes',
                             colormap = 'plasma',
                             title = "Average Rating vs Movie Length",
                             xlabel = "Movie Length",
                             ylabel = "Rating out of 10"
                             );
```