ML 512 Project Choice 1 - Explore methods

In [5]:
```
import pandas as pd
import numpy as np
import json
import collections
import seaborn as sns; sns.set()
import matplotlib.pyplot as plt
import collections
plt.style.use('ggplot')
```

In [6]:
```
movie_df = pd.read_csv('tmdb_movies_data.csv')
```

In [7]:
```
movie_df.shape
```

Out[7]:
```
(10866, 21)
```

In [8]:
```
movie_df.columns
```

Out[8]:
```
Index(['id', 'imdb_id', 'popularity', 'budget', 'revenue', 'original_title',
       'cast', 'homepage', 'director', 'tagline', 'keywords', 'overview',
       'runtime', 'genres', 'production_companies', 'release_date',
       'vote_count', 'vote_average', 'release_year', 'budget_adj',
       'revenue_adj'],
      dtype='object')
```

In [9]:
```
movie_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 21 columns):
id                      10866 non-null int64
imdb_id                 10856 non-null object
popularity              10866 non-null float64
budget                  10866 non-null int64
revenue                 10866 non-null int64
original_title          10866 non-null object
cast                    10790 non-null object
homepage                2936 non-null object
director                10822 non-null object
tagline                 8042 non-null object
keywords                9373 non-null object
overview                10862 non-null object
runtime                 10866 non-null int64
genres                  10843 non-null object
production_companies    9836 non-null object
release_date            10866 non-null object
vote_count              10866 non-null int64
vote_average            10866 non-null float64
release_year            10866 non-null int64
budget_adj              10866 non-null float64
revenue_adj             10866 non-null float64
dtypes: float64(4), int64(6), object(11)
memory usage: 1.7+ MB
```

In [10]:
```
movie_df.budget.describe()
```

Out[10]:
```
count    1.086600e+04
mean     1.462570e+07
std      3.091321e+07
min      0.000000e+00
25%      0.000000e+00
50%      0.000000e+00
75%      1.500000e+07
max      4.250000e+08
Name: budget, dtype: float64
```

In [11]:
```
movie_df = movie_df.drop(movie_df[movie_df.budget == 0].index)
```

In [12]:
```
movie_df.budget.describe()
```

Out[12]:
```
count    5.170000e+03
mean     3.073943e+07
std      3.890065e+07
min      1.000000e+00
25%      6.000000e+06
50%      1.700000e+07
75%      4.000000e+07
max      4.250000e+08
Name: budget, dtype: float64
```

In [13]:
```
movie_df.shape
```

Out[13]:
```
(5170, 21)
```

In [14]:
```
movie_df.sample(1)
```

Out[14]:

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime	
7706	15728	tt0433350	0.39628	500000	220151	Boy Culture	Jonathon Trent|Derek Magyar|George Jonson|Patr...	NaN	Q. Allan Brocka	Sex pays. Love costs.	...	A successful male escort describes in a series...	88	Dr

1 rows × 21 columns

Genre Popularity Vs Decade

In [15]:
```
def get_decade_by_year(year):
    decade = year - (year%10)
    decade_plus_10 = decade +10
    decade_as_str = str(decade)+'-'+ str(decade_plus_10)
    return decade_as_str
```

In [16]:
```
get_decade_by_year(1951)
```

Out[16]:
```
'1950-1960'
```

In [17]:
```
year_of_release = []
decade_of_release = []
month_of_release = []
for x in range(len(movie_df)):
    year = int(movie_df.iloc[x]['release_date'][-4:])
    month = int(movie_df.iloc[x]['release_date'].split('/')[0])
    year_of_release.append(year)
    decade_of_release.append(get_decade_by_year(year))
    month_of_release.append(month)
movie_df['year_of_release'] = year_of_release
movie_df['decade_of_release'] = decade_of_release
movie_df['month_of_release'] = month_of_release
```

In [18]:
```
sample_cols = ['month_of_release','year_of_release','release_date','decade_of_release']
movie_df[sample_cols].sample(5)
```

Out[18]:

	month_of_release	year_of_release	release_date	decade_of_release
4684	8	2012	8/1/2012	2010-2020
8191	12	1995	12/13/1995	1990-2000
6572	6	2006	6/22/2006	2000-2010
6977	5	2004	5/19/2004	2000-2010
5176	7	2003	7/11/2003	2000-2010

In [19]:
```
genre_by_decade = collections.OrderedDict()
for i in range(len(movie_df)):
    decade = movie_df.iloc[i]['decade_of_release']
    if decade not in genre_by_decade:
        genre_by_decade[decade] = {}
    if type(movie_df.iloc[i]['genres'])==str:
        genres_as_list = movie_df.iloc[i]['genres'].split('|')
        for each_genre_in_movie in genres_as_list:
            if each_genre_in_movie not in genre_by_decade[decade]:
                genre_by_decade[decade][each_genre_in_movie] =1
            else:
                genre_by_decade[decade][each_genre_in_movie]+=1
```

In [20]:
```
df = pd.DataFrame(genre_by_decade)
cols= sorted(list(df.columns))
df[cols]
```

Out[20]:

	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Action	30.0	55.0	140.0	284	509	411
Adventure	33.0	40.0	102.0	164	339	228
Science Fiction	11.0	42.0	103.0	140	224	182
Thriller	26.0	63.0	140.0	330	619	464
Fantasy	6.0	13.0	67.0	110	189	123
Crime	17.0	36.0	78.0	183	307	203
Western	10.0	7.0	6.0	14	22	15
Drama	62.0	94.0	190.0	454	878	639
Family	13.0	13.0	44.0	111	219	123
Animation	4.0	10.0	14.0	31	109	92
Comedy	30.0	43.0	180.0	360	688	439
Mystery	12.0	16.0	29.0	100	185	98
Romance	26.0	19.0	85.0	176	364	191
War	14.0	12.0	18.0	20	58	33
History	13.0	10.0	20.0	32	68	40
Music	9.0	12.0	25.0	22	60	41
Horror	16.0	40.0	134.0	115	247	213
Documentary	NaN	NaN	3.0	5	25	31
TV Movie	NaN	NaN	NaN	1	4	4
Foreign	1.0	1.0	2.0	3	19	9

In [21]:
```
columns = list(df.columns)
for column in columns:
    df[column] = 100*df[column] /  df[column].sum()
cols= sorted(list(df.columns))
df[cols]
```

Out[21]:

	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Action	9.009009	10.456274	10.144928	10.696798	9.916228	11.483655
Adventure	9.909910	7.604563	7.391304	6.177024	6.604325	6.370495
Science Fiction	3.303303	7.984791	7.463768	5.273070	4.363920	5.085219
Thriller	7.807808	11.977186	10.144928	12.429379	12.059225	12.964515
Fantasy	1.801802	2.471483	4.855072	4.143126	3.682057	3.436714
Crime	5.105105	6.844106	5.652174	6.892655	5.980908	5.671975
Western	3.003003	1.330798	0.434783	0.527307	0.428599	0.419111
Drama	18.618619	17.870722	13.768116	17.099812	17.105007	17.854149
Family	3.903904	2.471483	3.188406	4.180791	4.266511	3.436714
Animation	1.201201	1.901141	1.014493	1.167608	2.123515	2.570550
Comedy	9.009009	8.174905	13.043478	13.559322	13.403468	12.265996
Mystery	3.603604	3.041825	2.101449	3.766478	3.604130	2.738195
Romance	7.807808	3.612167	6.159420	6.629002	7.091370	5.336686
War	4.204204	2.281369	1.304348	0.753296	1.129944	0.922045
History	3.903904	1.901141	1.449275	1.205273	1.324761	1.117631
Music	2.702703	2.281369	1.811594	0.828625	1.168907	1.145571
Horror	4.804805	7.604563	9.710145	4.331450	4.812001	5.951383
Documentary	NaN	NaN	0.217391	0.188324	0.487045	0.866164
TV Movie	NaN	NaN	NaN	0.037665	0.077927	0.111763
Foreign	0.300300	0.190114	0.144928	0.112994	0.370154	0.251467

In [22]:
```
df
```

Out[22]:

	2010-2020	1970-1980	2000-2010	1990-2000	1980-1990	1960-1970
Action	11.483655	10.456274	9.916228	10.696798	10.144928	9.009009
Adventure	6.370495	7.604563	6.604325	6.177024	7.391304	9.909910
Science Fiction	5.085219	7.984791	4.363920	5.273070	7.463768	3.303303
Thriller	12.964515	11.977186	12.059225	12.429379	10.144928	7.807808
Fantasy	3.436714	2.471483	3.682057	4.143126	4.855072	1.801802
Crime	5.671975	6.844106	5.980908	6.892655	5.652174	5.105105
Western	0.419111	1.330798	0.428599	0.527307	0.434783	3.003003
Drama	17.854149	17.870722	17.105007	17.099812	13.768116	18.618619
Family	3.436714	2.471483	4.266511	4.180791	3.188406	3.903904
Animation	2.570550	1.901141	2.123515	1.167608	1.014493	1.201201
Comedy	12.265996	8.174905	13.403468	13.559322	13.043478	9.009009
Mystery	2.738195	3.041825	3.604130	3.766478	2.101449	3.603604
Romance	5.336686	3.612167	7.091370	6.629002	6.159420	7.807808
War	0.922045	2.281369	1.129944	0.753296	1.304348	4.204204
History	1.117631	1.901141	1.324761	1.205273	1.449275	3.903904
Music	1.145571	2.281369	1.168907	0.828625	1.811594	2.702703
Horror	5.951383	7.604563	4.812001	4.331450	9.710145	4.804805
Documentary	0.866164	NaN	0.487045	0.188324	0.217391	NaN
TV Movie	0.111763	NaN	0.077927	0.037665	NaN	NaN
Foreign	0.251467	0.190114	0.370154	0.112994	0.144928	0.300300

In [23]:
```
df.T.columns
```

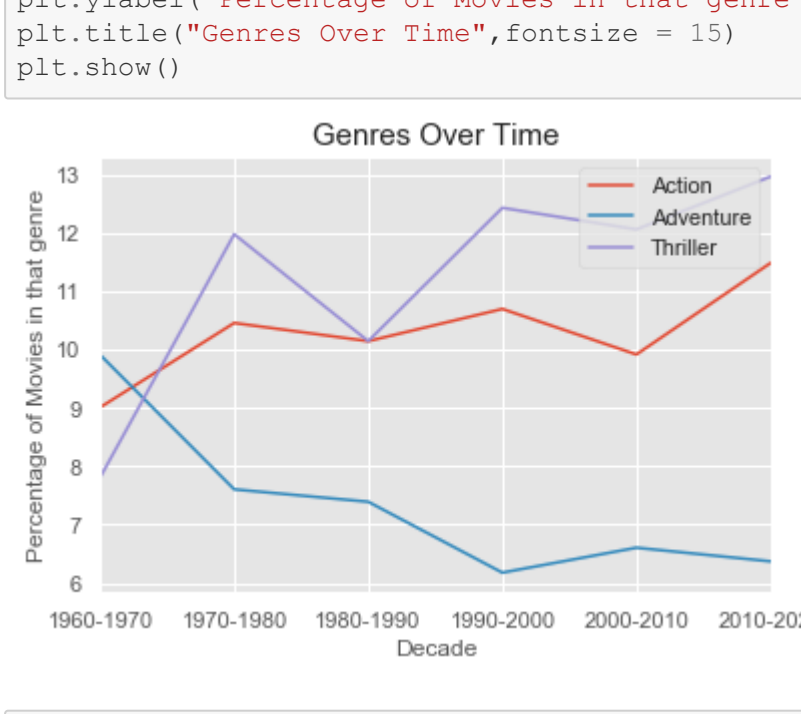
Out[23]:
```
Index(['Action', 'Adventure', 'Science Fiction', 'Thriller', 'Fantasy',
       'Crime', 'Western', 'Drama', 'Family', 'Animation', 'Comedy', 'Mystery',
       'Romance', 'War', 'History', 'Music', 'Horror', 'Documentary',
       'TV Movie', 'Foreign'],
      dtype='object')
```

In [24]:
```
a =df.T.sort_index()
```

In [25]:
```
a.columns
```

Out[25]:
```
Index(['Action', 'Adventure', 'Science Fiction', 'Thriller', 'Fantasy',
       'Crime', 'Western', 'Drama', 'Family', 'Animation', 'Comedy', 'Mystery',
       'Romance', 'War', 'History', 'Music', 'Horror', 'Documentary',
       'TV Movie', 'Foreign'],
      dtype='object')
```

In [26]:
```
## plt.figure(figsize=(10,7))
cols =['Action','Adventure','Thriller']
a[cols].plot()
plt.xlabel("Decade",fontsize = 12)
plt.ylabel("Percentage of Movies in that genre",fontsize=12)
plt.title("Genres Over Time",fontsize = 15)
plt.show()
```



In [27]:
```
df.sum(axis=0)
```

Out[27]:
```
2010-2020    100.0
1970-1980    100.0
2000-2010    100.0
1990-2000    100.0
1980-1990    100.0
1960-1970    100.0
dtype: float64
```

In [28]:
```
df.nlargest(1,'1960-1970')
```

Out[28]:

	2010-2020	1970-1980	2000-2010	1990-2000	1980-1990	1960-1970
Drama	17.854149	17.870722	17.105007	17.099812	13.768116	18.618619

In [29]:
```
movie_df.columns
```

Out[29]:
```
Index(['id', 'imdb_id', 'popularity', 'budget', 'revenue', 'original_title',
       'cast', 'homepage', 'director', 'tagline', 'keywords', 'overview',
       'runtime', 'genres', 'production_companies', 'release_date',
       'vote_count', 'vote_average', 'release_year', 'budget_adj',
       'revenue_adj', 'year_of_release', 'decade_of_release',
       'month_of_release'],
      dtype='object')
```

In [30]:
```
genre_score = []
curr_genre_score = []
for i in range(len(movie_df)):
    if type(movie_df.iloc[i]['genres'])==str:
        each_movie_genre_score =0
        each_movie_curr_genre_score = 0
        decade_of_release = movie_df.iloc[i]['decade_of_release']
        genres_as_list = movie_df.iloc[i]['genres'].split('|')
        for each_genre_in_movie in genres_as_list:
            each_movie_genre_score+=df[decade_of_release][each_genre_in_movie]
            each_movie_curr_genre_score+=df['2010-2020'][each_genre_in_movie]
    else:
        each_movie_genre_score = 0
        each_movie_curr_genre_score =0
    curr_genre_score.append(each_movie_curr_genre_score)
    genre_score.append(each_movie_genre_score)
movie_df['genre_score'] = genre_score
movie_df['curr_genre_score'] = curr_genre_score
```

In [31]:
```
movie_df['curr_genre_score'].describe()
```

Out[31]:
```
count    5170.000000
mean       25.072605
std        10.895798
min         0.000000
25%        17.854149
50%        23.526125
75%        33.556859
max        60.938810
Name: curr_genre_score, dtype: float64
```

In [32]:
```
movie_df['genre_score'].describe()
```

Out[32]:
```
count    5170.000000
mean       24.962696
std        10.640711
min         0.000000
25%        17.602682
50%        23.749651
75%        32.768362
max        60.677966
Name: genre_score, dtype: float64
```

In [33]:
```
# Number of movies by decade
df.sum(axis = 0, skipna = True)
```

Out[33]:
```
2010-2020    100.0
1970-1980    100.0
2000-2010    100.0
1990-2000    100.0
1980-1990    100.0
1960-1970    100.0
dtype: float64
```

Inflation Vs Profit

In [34]:
```
inflation_df = pd.read_csv('infla.csv')
inflation_df['DATE'] = pd.to_datetime(inflation_df['DATE'])
inflation_df["year"] = inflation_df["DATE"].dt.year
inflation_df["month"] = inflation_df["DATE"].dt.month
```

In [35]:
```
inflation_df.sample(3)
```

Out[35]:

	DATE	CPIAUCNS_NBD19130101	year	month
596	1965-09-01	12.27919	1965	9
511	1958-08-01	11.23002	1958	8
1140	2011-01-01	85.57467	2011	1

In [36]:
```
movie_df.columns
```

Out[36]:
```
Index(['id', 'imdb_id', 'popularity', 'budget', 'revenue', 'original_title',
       'cast', 'homepage', 'director', 'tagline', 'keywords', 'overview',
       'runtime', 'genres', 'production_companies', 'release_date',
       'vote_count', 'vote_average', 'release_year', 'budget_adj',
       'revenue_adj', 'year_of_release', 'decade_of_release',
       'month_of_release', 'genre_score', 'curr_genre_score'],
      dtype='object')
```

In [37]:
```
inflated_budget =[]
inflated_revenue = []
inflated_profit = []

for i in range(len(movie_df)):
    cpi = inflation_df.loc[inflation_df.year == movie_df.iloc[i].year_of_release][inflation_df.month ==
 movie_df.iloc[i].month_of_release]['CPIAUCNS_NBD19130101'].item()
    inflated_budget.append(movie_df.iloc[i].budget/cpi)
    inflated_revenue.append(movie_df.iloc[i].revenue/cpi)

movie_df['inflated_budget'] = inflated_budget
movie_df['inflated_revenue'] = inflated_revenue
movie_df['inflated_profit'] = movie_df['inflated_revenue'] -movie_df['inflated_budget']
```

```
/Users/mvsnbharath/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:6: UserWarning: Boolea
n Series key will be reindexed to match DataFrame index.

/Users/mvsnbharath/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:6: FutureWarning: `ite
m` has been deprecated and will be removed in a future version
```

In [38]:
```
cols =['inflated_budget','inflated_revenue','inflated_profit']
movie_df[cols].sample(3)
```

Out[38]:

	inflated_budget	inflated_revenue	inflated_profit
1491	2.384666e+05	6.213233e+04	-1.763343e+05
2008	1.179523e+06	3.401128e+06	2.221605e+06
4189	9.467578e+05	3.383665e+06	2.436907e+06

Length Vs Decade

In [39]:
```
movie_df.runtime.describe()
```

Out[39]:
```
count    5170.000000
mean      107.093230
std        22.808798
min         0.000000
25%        93.000000
50%       103.000000
75%       117.000000
max       540.000000
Name: runtime, dtype: float64
```

In [40]:
```
# cat1 = [0-90]
# cat2 = [91-120]
# cat3 = [>120]
```

In [41]:
```
def get_category_by_length(duration):
    if duration>=0 and duration <90:
        return "Less (dur)"
    elif duration >=90 and duration<120:
        return "Med (dur)"
    else:
        return "Long (dur)"
```

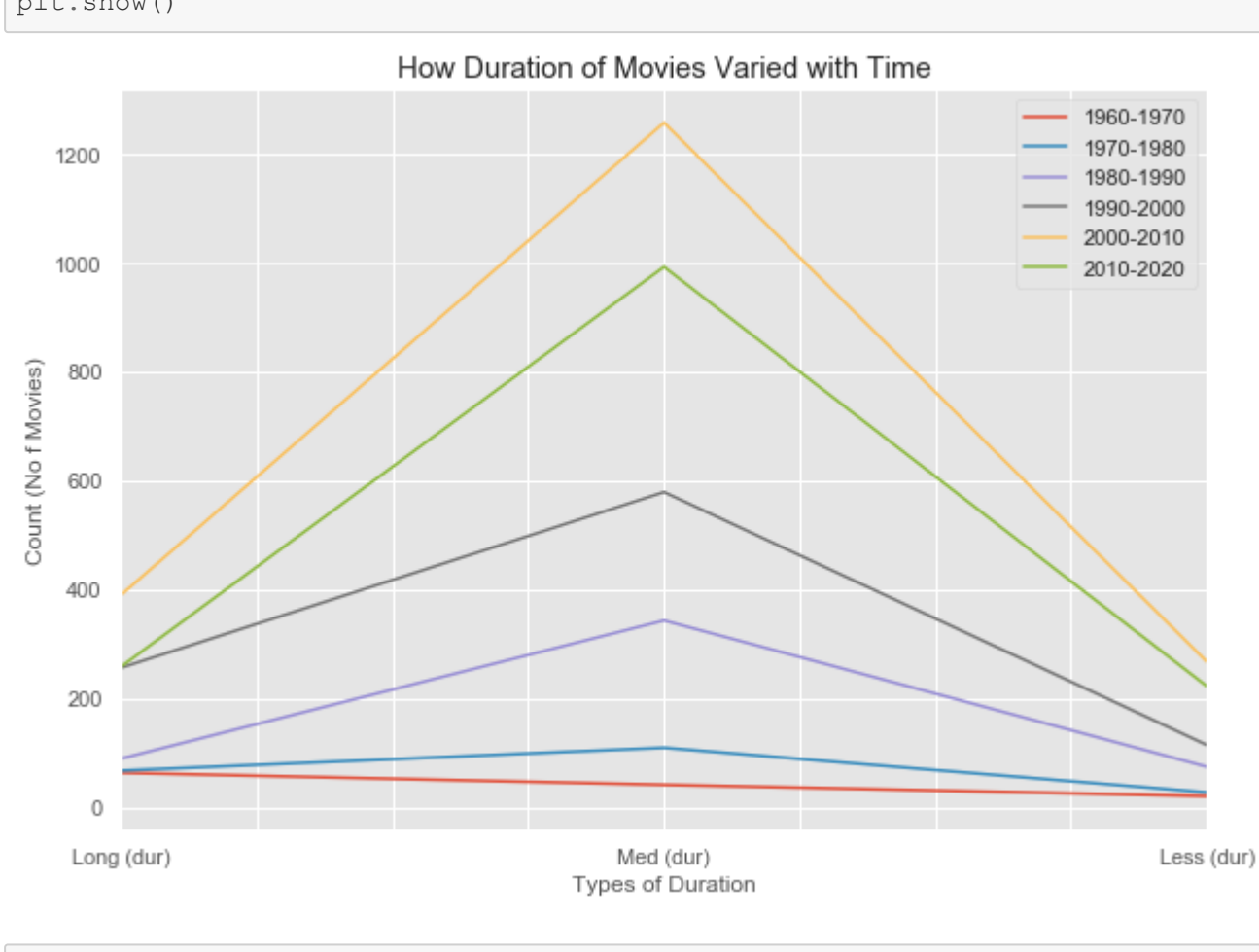
In [42]:
```
duration_by_decade = collections.OrderedDict()
for i in range(len(movie_df)):
    decade = movie_df.iloc[i]['decade_of_release']
    if decade not in duration_by_decade:
        duration_by_decade[decade] = {}
    movie_duration_category = get_category_by_length(movie_df.iloc[i]['runtime'])
    if movie_duration_category not in duration_by_decade[decade]:
        duration_by_decade[decade][movie_duration_category] =1
    else:
        duration_by_decade[decade][movie_duration_category]+=1
```

In [43]:
```
df = pd.DataFrame(duration_by_decade)
cols= sorted(list(df.columns))
df[cols]
```

Out[43]:

	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Long (dur)	63	67	89	256	390	258
Med (dur)	41	109	343	579	1258	993
Less (dur)	20	27	74	114	267	222

In [44]:
```
plt.figure(figsize=(10,7))
ax = plt.gca()

df.plot(kind='line',y='1960-1970',ax=ax)
df.plot(kind='line',y='1970-1980',ax=ax)
df.plot(kind='line',y='1980-1990',ax=ax)
df.plot(kind='line',y='1990-2000',ax=ax)
df.plot(kind='line',y='2000-2010',ax=ax)
df.plot(kind='line',y='2010-2020',ax=ax)

plt.title("How Duration of Movies Varied with Time",fontsize=15)
plt.xlabel("Types of Duration",fontsize=12)
plt.ylabel("Count (No f Movies)",fontsize=12)

plt.show()
```



In [45]:
```
df_with_dur_scores = df.copy()
columns = list(df.columns)
for column in columns:
    df_with_dur_scores[column] = 100*df_with_dur_scores[column] /  df_with_dur_scores[column].sum()
cols= sorted(list(df.columns))
df_with_dur_scores[cols]
```

Out[45]:

	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Long (dur)	50.806452	33.004926	17.588933	26.975764	20.365535	17.515275
Med (dur)	33.064516	53.694581	67.786561	61.011591	65.691906	67.413442
Less (dur)	16.129032	13.300493	14.624506	12.012645	13.942559	15.071283

In [46]:
```
dur_score = []
for i in range(len(movie_df)):
    decade_of_release = movie_df.iloc[i]['decade_of_release']
    d_score = df_with_dur_scores[decade_of_release][get_category_by_length(movie_df.iloc[i]['runtime'
])]
    dur_score.append(d_score)
movie_df['dur_score'] = dur_score
```

In [47]:
```
movie_df['dur_score'].sample(2)
```

Out[47]:
```
81      15.071283
4423    67.413442
Name: dur_score, dtype: float64
```

In [48]:
```
directors_list = pd.read_csv('directors_list.csv', encoding='latin-1')
movie_df_dirNew = pd.merge(movie_df,directors_list,left_on='director',right_on='Name', how='left')
```

In [49]:
```
movie_df_dirNew['Description'].isna().sum()

movie_df_dirNew['cast'] = movie_df_dirNew['cast'].astype('str')
actors_df = pd.read_csv('actors_list.csv', encoding='latin-1')
actress_df = pd.read_csv('actress_list.csv', encoding='latin-1')
actress_df = actress_df.drop(['Position', 'Const', 'Created', 'Modified','Known For', 'Birth Date'], ax
is=1)
actors_df = actors_df.drop(['Position', 'Const', 'Created', 'Modified','Known For', 'Birth Date'], axis
=1)
cast_df = pd.concat([actors_df, actress_df],axis=0)
cast_df['Description'] = cast_df['Description'].apply(pd.to_numeric)
cast_df_new = dict(zip(cast_df.Name, cast_df.Description))
movie_df_dirNew['cast_points'] = 0
```

In [50]:
```
l = []
for index, row in movie_df_dirNew.iterrows():
    s = row['cast']
    x= s.split('|')
    if len(x)>3:
        x=x[:3]
    count = 0
    sum =0
    for i in x:
        if i in cast_df_new:
            sum = sum + int(cast_df_new.get(i))
        else:
            sum = sum + 0
    l.append(sum)
```

In [51]:
```
movie_df_dirNew['cast_points'] = pd.Series(l)

movie_df_dirNew['cast_points'].isnull().sum()

companies_df = pd.read_csv('production_companies_data.csv', encoding='latin-1')

companies_df['score'] = companies_df['count']+(companies_df['domestic']/10000000)+(companies_df['worldw
ide']/10000000)

mydict_prod = dict(zip(companies_df.Company_name, companies_df.score))
movie_df_dirNew['production_points'] = 0
movie_df_dirNew['production_companies'] = movie_df_dirNew['production_companies'].astype('str')
```

In [52]:
```
l = []
for index, row in movie_df_dirNew.iterrows():
    s = row['production_companies']
    x=s.split('|')
    sum =0
    for i in x:
        if i in mydict_prod:
            sum = sum + mydict_prod.get(i)
    else:
        sum = sum + 0
    l.append(sum)

movie_df_dirNew['production_points'] = pd.Series(l)
movie_df_dirNew['production_points']
```

Out[52]:
```
0       4693.446534
1          0.000000
2          0.000000
3       1943.631948
4       2473.997248
           ...
5191       0.000000
5192       0.000000
5193       0.000000
5194    6066.473052
5195       0.000000
Name: production_points, Length: 5196, dtype: float64
```

Oscar data

In [53]:
```
awards_df = pd.read_csv('awards.csv', encoding='latin-1')
```

In [54]:
```
awards_df.columns
```

Out[54]:
```
Index(['Year', 'Ceremony', 'Award', 'Winner', 'Unnamed: 4', 'Name', 'value'], dtype='object')
```

In [55]:
```
awards_df['Winner'].fillna(0)
```

Out[55]:
```
0       0.0
1       0.0
2       0.0
3       0.0
4       0.0
       ...
9959    0.0
9960    0.0
9961    1.0
9962    1.0
9963    0.0
Name: Winner, Length: 9964, dtype: float64
```

In [56]:
```
awards_df_new = awards_df.groupby('Name').agg({'Winner':'sum'})
```

In [57]:
```
awards_df_new.shape
```

Out[57]:
```
(6363, 1)
```

In [58]:
```
movie_df_dirNew.shape
```

Out[58]:
```
(5196, 36)
```

In [59]:
```
movie_df_dirNew=pd.merge(movie_df_dirNew,awards_df_new,on='Name', how='left')
```

In [60]:
```
movie_df_dirNew.shape
```

Out[60]:
```
(5196, 37)
```

In [61]:
```
movie_df_dirNew['Winner'].isna().sum()
```

Out[61]:
```
4256
```

In [62]:
```
movie_df_dirNew['Winner'].fillna(-1,inplace=True)
```

In [63]:
```
movie_df_dirNew.columns
```

Out[63]:
```
Index(['id', 'imdb_id', 'popularity', 'budget', 'revenue', 'original_title',
       'cast', 'homepage', 'director', 'tagline', 'keywords', 'overview',
       'runtime', 'genres', 'production_companies', 'release_date',
       'vote_count', 'vote_average', 'release_year', 'budget_adj',
       'revenue_adj', 'year_of_release', 'decade_of_release',
       'month_of_release', 'genre_score', 'curr_genre_score',
       'inflated_budget', 'inflated_revenue', 'inflated_profit', 'dur_score',
       'Position', 'Description', 'Name', 's', 'cast_points',
       'production_points', 'Winner'],
      dtype='object')
```

In [64]:
```
df_endurance = movie_df_dirNew.copy()
```

In [65]:
```
cols = ['budget_adj','genre_score','dur_score']
df_old = movie_df_dirNew[cols]
df_old.sample(3)
```

Out[65]:

	budget_adj	genre_score	dur_score
3811	1.469329e+07	19.927536	67.786561
3459	2.308891e+07	18.273914	20.365535
1379	2.025573e+06	20.358465	65.691906

In [66]:
```
from sklearn import preprocessing
```

In [67]:
```
df_scaler = df_old.copy()
ss = preprocessing.MinMaxScaler()
df_scaler = pd.DataFrame(ss.fit_transform(df_old))
columnNames = df_old.columns.to_list()
df_scaler.columns = columnNames
df_scaler.describe()
```

Out[67]:

	budget_adj	genre_score	dur_score
count	5196.000000	5196.000000	5196.000000
mean	0.086995	0.411507	0.658534
std	0.098851	0.175217	0.401399
min	0.000000	0.000000	0.000000
25%	0.019064	0.290100	0.149763
50%	0.053618	0.391405	0.962444
75%	0.118224	0.540037	0.993310
max	1.000000	1.000000	1.000000

In [68]:
```
weight_scale={
    "budget_adj"     : 6,
    "genre_score"    : 3,
    "dur_score"      : 1,
}
for k,v in weight_scale.items():
    df_scaler[k] = df_scaler[k] * v
df_endurance['old_pop_score'] = np.sqrt(np.sum(np.square(df_scaler), axis=1))
```

In [69]:
```
df_endurance.old_pop_score.describe()
```

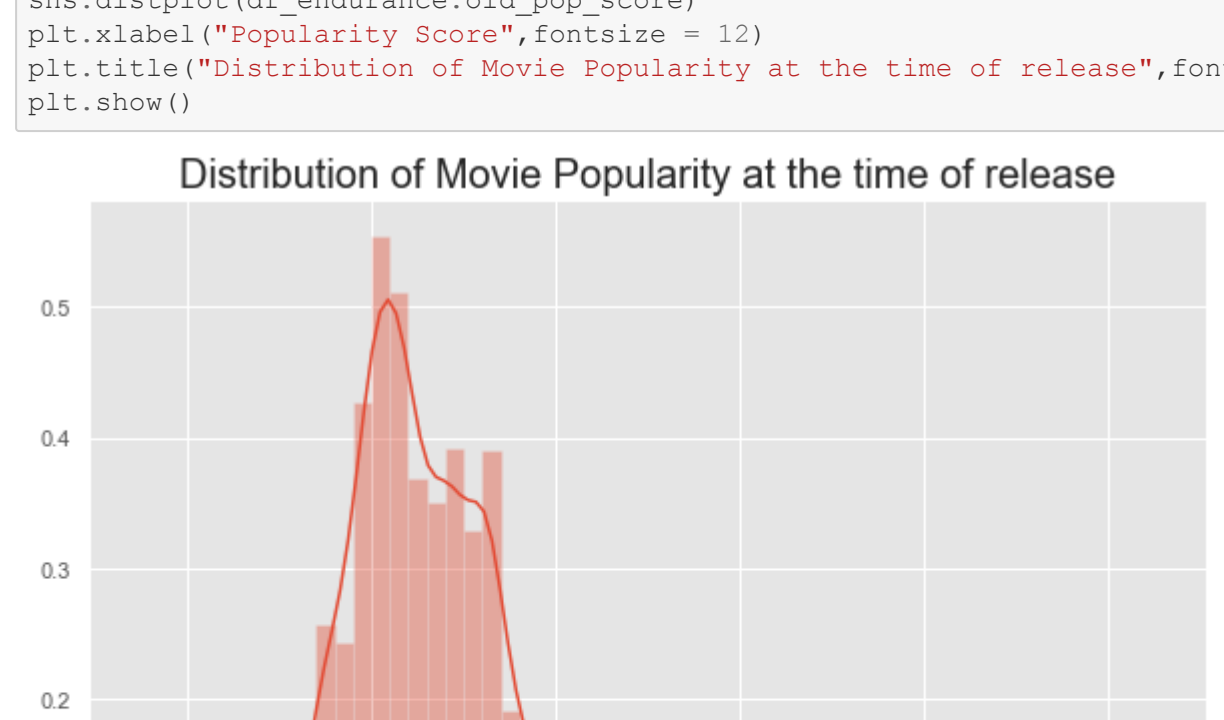
Out[69]:
```
count    5196.000000
mean        1.640155
std         0.573735
min         0.015016
25%         1.267272
50%         1.564290
75%         2.020677
max         6.318676
Name: old_pop_score, dtype: float64
```

In [70]:
```
x = df_endurance[['old_pop_score']].values.astype(float)

# Create a minimum and maximum processor object
min_max_scaler = preprocessing.MinMaxScaler()

# Create an object to transform the data to fit minmax processor
x_scaled = min_max_scaler.fit_transform(x)

# Run the normalizer on the dataframe
df_normalized = pd.DataFrame(x_scaled)
df_normalized.columns = ['old_pop_score']
df_endurance['old_pop_score'] = df_normalized['old_pop_score']*10
```

In [71]:
```
df_endurance.old_pop_score.describe()
```

Out[71]:
```
count    5196.000000
mean        2.578089
std         0.910161
min         0.000000
25%         1.986554
50%         2.457737
75%         3.181741
max        10.000000
Name: old_pop_score, dtype: float64
```

```
In [72]: plt.figure(figsize=(10,7))
         sns.distplot(df_endurance.old_pop_score)
         plt.xlabel("Popularity Score",fontsize = 12)
         plt.title("Distribution of Movie Popularity at the time of release",fontsize = 20)
         plt.show()
```




```
In [73]: cols = ['vote_average','curr_genre_score','cast_points','production_points','inflated_profit']
         df_new = movie_df_dirNew[cols]
         df_new.sample(4)
```

Out[73]:

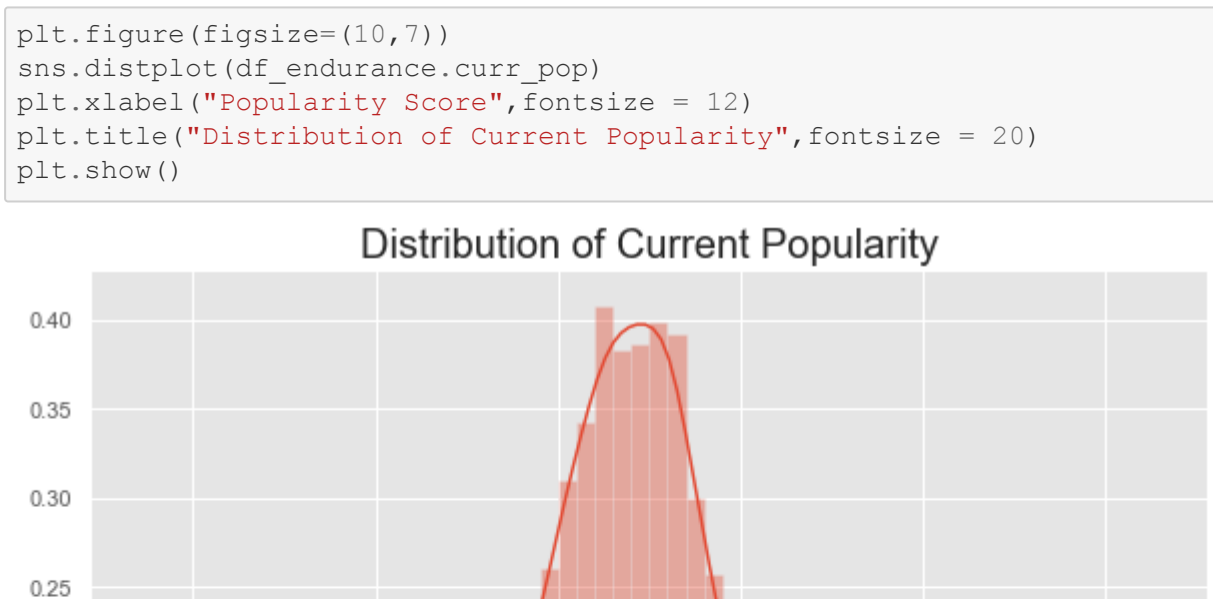
	vote_average	curr_genre_score	cast_points	production_points	inflated_profit
1413	6.0	12.964515	3697	0.000000	-2.898742e+04
3499	5.8	23.749651	33028	0.000000	1.156134e+05
2451	6.9	25.677564	64611	6379.980627	1.300685e+06
3761	7.1	23.526125	0	0.000000	-1.448865e+04

```
In [74]: df_scaler_new_score = df_new.copy()
         ss = preprocessing.MinMaxScaler()
         df_scaler_new_score = pd.DataFrame(ss.fit_transform(df_new))
         columnNames = df_new.columns.to_list()
         df_scaler_new_score.columns = columnNames

In [75]: df_scaler_new_score.production_points.describe()

Out[75]: count    5196.000000
         mean        0.137551
         std         0.188650
         min         0.000000
         25%         0.000000
         50%         0.024126
         75%         0.284298
         max         1.000000
         Name: production_points, dtype: float64

In [76]: df_scaler_new_score.sample(2)
```

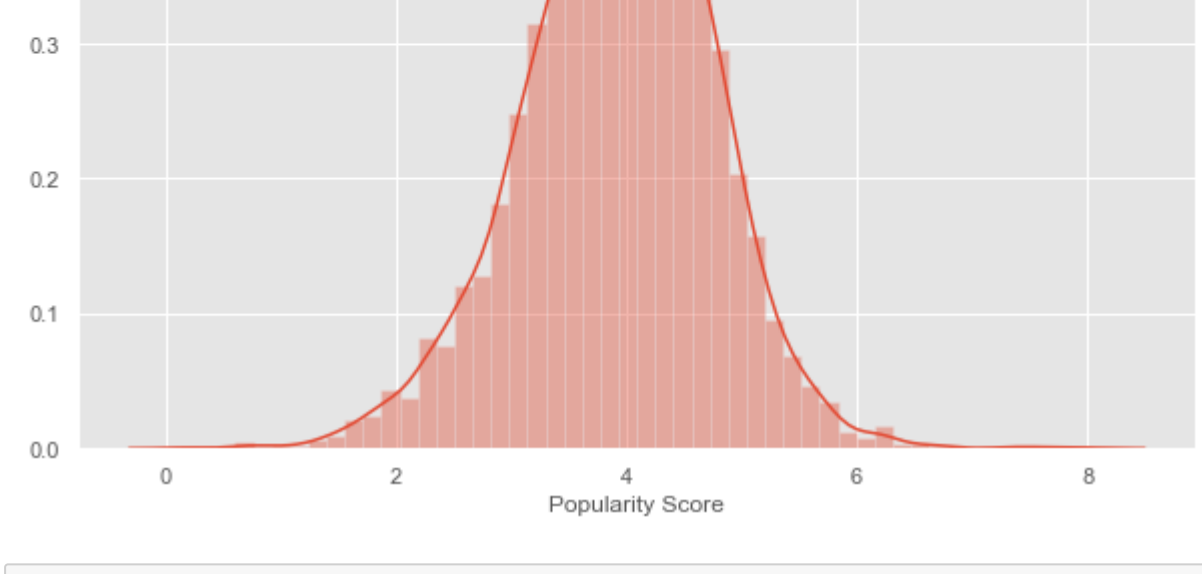
Out[76]:

	vote_average	curr_genre_score	cast_points	production_points	inflated_profit
1526	0.73913	0.341128	0.000000	0.489577	0.191323
1314	0.73913	0.389729	0.092765	0.410386	0.151273

```
In [77]: weight_scale={
             "vote_average" : 30,
             "curr_genre_score": 15,
             "cast_points": 15,
             "production_points": 10,
             "inflated_profit"    : 30
         }
         for k,v in weight_scale.items():
             df_scaler_new_score[k] = df_scaler_new_score[k] * v
         df_endurance['curr_pop'] = np.sqrt(np.sum(np.square(df_scaler_new_score), axis=1))

In [78]: df_endurance.curr_pop.describe()

Out[78]: count    5196.000000
         mean       21.589093
         std         3.899382
         min         4.113262
         25%        19.188923
         50%        21.820943
         75%        24.176097
         max        41.599555
         Name: curr_pop, dtype: float64

In [79]: x = df_endurance[['curr_pop']].values.astype(float)

         # Create a minimum and maximum processor object
         min_max_scaler = preprocessing.MinMaxScaler()

         # Create an object to transform the data to fit minmax processor
         x_scaled = min_max_scaler.fit_transform(x)

         # Run the normalizer on the dataframe
         df_normalized = pd.DataFrame(x_scaled)
         df_normalized.columns = ['curr_pop']
         df_endurance['curr_pop'] = df_normalized['curr_pop']*10

In [80]: df_endurance.curr_pop.describe()

Out[80]: count    5196.000000
         mean        4.661926
         std         1.040216
         min         0.000000
         25%         4.021646
         50%         4.723775
         75%         5.352046
         max        10.000000
         Name: curr_pop, dtype: float64

In [81]: plt.figure(figsize=(10,7))
         sns.distplot(df_endurance.curr_pop)
         plt.xlabel("Popularity Score",fontsize = 12)
         plt.title("Distribution of Current Popularity",fontsize = 20)
         plt.show()
```




```
In [82]: df_endurance.columns

Out[82]: Index(['id', 'imdb_id', 'popularity', 'budget', 'revenue', 'original_title',
                'cast', 'homepage', 'director', 'tagline', 'keywords', 'overview',
                'runtime', 'genres', 'production_companies', 'release_date',
                'vote_count', 'vote_average', 'release_year', 'budget_adj',
                'revenue_adj', 'year_of_release', 'decade_of_release',
                'month_of_release', 'genre_score', 'curr_genre_score',
                'inflated_budget', 'inflated_revenue', 'inflated_profit', 'dur_score',
                'Position', 'Description', 'Name', 's', 'cast_points',
                'production_points', 'Winner', 'old_pop_score', 'curr_pop'],
               dtype='object')

In [83]: df_endurance['endurance']= 0.65*df_endurance['curr_pop']+0.35*df_endurance['old_pop_score']

In [84]: plt.figure(figsize=(10,7))
         sns.distplot(df_endurance.endurance)
         plt.xlabel("Popularity Score",fontsize = 12)
         plt.title("Distribution of Endurance Score",fontsize = 20)
         plt.show()
```




```
In [85]: a = df_endurance.nlargest(10, ['endurance'])['original_title'].to_frame()
         a
```

Out[85]:

	original_title
2420	Titanic
478	Avatar
2032	The Dark Knight Rises
1261	The Dark Knight
451	Star Wars
937	The Warrior's Way
4	Star Wars: The Force Awakens
728	Inception
15	Avengers: Age of Ultron
5104	The Exorcist

```
In [86]: df_endurance[df_endurance['Winner']==0].count()

Out[86]: id                      475
         imdb_id                 475
         popularity              475
         budget                  475
         revenue                 475
         original_title          475
         cast                    475
         homepage                148
         director                475
         tagline                 418
         keywords                467
         overview                475
         runtime                 475
         genres                  475
         production_companies    475
         release_date            475
         vote_count              475
         vote_average            475
         release_year            475
         budget_adj              475
         revenue_adj             475
         year_of_release         475
         decade_of_release       475
         month_of_release        475
         genre_score             475
         curr_genre_score        475
         inflated_budget         475
         inflated_revenue        475
         inflated_profit         475
         dur_score               475
         Position                475
         Description             475
         Name                    475
         s                         0
         cast_points             475
         production_points       475
         Winner                  475
         old_pop_score           475
         curr_pop                475
         endurance               475
         dtype: int64

In [87]: for x in a.index:
             print(df_endurance.loc[x]['Winner'])

         1.0
         1.0
         -1.0
         -1.0
         0.0
         -1.0
         -1.0
         -1.0
         -1.0
         1.0

In [88]: X_Columns = ['budget_adj','revenue_adj','genre_score','dur_score']
         Y_Columns = ['endurance']
         df_unscaled = df_endurance[X_Columns]
         Y_unscaled = df_endurance[Y_Columns]
         #Y = df_endurance[Y_Columns]

In [89]: # Create a minimum and maximum processor object
         min_max_scaler = preprocessing.MinMaxScaler()

         # Create an object to transform the data to fit minmax processor
         x_scaled = min_max_scaler.fit_transform(df_unscaled)

         # Run the normalizer on the dataframe
         df = pd.DataFrame(x_scaled)
         df.columns = list(df.columns)

In [90]: df.describe()
```

Out[90]:

	0	1	2	3
count	5196.000000	5196.000000	5196.000000	5196.000000
mean	0.086995	0.036200	0.411507	0.658534
std	0.098851	0.069235	0.175217	0.401399
min	0.000000	0.000000	0.000000	0.000000
25%	0.019064	0.000000	0.290100	0.149763
50%	0.053618	0.010201	0.391405	0.962444
75%	0.118224	0.040198	0.540037	0.993310
max	1.000000	1.000000	1.000000	1.000000

```
In [91]: # Create a minimum and maximum processor object
         min_max_scaler = preprocessing.MinMaxScaler()

         # Create an object to transform the data to fit minmax processor
         x_scaled = min_max_scaler.fit_transform(Y_unscaled)

         # Run the normalizer on the dataframe
         Y = pd.DataFrame(x_scaled)
         Y.columns = list(Y_unscaled.columns)

In [92]: Y.describe()
```

Out[92]:

	endurance
count	5196.000000
mean	0.479803
std	0.103326
min	0.000000
25%	0.416845
50%	0.484898
75%	0.547765
max	1.000000

```
In [93]: # sklearn libraries
         from sklearn.preprocessing import MinMaxScaler
         from sklearn.preprocessing import StandardScaler
         from scipy.spatial.distance import pdist, squareform
         from sklearn.linear_model import LinearRegression
         from sklearn.linear_model import LogisticRegression
         from sklearn.metrics import roc_auc_score
         from sklearn.metrics import classification_report
         from sklearn.metrics import confusion_matrix
         from sklearn.metrics import mean_squared_error
         from sklearn.model_selection import train_test_split
         from sklearn.linear_model import Ridge
         from sklearn.linear_model import RidgeCV
         from sklearn.linear_model import Lasso
         from sklearn.linear_model import LassoCV
         from sklearn.model_selection import permutation_test_score
         from sklearn.svm import SVC
         from sklearn.model_selection import StratifiedKFold
         from sklearn.model_selection import permutation_test_score
         from sklearn import metrics

In [94]: X_train, X_test, y_train, y_test = train_test_split(df, Y, test_size=0.25, random_state=42)

In [95]: def plot_top_coefficients(model, top_n = 2):
             '''
             Plots the magnitude of top and bottom n coefficients
             '''
             cols = X_train.columns
             coef = model.coef_
             zipped = list(zip(cols, coef))
             zipped.sort(key=lambda x: x[1], reverse = True)
             top_coefficients = pd.DataFrame(zipped).head(top_n).sort_values(1)
             #bottom_coefficients = pd.DataFrame(zipped).tail(top_n).sort_values(1,ascending=True)
             combined = pd.concat([top_coefficients], axis=0)
             combined.columns = ['Feature', 'Coefficient']
             return top_coefficients

In [96]: result ={}
```

1) Linear Regression

```
In [101]: lm = LinearRegression()
          lmPred = lm.fit(X_train,y_train)
          predictions = lmPred.predict(X_test)
          rms_error = np.sqrt(mean_squared_error((y_test), (predictions)))
          result["Linear Regression"] = rms_error
          print("RMS Error: "+str(rms_error ))

          RMS Error: 0.1032
```

2) Ridge

```
In [102]: ridge = Ridge()
          raw_ridge = ridge.fit(X_train, y_train)
          predictions = raw_ridge.predict(X_test)
          rms_error = np.sqrt(mean_squared_error((y_test), (predictions)))
          result["Ridge"] = rms_error
          print("Ridge RMS Error: "+str(rms_error))

          Ridge RMS Error: 0.107
```

3) Lasso

```
In [103]: lasso = Lasso()
          raw_lasso = lasso.fit(X_train, y_train)
          predictions = raw_lasso.predict(X_test)
          rms_error = np.sqrt(mean_squared_error((y_test), (predictions)))
          result["Lasso"] = rms_error
          print("Lasso RMS Error: "+str(np.sqrt(mean_squared_error((y_test), (predictions)))))

          Lasso RMS Error: 0.1032
```

4) Ridge CV

```
In [100]: alphas = np.logspace(-6,6,20)
          ridgecv = RidgeCV(alphas=alphas)
          ridgecv = RidgeCV(alphas=alphas)
          raw_ridge_cv = ridgecv.fit(X_train, y_train)
          predictions = raw_ridge_cv.predict(X_test)
          rms_error = np.sqrt(mean_squared_error((y_test), (predictions)))
          result["RidgeCV"] = rms_error
          print("RidgeCV RMS Error: "+str(rms_error))

          RidgeCV RMS Error: 0.0735963199867618
```

5) Lasso CV

```
In [99]: lassocv = LassoCV(alphas=alphas)
         raw_lasso_cv = lassocv.fit(X_train, y_train)
         predictions = lassocv.predict(X_test)
         rms_error = np.sqrt(mean_squared_error((y_test), (predictions)))
         result["LassoCV"] = rms_error
         print("LassoCV RMS Error: "+str(np.sqrt(mean_squared_error((y_test), (predictions)))))

         LassoCV RMS Error: 0.07361600802453067

/Users/mvsnbharath/anaconda3/lib/python3.7/site-packages/sklearn/linear_model/coordinate_descent.py:1
100: DataConversionWarning: A column-vector y was passed when a 1d array was expected. Please change
the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
/Users/mvsnbharath/anaconda3/lib/python3.7/site-packages/sklearn/model_selection/_split.py:1978: Futu
reWarning: The default value of cv will change from 3 to 5 in version 0.22. Specify it explicitly to
silence this warning.
  warnings.warn(CV_WARNING, FutureWarning)
```