Investigate_a_Dataset

June 10, 2020

1 Project 2: Investigate a Dataset (TMDB Movie Data)

1.1 Table of Contents

## Introduction

For investigate a dataset project I will analyze data about "TMDB movie". I will be mainly focusing the relationship between components. To do this analysis, I will be looking closely at their relationship between revenues, popularity, genres.

Here is the lists of my questions for this data set project: 1. What is most frequent genres? 2. Is higher popularity make higher in revenues? 3. How did people's favorite genres changes over time (year by year)?

```
In [31]: import numpy as np
         import pandas as pd
         import matplotlib.pyplot as plt
         import seaborn as sns
         % matplotlib inline
```

```
In [48]: df = pd.read_csv('tmdb-movies-short.csv')
         df.head()
```

```
<class 'pandas.core.frame.DataFrame'>


Out[48]:        id    imdb_id  popularity     budget     revenue  \
         0  135397  tt0369610   32.985763  150000000  1513528810
         1   76341  tt1392190   28.419936  150000000   378436354
         2  262500  tt2908446   13.112507  110000000   295238201
         3  140607  tt2488496   11.173104  200000000  2068178225
         4  157336  tt0816692   24.949134  165000000   621752480

                             original_title  \
0                Jurassic World
1            Mad Max: Fury Road
2                     Insurgent
3  Star Wars: The Force Awakens
4                  Interstellar

                                                cast  \
0  Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...
1  Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...
2  Shailene Woodley|Theo James|Kate Winslet|Ansel...
3  Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...
4  Matthew McConaughey|Jessica Chastain|Anne Hath...

                                            homepage           director  \
0                      http://www.jurassicworld.com/    Colin Trevorrow
1                        http://www.madmaxmovie.com/      George Miller
2     http://www.thedivergentseries.movie/#insurgent   Robert Schwentke
3  http://www.starwars.com/films/star-wars-episod...        J.J. Abrams
4                  http://www.interstellarmovie.net/  Christopher Nolan

                                             tagline      ...       \
0                                  The park is open.      ...
1                                 What a Lovely Day.      ...
2                         One Choice Can Destroy You      ...
3                      Every generation has a story.      ...
4  Mankind was born on Earth. It was never meant ...      ...

                                            overview runtime  \
0  Twenty-two years after the events of Jurassic ...     124
1  An apocalyptic story set in the furthest reach...     120
2  Beatrice Prior must confront her inner demons ...     119
3  Thirty years after defeating the Galactic Empi...     136
4  Interstellar chronicles the adventures of a gr...     169

                                      genres  \
0  Action|Adventure|Science Fiction|Thriller
1  Action|Adventure|Science Fiction|Thriller
2         Adventure|Science Fiction|Thriller
3   Action|Adventure|Science Fiction|Fantasy
4            Adventure|Drama|Science Fiction

                                production_companies release_date vote_count  \
0  Universal Studios|Amblin Entertainment|Legenda...       6/9/15       5562
1  Village Roadshow Pictures|Kennedy Miller Produ...      5/13/15       6185
2  Summit Entertainment|Mandeville Films|Red Wago...      3/18/15       2480
3          Lucasfilm|Truenorth Productions|Bad Robot     12/15/15       5292
4  Paramount Pictures|Legendary Pictures|Warner B...      11/5/14       6498
```

```
   vote_average  release_year   budget_adj   revenue_adj
0           6.5          2015  137999939.3  1.392446e+09
1           7.1          2015  137999939.3  3.481613e+08
2           6.3          2015  101199955.5  2.716190e+08
3           7.5          2015  183999919.0  1.902723e+09
4           8.0          2014  151980023.4  5.726906e+08

[5 rows x 21 columns]
```

## Data Wrangling

1.1.1 General Properties

```
In [4]: df.shape
```

```
Out[4]: (10866, 21)
```

```
In [5]: df.describe()
```

```
Out[5]:                   id    popularity        budget       revenue       runtime  \
        count   10866.000000  10866.000000  1.086600e+04  1.086600e+04  10866.000000
        mean    66064.177434      0.646441  1.462570e+07  3.982332e+07    102.070863
        std     92130.136561      1.000185  3.091321e+07  1.170035e+08     31.381405
        min         5.000000      0.000065  0.000000e+00  0.000000e+00      0.000000
        25%     10596.250000      0.207583  0.000000e+00  0.000000e+00     90.000000
        50%     20669.000000      0.383856  0.000000e+00  0.000000e+00     99.000000
        75%     75610.000000      0.713817  1.500000e+07  2.400000e+07    111.000000
        max    417859.000000     32.985763  4.250000e+08  2.781506e+09    900.000000

                  vote_count  vote_average  release_year    budget_adj   revenue_adj
        count   10866.000000  10866.000000  10866.000000  1.086600e+04  1.086600e+04
        mean      217.389748      5.974922   2001.322658  1.755104e+07  5.136436e+07
        std       575.619058      0.935142     12.812941  3.430616e+07  1.446325e+08
        min        10.000000      1.500000   1960.000000  0.000000e+00  0.000000e+00
        25%        17.000000      5.400000   1995.000000  0.000000e+00  0.000000e+00
        50%        38.000000      6.000000   2006.000000  0.000000e+00  0.000000e+00
        75%       145.750000      6.600000   2011.000000  2.085325e+07  3.369710e+07
        max      9767.000000      9.200000   2015.000000  4.250000e+08  2.827124e+09
```

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

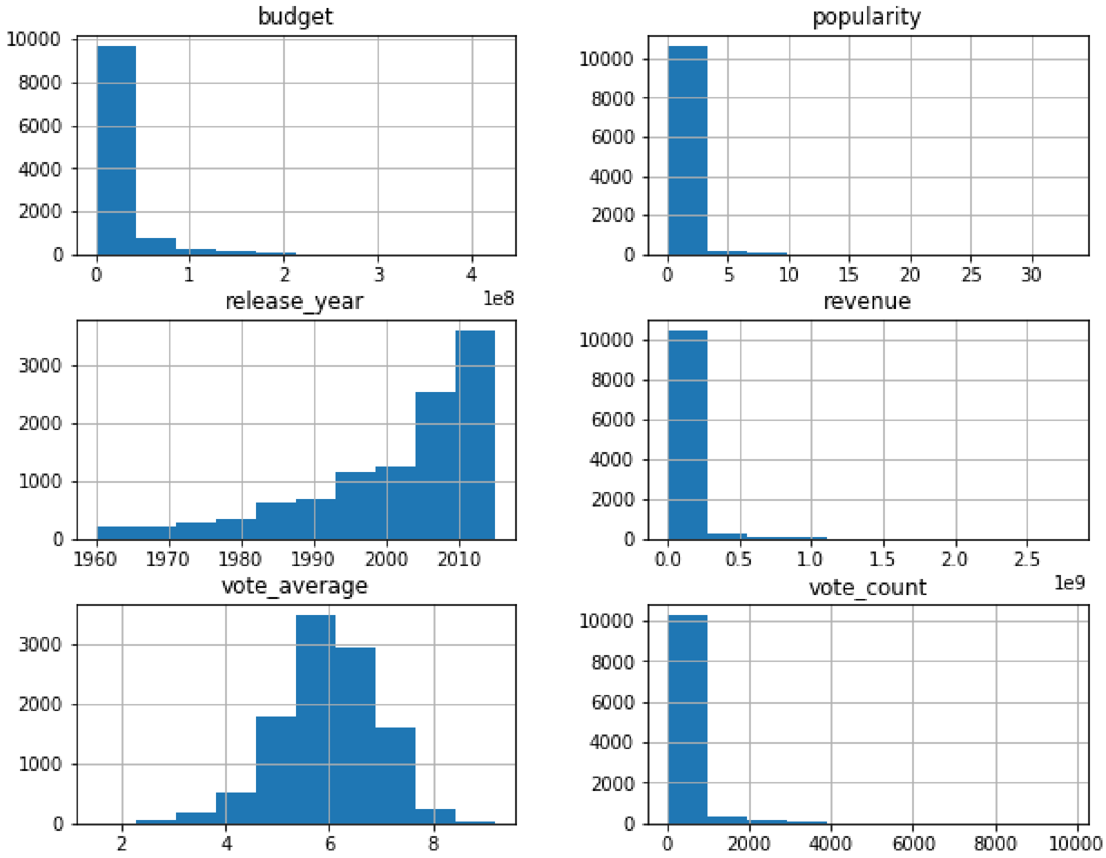
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 9 columns):
popularity               10866 non-null float64
budget                   10866 non-null int64
revenue                  10866 non-null int64
original_title           10866 non-null object
genres                   10866 non-null object
```

```
production_companies    10866 non-null object
vote_count              10866 non-null int64
vote_average            10866 non-null float64
release_year            10866 non-null int64
dtypes: float64(2), int64(4), object(3)
memory usage: 764.1+ KB
```

```
In [9]: df.dtypes
```

```
Out[9]: popularity              float64
        budget                    int64
        revenue                   int64
        original_title           object
        genres                   object
        production_companies     object
        vote_count                int64
        vote_average            float64
        release_year              int64
        dtype: object
```

```
In [110]: df.hist(figsize=(10,8));
```



1.1.2 Data Cleaning (Drop Unneeded Columns)

Removed: id, imdb_id, cast, homepage, director, tagline, overview, runtime, release_date, revenue_adj, budget_adj

```
In [33]: df = pd.read_csv('tmdb-movies-short.csv')
         df.drop(['id', 'imdb_id', 'cast', 'homepage', 'director', 'tagline', 'overview', 'runti
         df.head()
```

```
Out[33]:    popularity     budget     revenue                original_title  \
         0   32.985763  150000000  1513528810                Jurassic World
         1   28.419936  150000000   378436354            Mad Max: Fury Road
         2   13.112507  110000000   295238201                     Insurgent
         3   11.173104  200000000  2068178225  Star Wars: The Force Awakens
         4   24.949134  165000000   621752480                  Interstellar

                                              genres  \
         0  Action|Adventure|Science Fiction|Thriller
         1  Action|Adventure|Science Fiction|Thriller
         2         Adventure|Science Fiction|Thriller
         3   Action|Adventure|Science Fiction|Fantasy
         4            Adventure|Drama|Science Fiction

                                         production_companies  vote_count  \
         0  Universal Studios|Amblin Entertainment|Legenda...        5562
         1  Village Roadshow Pictures|Kennedy Miller Produ...        6185
         2  Summit Entertainment|Mandeville Films|Red Wago...        2480
         3          Lucasfilm|Truenorth Productions|Bad Robot        5292
         4  Paramount Pictures|Legendary Pictures|Warner B...        6498

            vote_average  release_year
         0           6.5          2015
         1           7.1          2015
         2           6.3          2015
         3           7.5          2015
         4           8.0          2014
```

1.1.3 Data Cleaning (Cleaning Duplicates)

Find and remove duplicate rows

```
In [5]: #find sum of null values in each column
        df.isnull().sum()
```

```
Out[5]: popularity              0
        budget                  0
        revenue                 0
        original_title          0
        genres                  0
        production_companies    0
        vote_count              0
        vote_average            0
        release_year            0
        dtype: int64
```

```
In [6]: sum(df.duplicated())

Out[6]: 0
```

```
In [7]: #drop dupliciated
        df.drop_duplicates()
        sum(df.duplicated())

Out[7]: 0
```

```
In [115]: df.shape

Out[115]: (10866, 9)
```

1.1.4 Data Cleaning (Make-up values with Zero)

To do this Data Cleaning, I will be filling zero values with average.

```
In [34]: #Filling NaN with empty string.
         df['production_companies'].fillna('', inplace=True)
         df['genres'].fillna('', inplace=True)
         df.to_csv(r'2.csv', index=True, header=True)
```

## Exploratory Data Analysis

For this section of the project I will be using compute statistics and create visualizations skills to research questions that I posed in the Introduction section.

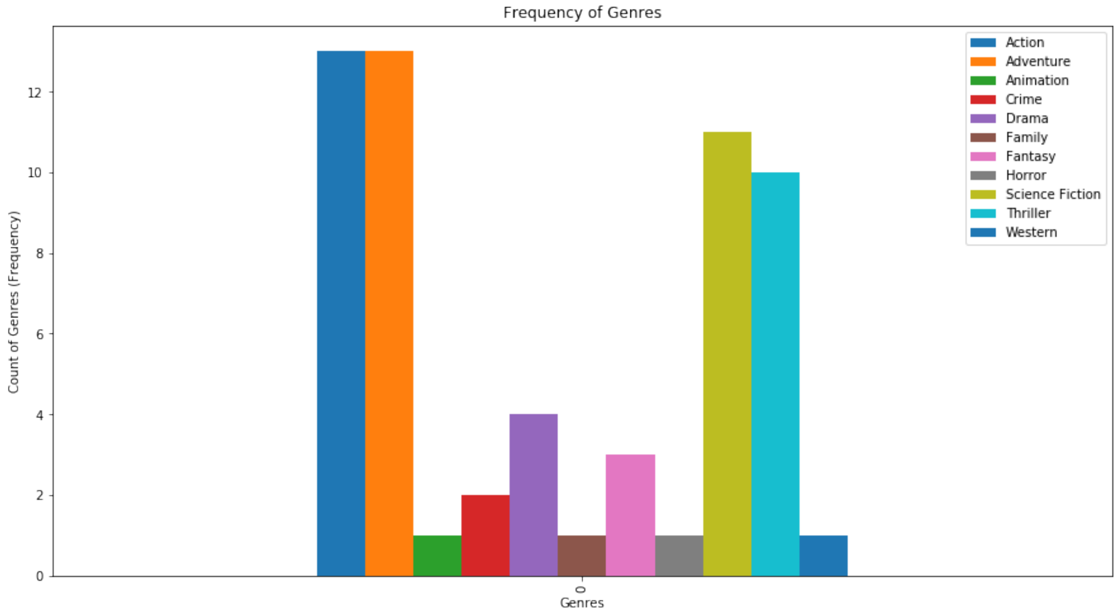
1.1.5 Research Question 1 (What is most frequent genres?)

For this first research, I will define top 30 genres that are most frequently released of all time.

```
In [9]: final_data = {} # In order to assemble the data, I made a dictionary
        for row in df.genres: # retrive each row from a genre column
            split_data = row.split('|') # by using .split function, split each genres in row and
            for item in split_data: # The item refers to 21 genres listed in the data. I used "i
                if item in final_data:# In another words, if 21 genres are in dictionary we add
                    final_data[item] = final_data[item] + 1
                else:
                    final_data[item] = 1
        print(final_data) # When final_data is printed, it shows count of each genres
        new_df = pd.DataFrame([final_data]) #
        new_df.plot(kind='bar',figsize=(15,8),align='center',stacked=False)
        plt.title('Frequency of Genres')
        plt.xlabel('Genres')
        plt.ylabel('Count of Genres (Frequency)')
        # # print(final_data)
        # total_genre_movies = final_data('genres')
        # total_genre_movies.iloc[:20].plot.bar(figsize=(13,6),colormap= 'tab20c',fontsize=12)

        # genres = "Action","Adventure","Science Fiction","Thriller","Fantasy","Crime","Western"
        # labels = ['Action','Adventure','Science Fiction','Thriller','Fantasy','Crime','Western
        # values = [2385,1471,1230,2908,916,1355,165,4761,1231,699,3793,810,1712,270,334,408,163
        # plt.bar(labels,values)
```

```
{'Action': 13, 'Adventure': 13, 'Science Fiction': 11, 'Thriller': 10, 'Fantasy': 3, 'Drama': 4,
```

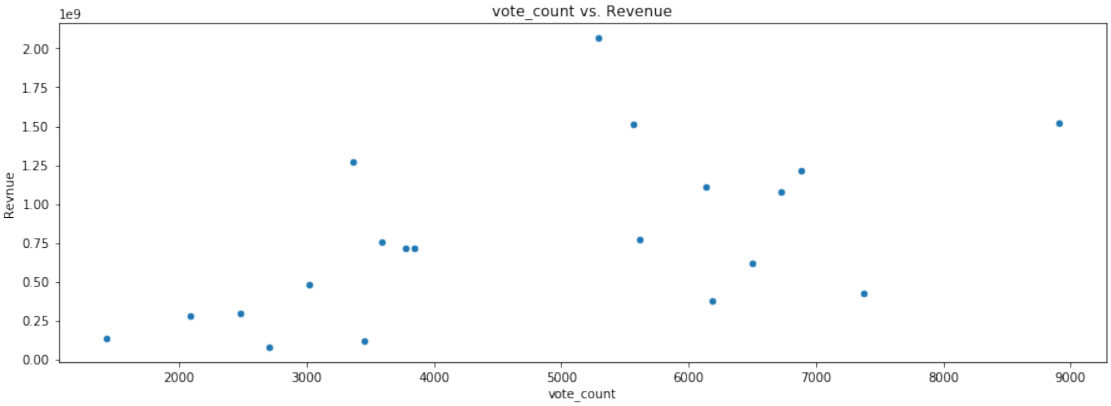
```
Out[9]: Text(0,0.5,'Count of Genres (Frequency)')
```



### Research Question 2 (Is higher popularity make higher in revenues?) > For this first research, I will define how popularity have relation between revenues. In order to do this comparison, I compared revenue with vote count.

```
In [10]: df.plot(x='vote_count', y='revenue', kind='scatter', figsize=(15,5))
         plt.title('vote_count vs. Revenue')
         plt.xlabel('vote_count')
         plt.ylabel('Revnue')
```

```
Out[10]: Text(0,0.5,'Revnue')
```



1.1.6 Research Question 3 (How did people's favorite genres changes over time (year by year?))

For this research, I will define, how people's favoriate genres changed over years.

```
In [64]: import collections # To use counter function

         year = df['release_year'].unique() # To get unique years
         new_data = [] # I created a new variable.

         for y in year: # For year(y) in all unique years (for looping)
         #     print(year)
             # subsetting for corresponding year
             y_df = df[df['release_year'] == y] # I retrieved release_year column from csv match

             # converting pandas series to column
             genres_i1 = list(y_df['genres']) # I retrieved list of genres

             genres_f1 = [] # this will contain all the genres that we see for a given year(with

             for genre in genres_i1: # for splitting every entry in y_df[genres] with separator
                 for i in genre.split("|"): # By using .split function, I splited all individual
                     genres_f1.append(i) # By using .append function, I appended I valuable to g

             genres_counts_each_year = dict(collections.Counter(genres_f1)) # occurrence of each
         #     print('genres_counts_each_year', genres_counts_each_year)
         #     print('before', new_data)
             new_data.append(genres_counts_each_year)
         #     print('after', new_data)

         result = pd.DataFrame(new_data, index=year)
         result.head(20)
         # print(new_df)
         # new_df.to_csv(r'1.csv', index=True, header=True)

Out[64]:       Action  Adventure  Animation  Crime  Drama  Family  Fantasy  Horror  \
         2015       3          4        NaN    NaN    NaN     NaN      1.0     NaN
         2014       3          4        NaN    NaN    1.0     NaN      NaN     NaN
         2012       5          2        NaN    1.0    2.0     NaN      1.0     1.0
         2013       2          3        1.0    1.0    1.0     1.0      1.0     NaN

               Science Fiction  Thriller  Western
         2015                4         3      NaN
         2014                4         2      NaN
         2012                1         3      1.0
         2013                2         2      NaN
```

```
In [58]: # print(new_df)
         # new_df.plot(x='genres', y='vote_count',kind='bar',figsize=(5,5))
         # new_df['genres','release_year'].value_counts().head(30).plot(kind='barh')
         # plt.figure(figsize=(15,15))
```

```
In [143]: #map all the rows of genres in a list.
          genre_details = list(map(str,(df['genres'])))
          # print(genre_details)
          genre = ['Adventure', 'Science Fiction', 'Fantasy', 'Crime', 'Western', 'Family','nan'

          #make the numpy array of year and popularity which contain all the rows of release_yea
          year = np.array(df['release_year'])
          popularity = np.array(df['popularity'])

          #make a null dataframe which indexs are genres and columns are years.
          popularity_df = pd.DataFrame(index = genre, columns = range(1960, 2016))
          #change all the values of the dataframe from NAN to zero.
          popularity_df = popularity_df.fillna(value = 0.0)



          # print(popularity_df)
          z = 0
          temp_year = ''
          print(len(genre_details))
          for i in genre_details:

              split_genre = list(map(str,i.split('|')))
          #     print(split_genre)
              if(split_genre == ['']):
                  continue
          #     print(year[z])
          #     print(popularity_df.loc[split_genre, year[z]])
```

```
            temp_year = year[z]
            popularity_df.loc[split_genre, [temp_year]] = popularity_df.loc[split_genre, temp_
        #     print(popularity_df)
            z+=1
        popularity_df.to_csv(r'4.csv', index=True, header=True)
        #     break
```

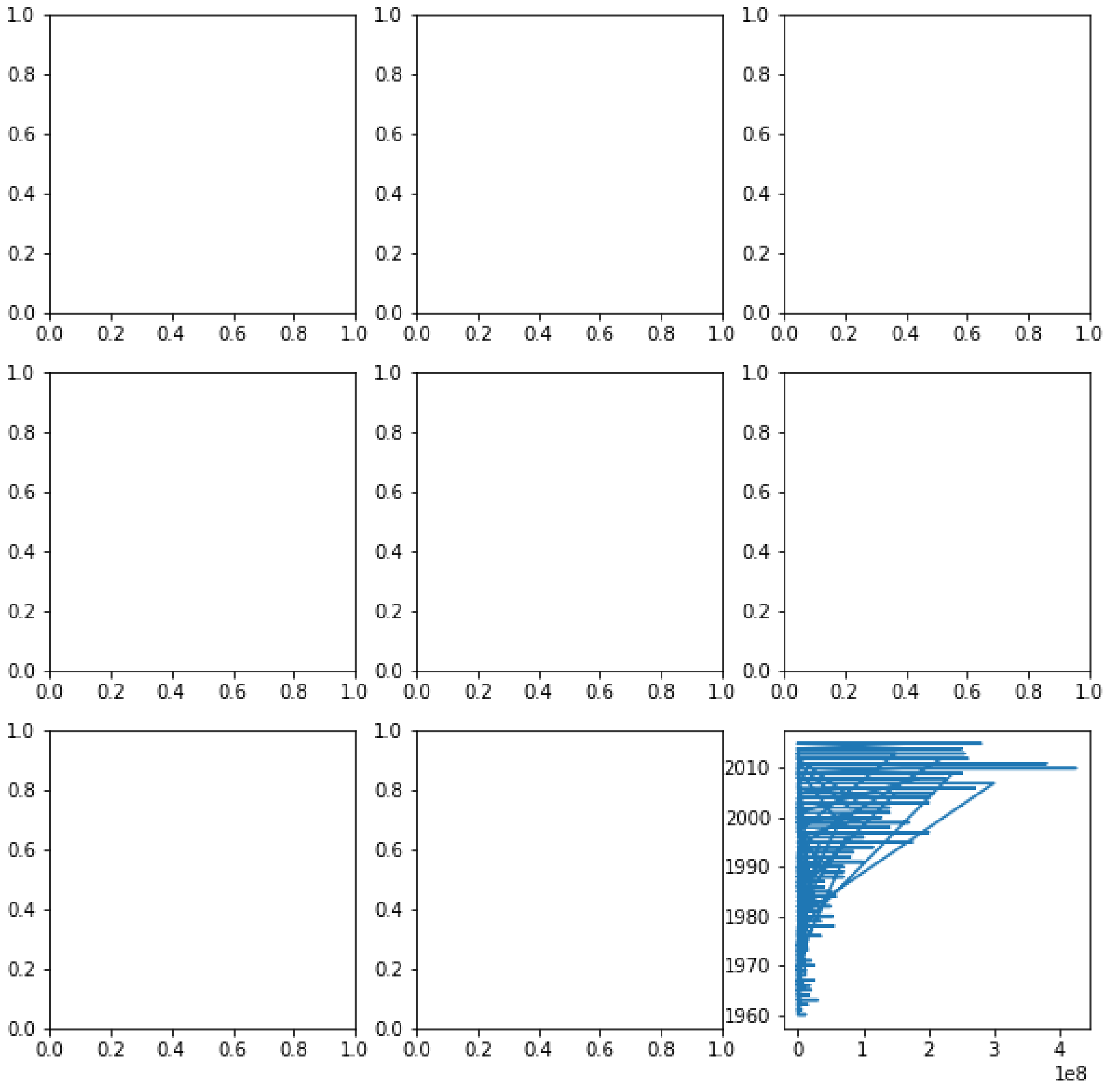
```
10866
```

```
In [146]: #calculate the standard deviation for the accurate results.
          def calculate_std(x):
              return (x-x.mean())/x.std(ddof=0)

          # popular_genre = calculate_std(popularity_df)
          popularity_df.head()
```

```
Out[146]:                      1960      1961      1962      1963      1964      1965  \
          Adventure        2.674413  3.317834  1.109717  2.357228  3.675426  1.024276
          Science Fiction  3.339672  0.787906  1.196412  2.204460  1.898735  0.406496
          Fantasy          1.872132  0.962335  0.675085  1.566682  0.628684  0.100102
          Crime            1.254870  0.374993  0.844694  1.489692  3.859109  0.708455
          Western          0.291026  1.620641  0.526108  1.139321  0.434551  1.670054

                               1966      1967      1968      1969     ...      \
          Adventure        3.345101  2.762950  1.367870  2.386837     ...
          Science Fiction  2.211383  1.814843  0.889752  2.735558     ...
          Fantasy          0.929393  1.106603  4.005599  1.754003     ...
          Crime            1.358987  2.208431  3.049814  1.041098     ...
          Western          1.376630  1.117509  0.166845  0.000000     ...

                                2006       2007       2008       2009       2010  \
          Adventure        37.807243  37.455995  60.945255  76.668674  62.814404
          Science Fiction  16.597229  24.706425  39.733235  60.947610  25.678203
          Fantasy          29.743052  31.087415  42.571058  40.261450  40.284399
          Crime            40.537588  49.392102  35.540713  28.362135  37.726581
          Western           0.430182   3.009499   0.769558   0.000000   4.579267

                                2011       2012       2013        2014        2015
          Adventure        55.426697  70.772133  56.058004  144.555220  226.422082
          Science Fiction  48.125939  44.232776  58.329498  121.783097  193.487063
          Fantasy          31.127985  47.031822  31.152139   68.334598   57.363748
          Crime            43.065274  47.304689  63.730323   59.681012   87.911125
          Western           4.185536   0.646815   2.167356    3.736086   19.072777

          [5 rows x 56 columns]
```

```
In [33]: plt.subplots(3,3,figsize=(10,10))
         plt.plot(df.budget, df.release_year)
         plt.plot(kind='barh')
```

```
Out[33]: []
```



```
In [140]: def count_genre(x):
          data_plot = reader[x].str.cat(sep = '|')
              data = pd.Series(data_plot.split('|'))
               info = data.value_counts(ascending=False)
              return info
```

```
      File "<ipython-input-140-c5586303f7e3>", line 2
    data_plot = reader[x].str.cat(sep = '|')
            ^
IndentationError: expected an indented block
```

## Conclusions

Question 1 conclusion: I researched what are most frequent genres that were released. As a result I figured out Drama, Thriller and Comedy were top three genres that most company produced. Also least produced genres were Western, TV Movie, and Foreign. Just by looking at this result, we can assume that Drama, Thriller, and Comedy were people's favorite movie genres.

Question 2 conclusion: I researched if higher popularity (vote count) make higher in revenue. In order to do this research, I looked relationship between vote count and revenue. I choose vote count to see the popularity among people because people would make a higher vote count if they liked the movie. I demonstrated this visualization by using scatter graph. From the graph I made, I could tell that higher vote count made higher revenue. Although the scatter graph did not gave exact flow like linear graph but still there were trend were clearly demonstrated on the graph.

1.2 Submitting your Project

Before you submit your project, you need to create a .html or .pdf version of this notebook in the workspace here. To do that, run the code cell below. If it worked correctly, you should get a return code of 0, and you should see the generated .html file in the workspace directory (click on the orange Jupyter icon in the upper left).

Alternatively, you can download this report as .html via the **File** > **Download as** submenu, and then manually upload it into the workspace directory by clicking on the orange Jupyter icon in the upper left, then using the Upload button.

Once you've done this, you can submit your project by clicking on the "Submit Project" button in the lower right here. This will create and submit a zip file with this .ipynb doc and the .html or .pdf version you created. Congratulations!

```
In [ ]: from subprocess import call
        call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])
```