Final Project Submission

Please fill out:

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- Student pace: Flex-20 week
- Scheduled project review date/time:
- Instructor name: Matt Carr
- Blog post URL: https://medium.com/@samuel.s.marder/slight-right-onto-data-science-64912ef3bd67

Overview

This project analyzes basic movie data to give Microsoft an idea on how to enter the market. Data analysis of various sources shows how different aspects affect the return on investment of the movie. This ranges from who should direct to the kind of film they should be making along with how long to make the film.

Business Problem

Microsoft needs to figure out the best way to invest in the first movie as a studio. Through examination of data provided from IMDB and TN, I can show some good ways to invest capital in the first film.

Data Analysis

In [17]:
```
import pandas as pd
import seaborn as sns
import numpy as np
import sqlite3
import matplotlib.pyplot as plt
%matplotlib inline
```

In [18]:
```
conn = sqlite3.connect("data/im.db")
sns.set(font_scale = 1)
pal = sns.color_palette("Blues", as_cmap=True)
```

First, I am gathering data for the movie directors

In [19]:
```
q = """SELECT p.primary_name AS director,
mb.primary_title
FROM persons AS p
JOIN directors USING (person_id)
JOIN movie_basics AS mb USING (movie_id)"""
director_movie_df = pd.read_sql(q, conn).drop_duplicates()
director_movie_df.head()
```

Out[19]:

	director	primary_title
0	Ruel S. Bayani	Paano na kaya
4	Ruel S. Bayani	No Other Woman
7	Ruel S. Bayani	One More Try
8	Ruel S. Bayani	Kasal
10	Bryan Beasley	The Quiet Philanthropist: The Edith Gaylord Story

In [20]:
```
director_movie_df.set_index('primary_title', inplace=True)
director_movie_df.head()
```

Out[20]:

	director
primary_title	
Paano na kaya	Ruel S. Bayani
No Other Woman	Ruel S. Bayani
One More Try	Ruel S. Bayani
Kasal	Ruel S. Bayani
The Quiet Philanthropist: The Edith Gaylord Story	Bryan Beasley

Second, I am pulling information about the runtime and genre of each movie

In [21]:
```
q = """SELECT mb.primary_title,
mb.runtime_minutes,
mb.genres
FROM movie_basics as mb"""
movie_df = pd.read_sql(q, conn).drop_duplicates()
movie_df.head()
```

Out[21]:

	primary_title	runtime_minutes	genres
0	Sunghursh	175.0	Action,Crime,Drama
1	One Day Before the Rainy Season	114.0	Biography,Drama
2	The Other Side of the Wind	122.0	Drama
3	Sabse Bada Sukh	NaN	Comedy,Drama
4	The Wandering Soap Opera	80.0	Comedy,Drama,Fantasy

In [22]:
```
#Bining up runtime
def bin_runtime(rt):
    if(rt <= 30):
        return "0 to 30"
    elif(rt <= 60):
        return "30 to 60"
    elif(rt <= 90):
        return "60 to 90"
    elif(rt <= 120):
        return "90 to 120"
    elif(rt <= 150):
        return "120 to 150"
    else:
        return "150+"
```

In [23]:
```
movie_df['genres'] = movie_df['genres'].str.split(pat=",")
movie_df['runtime_bins'] = movie_df['runtime_minutes'].apply(bin_runtime)
movie_df.set_index("primary_title", inplace=True)
movie_df.head()
```

Out[23]:

	runtime_minutes	genres	runtime_bins
primary_title			

	runtime_minutes	genres	runtime_bins
primary_title			
Sunghursh	175.0	[Action, Crime, Drama]	150+
One Day Before the Rainy Season	114.0	[Biography, Drama]	90 to 120
The Other Side of the Wind	122.0	[Drama]	120 to 150

```
In [24]: genre_df = movie_df.explode('genres')
         genre_df.head()
```

Out[24]:

	runtime_minutes	genres	runtime_bins
primary_title			
Sunghursh	175.0	Action	150+
Sunghursh	175.0	Crime	150+
Sunghursh	175.0	Drama	150+
One Day Before the Rainy Season	114.0	Biography	90 to 120
One Day Before the Rainy Season	114.0	Drama	90 to 120

Create a dataframe for movie budgets

I chose to read in the movie budgets csv file to find that the information in it was very string based. With some help from Yoni, I was able to clean the strings away in favor of numbers so I could calculate the ROI. I also stripped away all information that was not related to ROI to make merging and aggregation easier.

In [25]:
```
mb_df = pd.read_csv("data/tn.movie_budgets.csv")
mb_df = mb_df.set_index('movie')

mb_df['production_budget'].replace(to_replace=r'\D', value=r'', regex=True, inplace=True)
mb_df['production_budget'] = mb_df['production_budget'].astype(int)

mb_df['domestic_gross'].replace(to_replace=r'\D', value=r'', regex=True, inplace=True)
mb_df['domestic_gross'] = mb_df['domestic_gross'].astype(int)

mb_df['worldwide_gross'].replace(to_replace=r'\D', value=r'', regex=True, inplace=True)
mb_df['worldwide_gross'] = mb_df['worldwide_gross'].astype(float) #Turns out, int is too small here

mb_df['roi'] = mb_df['domestic_gross'] + mb_df['worldwide_gross'] - mb_df['production_budget']

mb_df.drop(columns = ['id', 'release_date', 'production_budget', 'domestic_gross', 'worldwide_gross'], inpla

mb_df.head()
```

Out[25]:

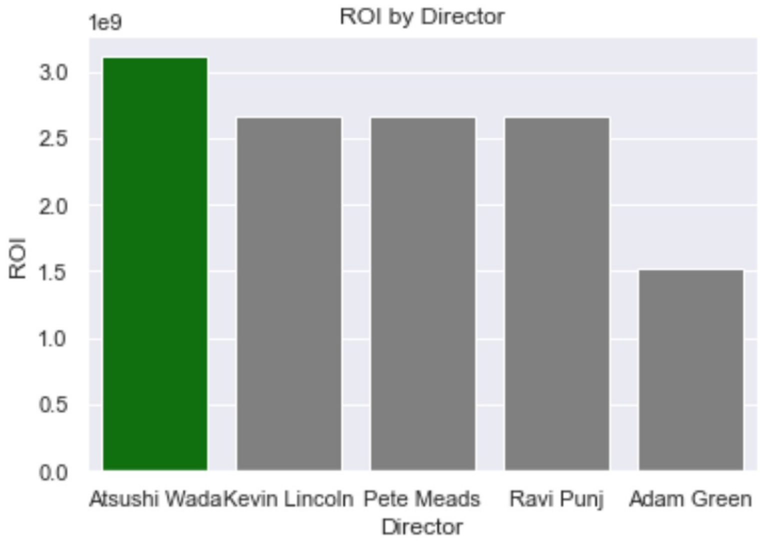
	roi
movie	
Avatar	3.111853e+09
Pirates of the Caribbean: On Stranger Tides	8.761278e+08
Dark Phoenix	-1.574753e+08
Avengers: Age of Ultron	1.531420e+09
Star Wars Ep. VIII: The Last Jedi	1.619903e+09

Create and visualize Director ROI Dataframe

I pulled data together from the movie budgets and director movie data frames so I can aggregate an average ROI based on the director of the film in question.

In [26]:
```
director_roi_df = mb_df.join(director_movie_df, how="inner")
director_roi_df = director_roi_df.groupby(['director']).mean()
director_roi_df.sort_values(['roi'], ascending=False, inplace=True)
director_roi_df.reset_index(inplace=True)
```

In [27]:
```
f, ax = plt.subplots()
clrs = ['grey' if (x < max(director_roi_df['roi'])) else 'green' for x in director_roi_df['roi']]
sns.barplot(x="director", y="roi", data=director_roi_df.head(), palette=clrs)
ax.set(xlabel="Director", ylabel="ROI", title="ROI by Director");
plt.savefig("./images/Director_ROI.png")
```

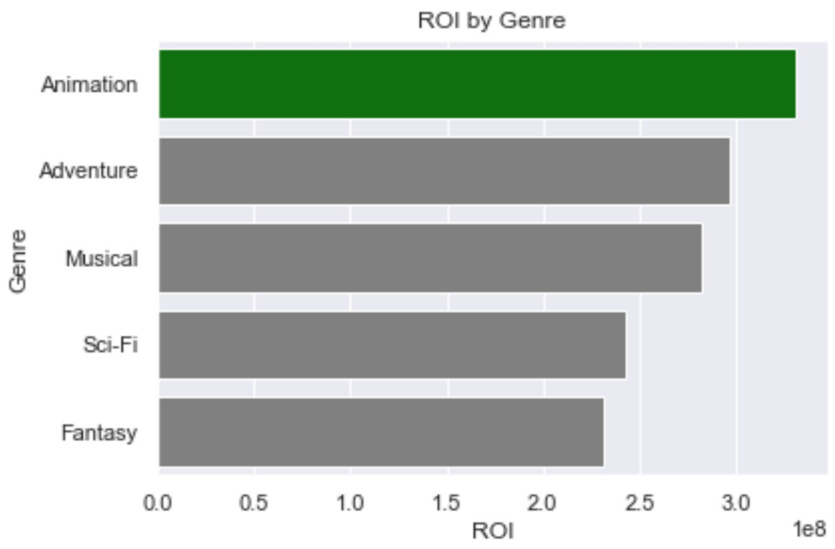


Create and visualize the Genre ROI Dataframe

I create the genre ROI data frame much like I did director but aggregating on genres instead of director

In [28]:
```
genre_roi_df = mb_df.join(genre_df, how="inner")
genre_roi_df = genre_roi_df.groupby(['genres']).mean()
genre_roi_df.sort_values(['roi'], ascending=False, inplace=True)
genre_roi_df.reset_index(inplace=True)
```

In [29]:
```
f, ax = plt.subplots()
clrs = ['grey' if (x < max(genre_roi_df['roi'])) else 'green' for x in genre_roi_df['roi']]
sns.barplot(x="roi", y="genres", data=genre_roi_df.head(), palette=clrs)
ax.set(ylabel="Genre", xlabel="ROI", title="ROI by Genre")
plt.savefig('./images/Genre_ROI.png');
```

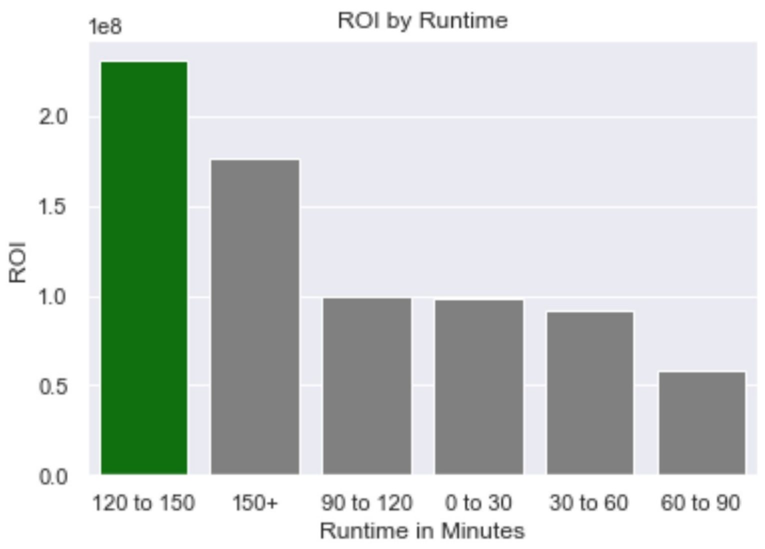


Create and visualize Runtime ROI Dataframe

For the final data frame, I combine the movie budget dataframe with the movie dataframe.

```
In [30]: rt_roi_df = mb_df.join(movie_df, how="inner")
         rt_roi_df.dropna(subset=["runtime_minutes"], inplace=True) #Removing ~400 movies with no runtime
         rt_roi_df = rt_roi_df.groupby(['runtime_bins']).mean()
         rt_roi_df.sort_values(['roi'], ascending=False, inplace=True)
         rt_roi_df.reset_index(inplace=True)
```

```
In [31]: f, ax = plt.subplots()
         clrs = ['grey' if (x < max(rt_roi_df['roi'])) else 'green' for x in rt_roi_df['roi']]
         sns.barplot(x="runtime_bins", y="roi", data=rt_roi_df, palette=clrs);
         ax.set(xlabel="Runtime in Minutes", ylabel="ROI", title="ROI by Runtime")
         plt.savefig('./images/Runtime_ROI.png');
```



Recommendations:

1. Do an animated film
2. Hire Atsushi Wada to direct
3. The best seems to be around 120 to 150 minutes in runtime

Next steps

- One flaw is my methods can be misleading by the number of observations in each bin i.e. Mr Wada may have made one outstanding film while Mr Lincoln has more stable ROI in comparison, additional analysis might be able to negate this flaw
- Further analysis could be done to provide a more comprehensive crew such as writers and actors from the IMDB sqlite db

```
In [ ]:
```