

Gender Roles in English Movies

Rebeka Mukherjee, Archit Rathore, Yash Gangrade

1 Introduction

Gender refers to the socially constructed characteristics of women and men such as norms, roles and interpersonal relationships [1]. The United Nations recognizes gender equality not only as a fundamental human right, but also a necessary foundation for a ‘peaceful, prosperous and sustainable world’ [2]. Achieving gender equality is one of UN’s goals towards sustainable development.

Media plays an important role in our lives. Though not an accurate representation, but media largely reflects the social constructs of the world we live in. At the same time, media largely influences our daily decisions and way of living. One of the most influential forms of media in the modern world is movies. We speculate that the representation of the genders on screen largely reflects our perceptions of the genders in real life.

In this study we explored and analyzed the role of gender in movies. Our main objective was to compare our findings with the current situation of gender equality in the real world. This comparison would allow us to answer questions like: how can media be used efficiently to achieve equality among the genders?

The following sections describe our project in detail. Section 2 provides information about the data that we used for the project, how we processed it for the study, and the preliminary exploration done on it. Section 3 focuses on the approaches taken by us to meet the project objective. The findings of the approaches are reported in section 4. Section 5 documents the evaluations of these findings. Section 6 and 7 touch up on the future directions of this project and the conclusions we drew from this project, respectively.

2 Data

The complete data is fetched from this Kaggle dataset: <https://www.kaggle.com/rounakbanik/the-movies-dataset/>. The dataset is downloadable after creating a Kaggle account and comes with a public domain creative commons license.

The dataset contains metadata for 45,000 movies. Data points include cast, crew, plot keywords, budget, revenue, posters, release dates, languages, production companies, countries, TMDB vote counts and vote averages. The compressed dataset is roughly 230 MBs.

We also developed a web scraper to extract the script of these movies from the Internet Movie Script Database (IMSDb) website: <https://www.imsdb.com/>.

2.1 Data Processing

Though the downloaded data was in CSV format, there were some issues with the structure such as... We created objects for each movie by using information from the files 'movies_metadata.csv' and 'credits.csv'. Figure 1 shows all the member variables and methods associated with each object. We used these collection of objects for all preliminary data exploration.

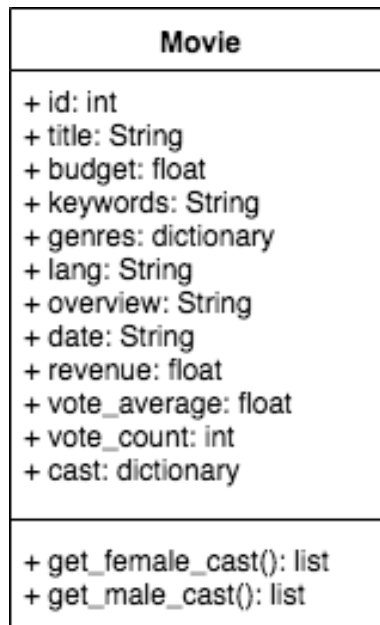


Figure 1: Class diagram for the Movies class

We also wanted to convert the data into a graph that could be further used to perform similarity based analysis methods. For this purpose, we randomly selected 300 English movies whose script was available in the IMSDB website. The reason we selected only English movies is because we speculate that it is the language in which most number of movies are viewed in the United States. English movie scripts were also easily available from the IMSDB website, and easy for us to process and analyze.

We came up with a list of gender words (Table 1) and created a bag of words vector for each of these movies based on how many times these words appeared in the script for that movie. Table 2 shows the corresponding vectors for a subset of 3 movies.

We found the pairwise similarities between two movies by taking the cosine similarity (1 - cosine distance) between the bag of word vectors for the corresponding movies. Then we represented all the movies as an undirected graph by constructing an adjacency matrix where each movie was a vertex, and the weight of the edges between them was their pairwise similarity. We had to additionally adjust the adjacency matrix by setting the diagonal elements to 0. Table 3 shows the adjacency matrix created from the movies mentioned in Table 2.

Male Words	Female Words
he	she
him	her
his	hers
himself	herself
man	woman
boy	girl
lord	lady
sir	madam
father	mother
grandfather	grandmother
son	daughter
grandson	granddaughter
brother	sister
husband	wife
boyfriend	girlfriend
uncle	aunt
nephew	niece

Table 1: Gender words used to generate bag of words vectors

Movie Name	BOW Vector
Toy Story	[158, 86, 220, 27, 14, 13, 0, 4, 0, 0, 1, 0, 0, 0, 0, 0, 0, 11, 25, 0, 0, 0, 0, 1, 0, 6, 0, 0, 0, 3, 1, 0, 0, 0]
Braveheart	[411, 184, 494, 17, 45, 15, 41, 13, 60, 0, 32, 0, 17, 16, 0, 12, 7, 145, 187, 1, 6, 10, 12, 4, 1, 9, 0, 7, 0, 0, 9, 0, 0, 0]
Notting Hill	[181, 50, 68, 5, 31, 3, 1, 10, 0, 0, 1, 0, 2, 0, 6, 0, 0, 152, 104, 1, 2, 8, 22, 1, 1, 3, 2, 0, 0, 2, 2, 1, 0, 0]

Table 2: Bag of words vector generated for 3 movies.

	ToyStory	Braveheart	Notting Hill
ToyStory	0	0.975	0.668
Braveheart	0.975	0	0.817
Notting Hill	0.668	0.817	0

Table 3: Adjacency matrix generated for the above 3 movies.

2.2 Data Exploration

We found out that out of 32937 English movies, only 4457 (**13.53%**) movies had a cast where the number of female cast members were more than the number of male cast members.

Next, wanted to find out the female-to-male ratio for each genre of movie. To do this we simply extracted all the genres of English movies and for each genre, we found the ratio of the number of female cast members to the number of male cast members for every movie in that genre. Then we took the mean of the ratios for every movie in a particular genre. Table 4 shows the results that we found from this step.

Genre	Female-to-male Ratio
Action	0.395
Adventure	0.425
Animation	0.457
Comedy	0.675
Crime	0.479
Documentary	0.155
Drama	0.678
Family	0.689
Fantasy	0.607
Foreign	0.521
History	0.324
Horror	0.678
Music	0.6
Mystery	0.652
Romance	0.814
Science Fiction	0.494
TV Movie	0.877
Thriller	0.595
War	0.295
Western	0.319

Table 4: Female-to-male cast ratios for each genre of English movies.

It is very surprising to see that ‘Documentary’ movies have the least female-to-male ratio, followed closely by ‘War’ and ‘Western’ movies, which is not so surprising. On the other hand, ‘TV Movies’ have the largest female-to-male ratio, followed by ‘Romance’ and ‘Family’.

We also wanted to find out the female-to-male ratio according to language of the movie. To do this we extracted the languages of all movies and for each language, we found the ratio of the number of female cast members to the number of male cast members for every movie in that language. Then we took the mean of the ratios for every movie in a particular language. While doing this we ignored any language that had less than 5 movies in the dataset. Table 4 shows the results for the top 20 movies with the highest female-to-male ratios.

Vietnamese movies apparently have the largest female-to-male cast ratio which is quite close to gender equality, followed by Tagalog and Korean movies. Surprisingly, all the three languages are from East Asian countries.

Language	Female-to-male Ratio
Vietnamese (vi)	0.994
Tagalog (tl)	0.787
Korean (ko)	0.72
French (fr)	0.682
Latin (la)	0.667
Esperanto (eo)	0.667
Kurdish (ku)	0.667
Spanish (es)	0.653
Abkhazian (ab)	0.648
Japanese (ja)	0.639
Italian (it)	0.623
Hindi (hi)	0.606
Swedish (sv)	0.596
German (de)	0.594
English (en)	0.566
Catalan (ca)	0.546
Portuguese (pt)	0.546
Chinese (zh)	0.54

Table 5: Top 20 languages with the highest female-to-male cast ratios.

3 Methods

In order to meet our objective, we tried three different data mining techniques.

3.1 Regression

Our first approach was to see if we could fit a least squares linear regression model to our data.

First, we built a very simple model to predict the average female-to-male cast ratio of English movies, given the year the movie was released. To do this we found the female-to-male cast ratio for each movie released in a particular year. Then, for each year we found the mean of these ratios. Using this we trained our model.

[illegible]

3.2 Similarity

Our second approach was to compare movies based on similarity. For this, we used the graph mentioned in section 2.1 over 300 movies where each node is a movie and the weight of the edge between two movies is the cosine similarity of the bag of words vector generated for the scripts of the two movies using the gender words mentioned in Table 1.

We used a movie within this subset with the female-to-male ratio of 1 as the seed, and looked at all nodes it was connected to with a weight greater than or equal to 0.95. Then we compared the female-to-male cast ratios of these movies to the average female-to-male cast ratio of English movies (as given in Table 5, in order to validate our results).

3.3 Matrix Factorization

4 Results

Explain what you learned. This is often greatly aided through charts of experiments. But you should also include what lessons you came away with in words; just charts or mathematics is insufficient.

4.1 Regression

Figure 2 shows a plot of the female-to-male cast ratio against the corresponding year using blue points. It also shows the linear regression model that was fit on the data points using a red line. We can see that the ratio increases steadily with each year.

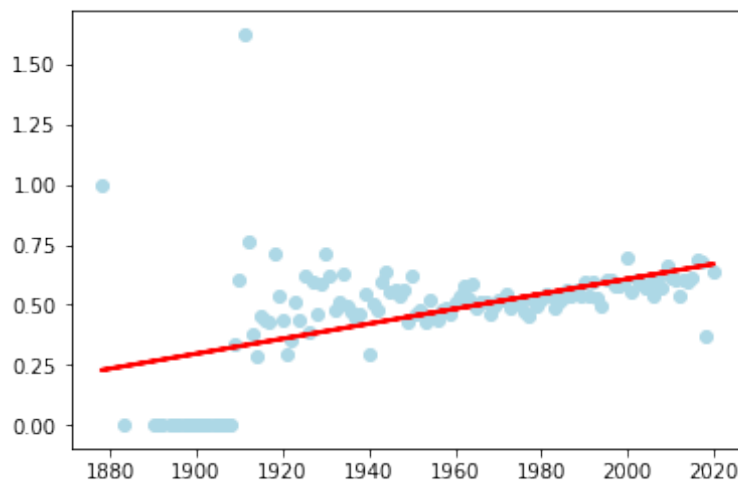


Figure 2: Female-to-male cast ratio vs. movie release date

We would ignore the data about movies before 1920 because movies were not a popular and influential form of media back then. Data about movies were also probably not documented properly back then.

We used our model to predict the female-to-male cast ratios in the next few years. Table 6 shows some of our findings. According to the model, the future looks promising for gender equality.

Year	Female-to-male Ratio
2020	0.669
2030	0.701
2040	0.732
2050	0.763

Table 6: Female-to-male cast ratios in the next few years.

After training the regression model with the extended features, the following are the results we got:

Coefficients: 0.00196131, -0.00938181, 0.00060612, -0.01883477, -0.06328047, -0.04728943, -0.01352373, -0.10219383, -0.04466916, -0.0184048 , -0.01386901, -0.00150656, 0.1008569 , -0.02415882, 0.08578996, 0.02704775, -0.02956841, 0.09406215, 0.04004039, 0.0693289 , -0.07280574, 0.11247093, 0.11776258, 0.16313531, 0.0632939 , 0.41049857, 0.14284822, 0.1705879 , 0.13669169, 0.22338932, 0.11636392, 0.0834649 , 0.14178295, 0.11000807, 0.07356729

Intercept: -3.3963871812633526

Here we see again that the slope of the linear regression is positive, suggesting that the female-to-male ratio increases with the increase in year.

4.2 Similarity

We found that out of the 300 movies, the movie ‘Jane Eyre’ had the highest female-to-male cast ratios of 3.75. We then found out all other movies in the graph that had an edge connected to ‘Jane Eyre’ with a weight of 0.95 or greater. Table 7 lists all these movies and their corresponding female-to-male cast ratios.

Movie	Female-to-male Ratio
My Best Friend's Wedding	1.0
Beloved	2.5
Even Cowgirls Get the Blues	0.875
Scream 2	1.737
Drop Dead Gorgeous	1.714
Scream	0.545
Carrie	1.125
Aliens	0.467
G.I. Jane	0.182
Jane Eyre	0.667
Stepmom	1.667
The Long Kiss Goodnight	0.444
Prom Night	0.6
Heavenly Creatures	1.5
Cruel Intentions	1.571
All About Eve	1.375
10 Things I Hate About You	0.6
Friday the 13th	0.727
Never Been Kissed	0.75
Heathers	0.778
Peggy Sue Got Married	1.125
The Haunting	1.5
Serial Mom	1.625
The Piano	0.5
Twilight	0.5
The Birds	0.875

Table 7: Movies similar to 'Anastasia'.

We know from Table 5 that the average female-to-male cast ratios for English movies is 0.566. We found that 20 movies of the 26 movie **76.9%** more than 95% similar to 'Anastasia', a movie with female-to-male cast ratio of 1, had a female-to-male cast ratio greater than or equal to 0.566.

4.3 Matrix Factorization

5 Evaluation

Due to the exploratory nature of this project, we did not have any metrics to evaluate our results, or any values to compare our results to. However, as mentioned earlier, our main objective was to compare our findings with the current situation of gender equality in the real world.

We found that ...

6 Future Work

Further work on this topic would include applying topic modelling techniques on the movie scripts to gather in-depth information and be able to answer more interesting questions.

7 Conclusion

The issue of gender equality is very relevant in the current times. Mining data from movies and using proper visual techniques to represent the data is an interesting way to explore the topic.

References

- [1] World Health Organization. Gender, equity and human rights.
- [2] United Nations. Gender equality.