Predicting IMDB score for TV shows

The Problem

- There have been 38 cancelled TV shows in 2018 from 5 networks alone (ABC, CBS, The CW, Fox, NBC)
- The average cost for a 30-minute comedy pilot is $2 million.
- An hour-long drama averages out at $5.5 million.
- Per ScreenRant, 65% of new shows get cancelled per season
- All this is compounded by the fact that streaming is increasing in popularity, actively taking away from traditional tv-based viewing

The Question

- Can Hollywood’s bean counters be replaced with machine learning?
- Is it possible to predict a show’s success based on certain features about the show?

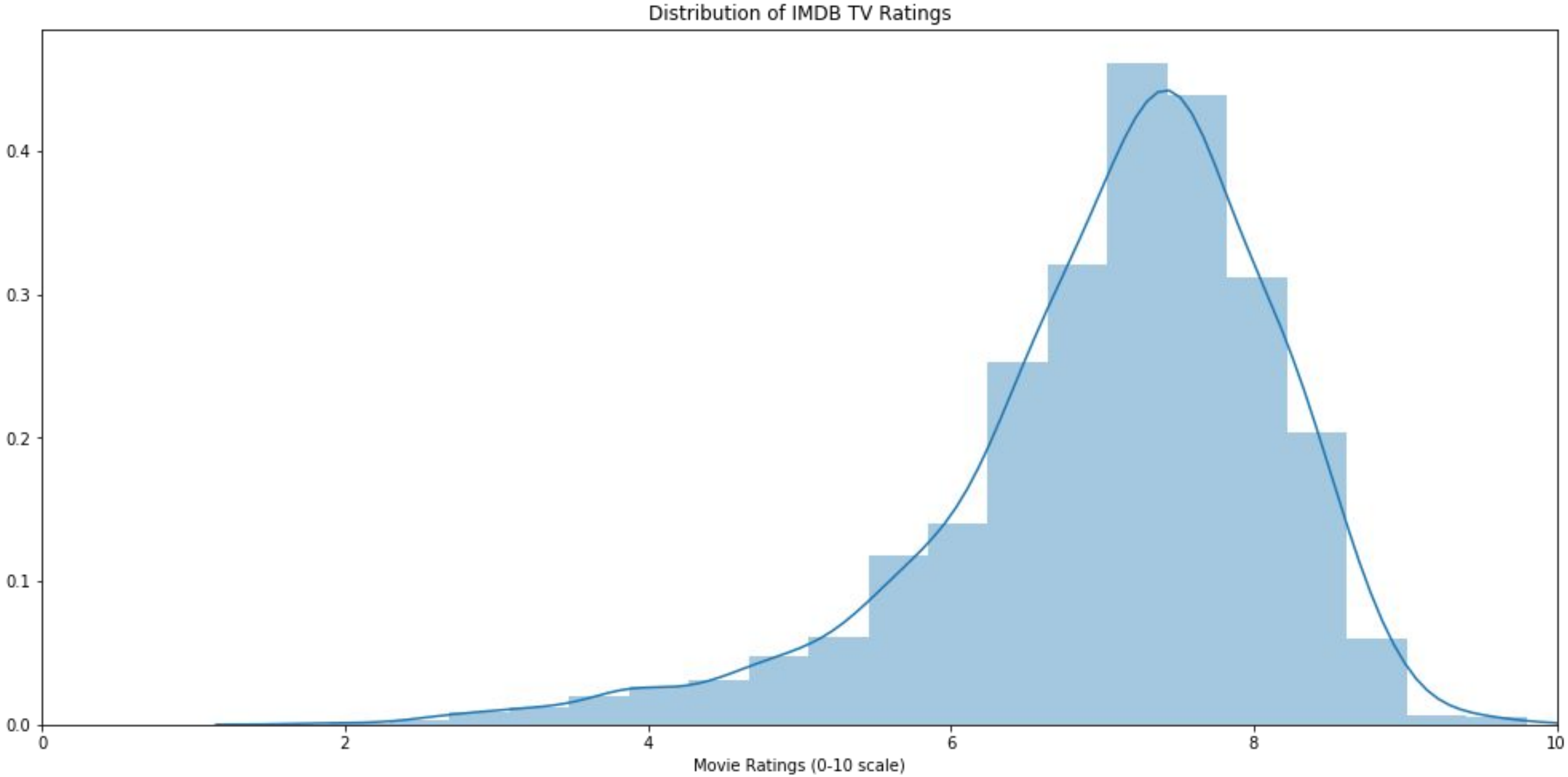
The Dataset

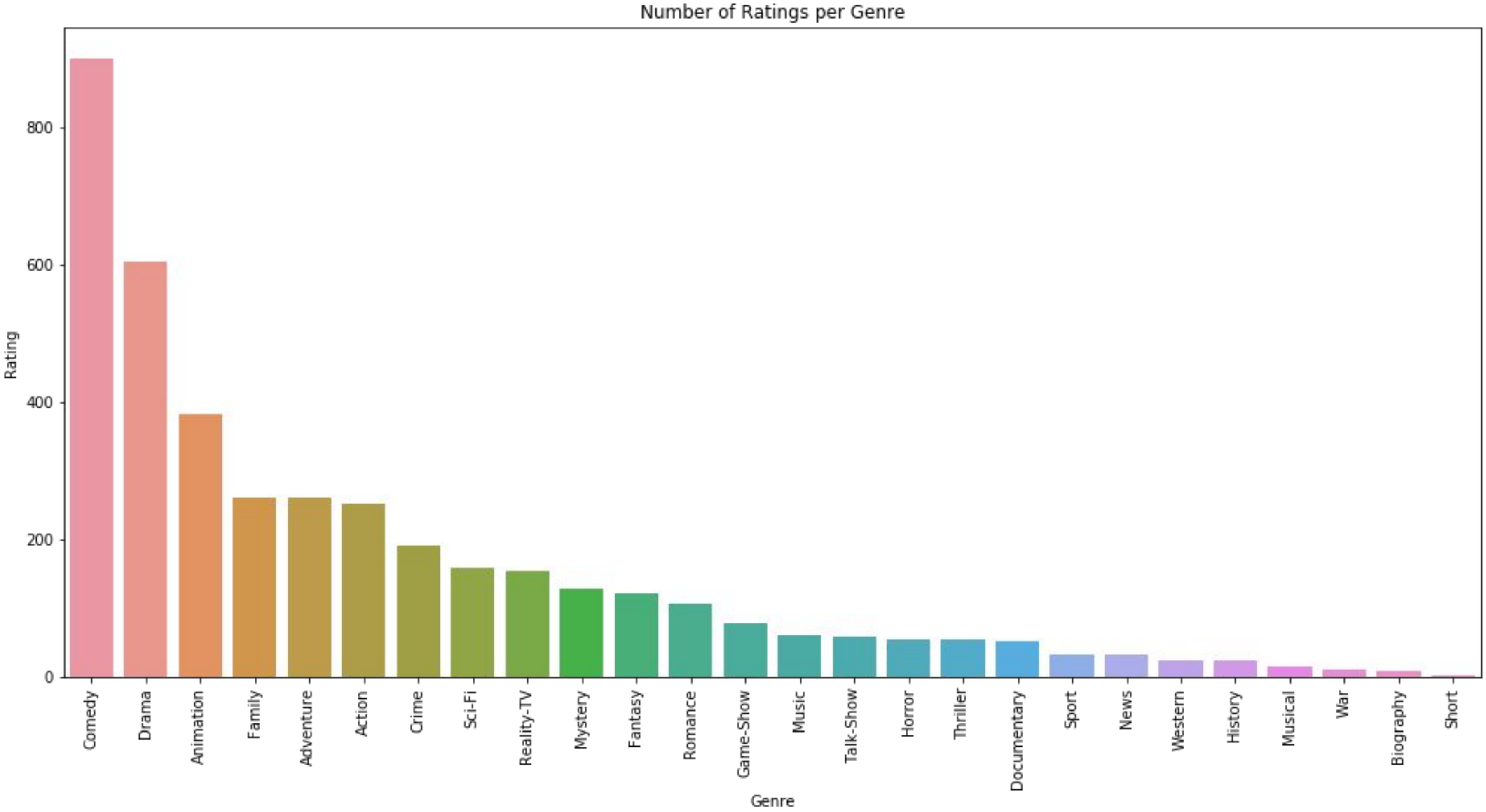
- Data is the modern gold, so there are limited resources on gathering viewership data for tv shows
- Target to predict is IMDB score
- Important features may include:
  - Actors
  - Writers
  - Genre
  - Air time
  - Runtime

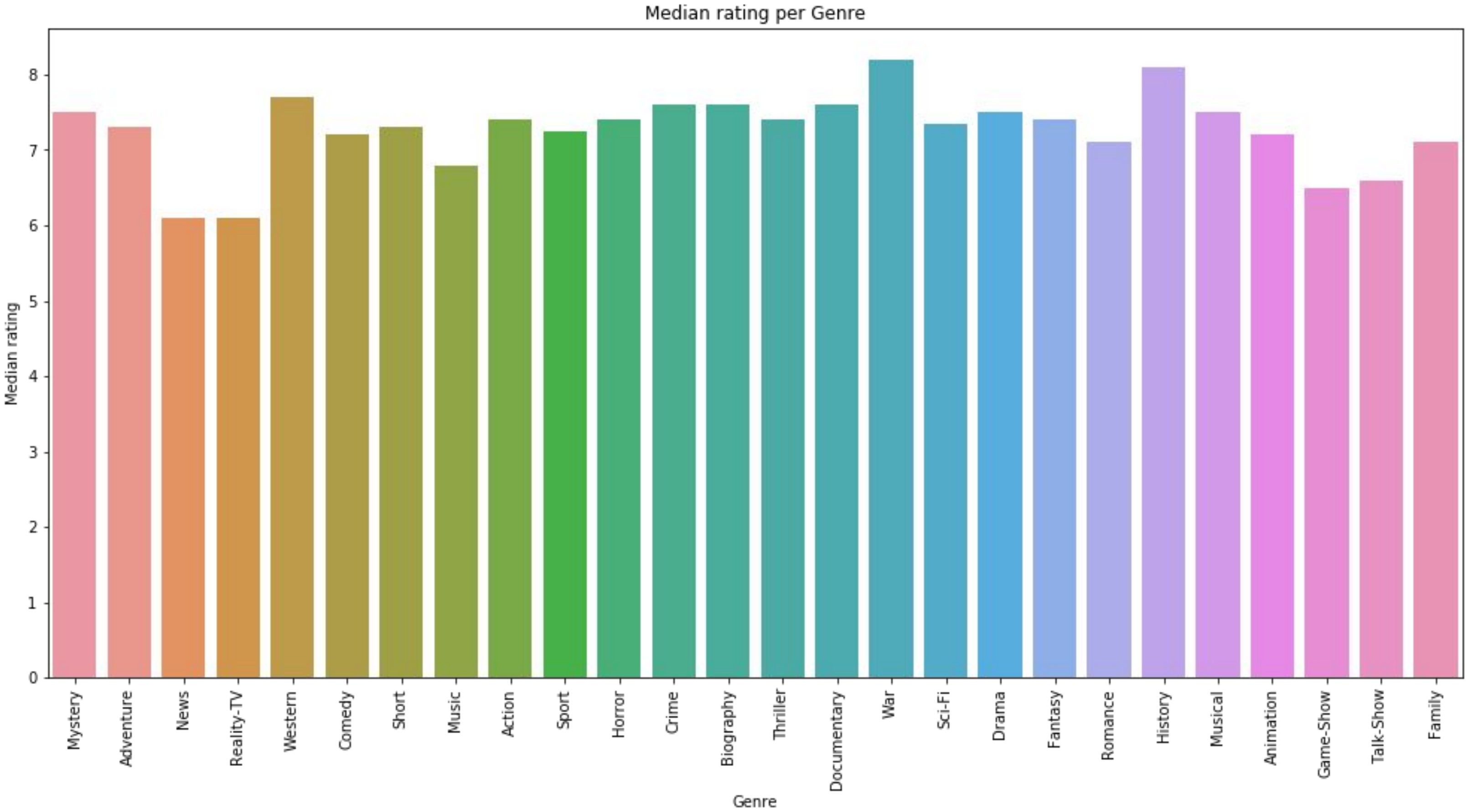
The Dataset pt 2

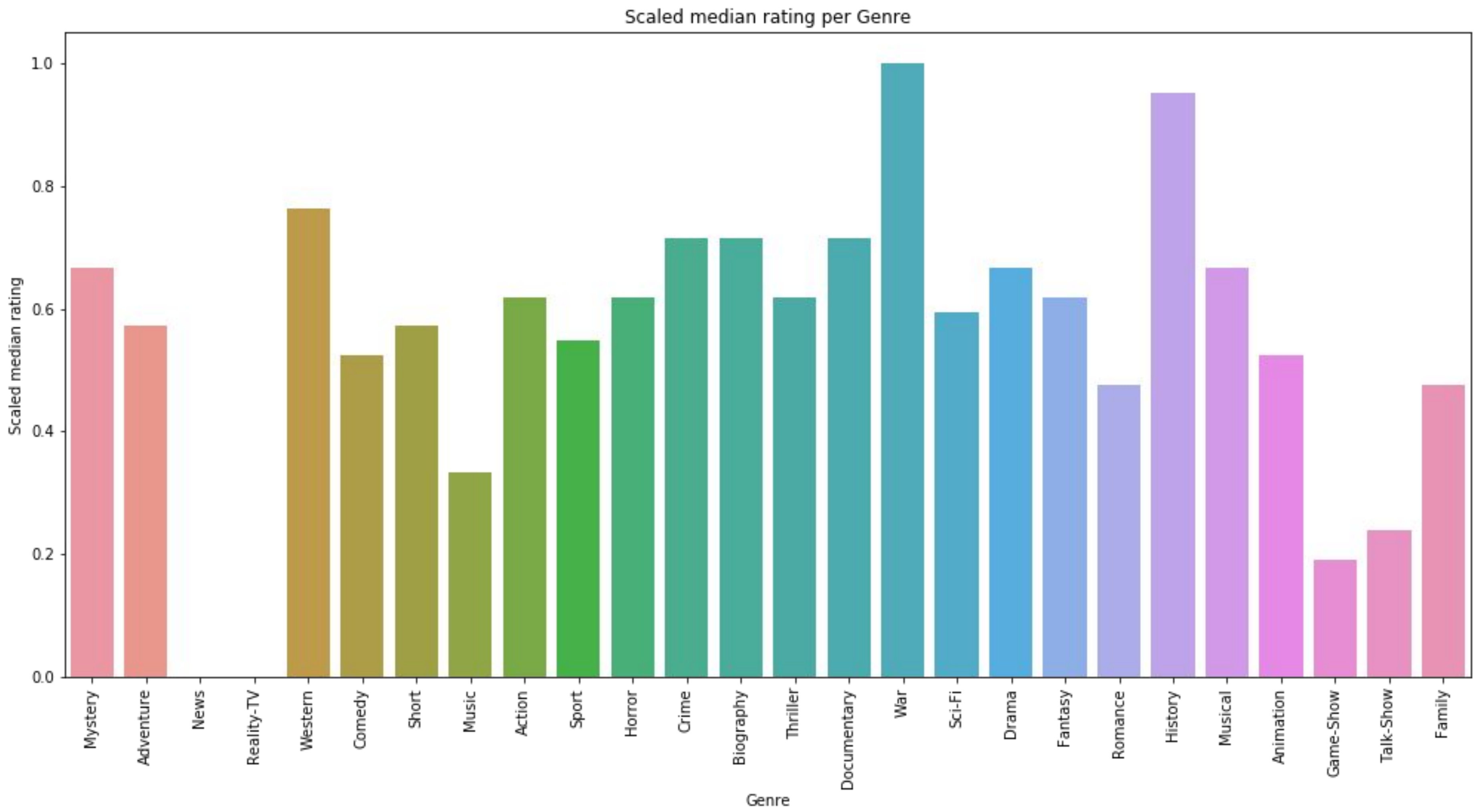
- The intuitive sources:
    - Nielsen - $$$
    - IMDB - No open API
- Network TV shows from Wikipedia
- APIs used instead:
    - The Movie Database (TMDB)
    - The TVDB (TVDB)
    - The Open Movie Database (OMDB)

Initial Data Exploration




Number of Ratings per Genre
Rating
800
600
400
200
0
Genre
Comedy
Drama
Animation
Family
Adventure
Action
Crime
Sci-Fi
Reality-TV
Mystery
Fantasy
Romance
Game-Show
Music
Talk-Show
Horror
Thriller
Documentary
Sport
News
Western
History
Musical
War
Biography
Short


Median rating per Genre
Median rating
0
1
2
3
4
5
6
7
8
Mystery
Adventure
News
Reality-TV
Western
Comedy
Short
Music
Action
Sport
Horror
Crime
Biography
Thriller
Documentary
War
Sci-Fi
Drama
Fantasy
Romance
History
Musical
Animation
Game-Show
Talk-Show
Family
Genre


Scaled median rating per Genre
Scaled median rating
Genre
0.0
0.2
0.4
0.6
0.8
1.0
Mystery
Adventure
News
Reality-TV
Western
Comedy
Short
Music
Action
Sport
Horror
Crime
Biography
Thriller
Documentary
War
Sci-Fi
Drama
Fantasy
Romance
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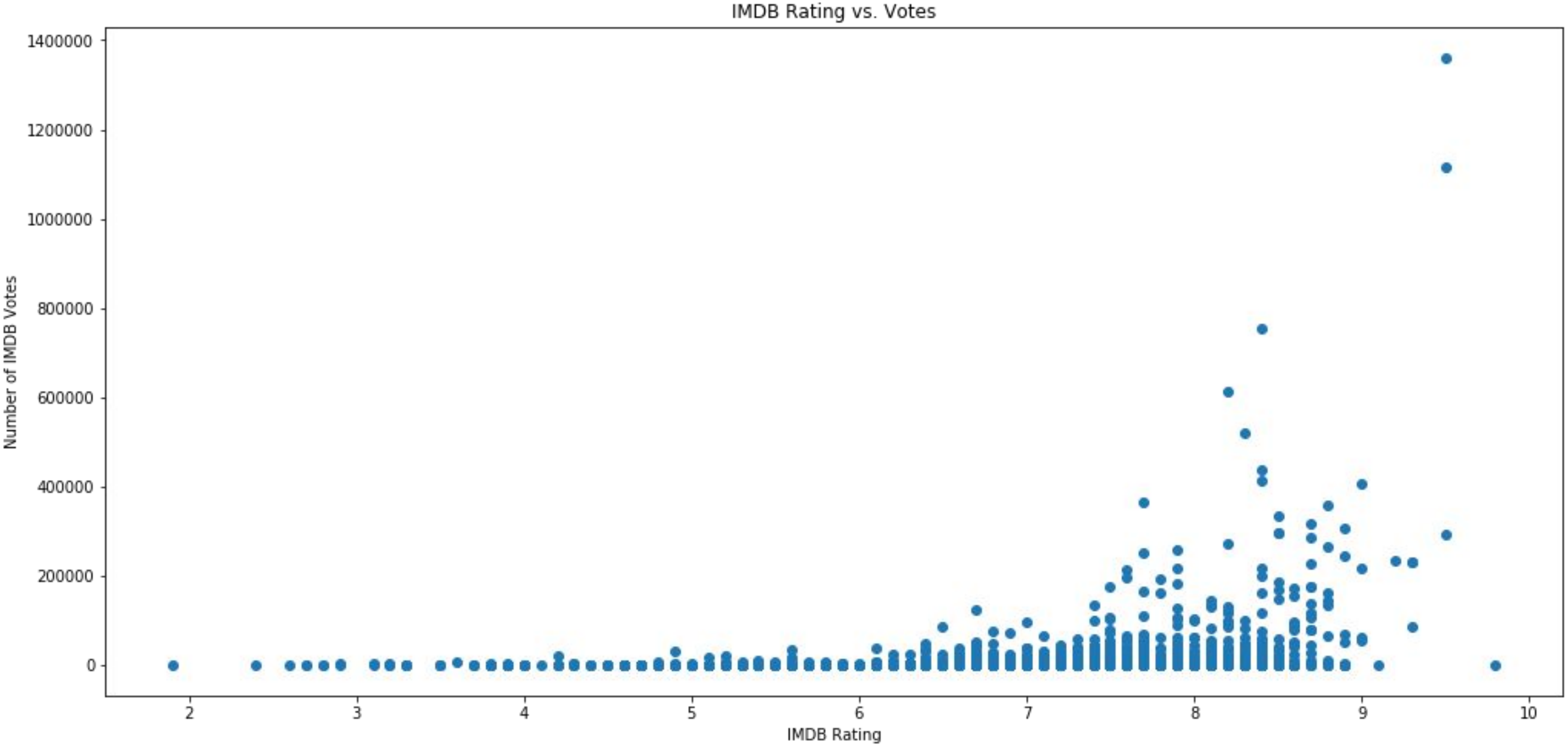
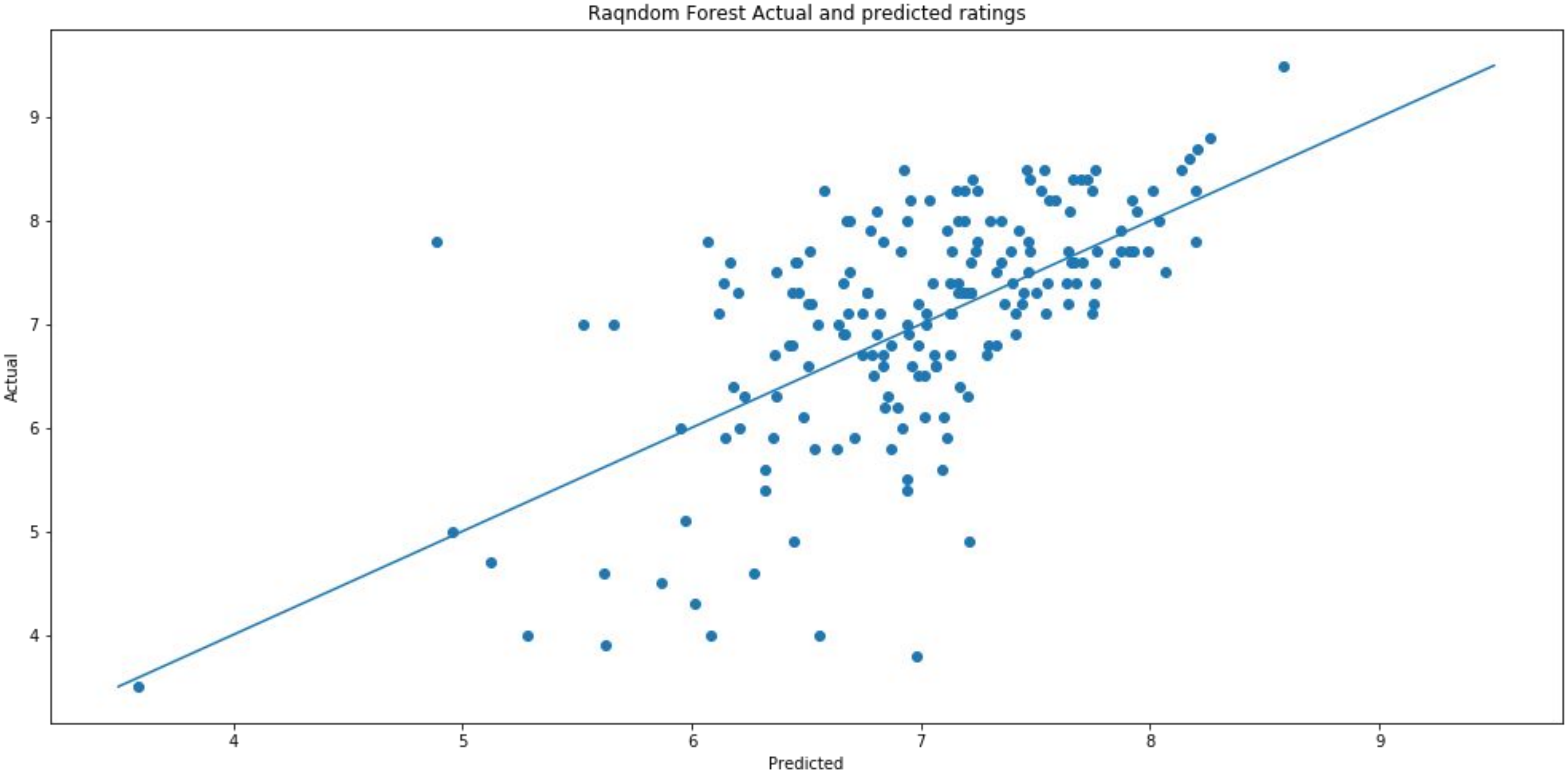

IMDB Rating vs. Votes
Number of IMDB Votes
1400000
1200000
1000000
800000
600000
400000
200000
0
2
3
4
5
6
7
8
9
10
IMDB Rating

The Approach/Methodologies

- Features engineered:
  - Actors > imbued weights based on frequency of appearance
  - Runtime > half hour/full/special (movies)
  - Timeslot > Morning/Afternoon/Evening/Late Night
  - First episode aired month > Seasons
  - Awards/nominated > Yes/No
- Models evaluated:
  - Linear Regression
  - Random Forest
  - Gradient Boost


Raqndom Forest Actual and predicted ratings
Actual
9
8
7
6
5
4
Predicted
4
5
6
7
8
9

Conclusion

- The best model has ~43% of the variance explained by the model.
- The best model has a mean absolute error of .583
    - The mean rating is 7.03
    - One standard deviation is 1.1
- The model will not be able to reliably replace bean counters in the current state
- With better data, the model can be improved for production use

Model	R2	Mean Absolute Error
Linear Regression	0.200	0.715
Random Forest	0.429	0.583
Gradient Boost	0.401	0.599

Next Steps

- Acquire more complete data - no missing values
- Utilize per episode data (rather than per series)
    - Evaluate rating trends between and within seasons
    - Writers per episode
    - Directors per episode
    - Guest Stars Y/N
    - Timeslot
- Possibly change the target variable - viewership numbers may be a better indicator than ratings, which are very subjective