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Spectral analysis of 5000 movies network

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Goals of the Project

- Build & analyse the movie graph
- Genres classification investigation
- Movie recommender engine

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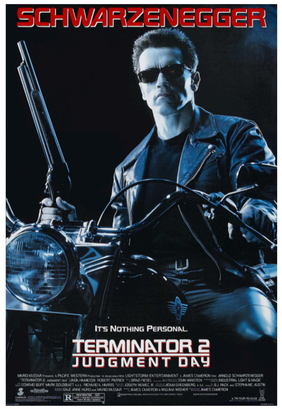
Data Acquisition & cleaning



- Starting point: 5000 movies datasets from Kaggle of movies and production crews [in text and JSON format]
- Datasets used to build Pandas data-frame with movies as lines and their attributes as columns.
- Unuseful lines removed: not released movies, movies with no title or no actor,...
- Unuseful attributes removed: movie IDs, webpage,...

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Data Exploration

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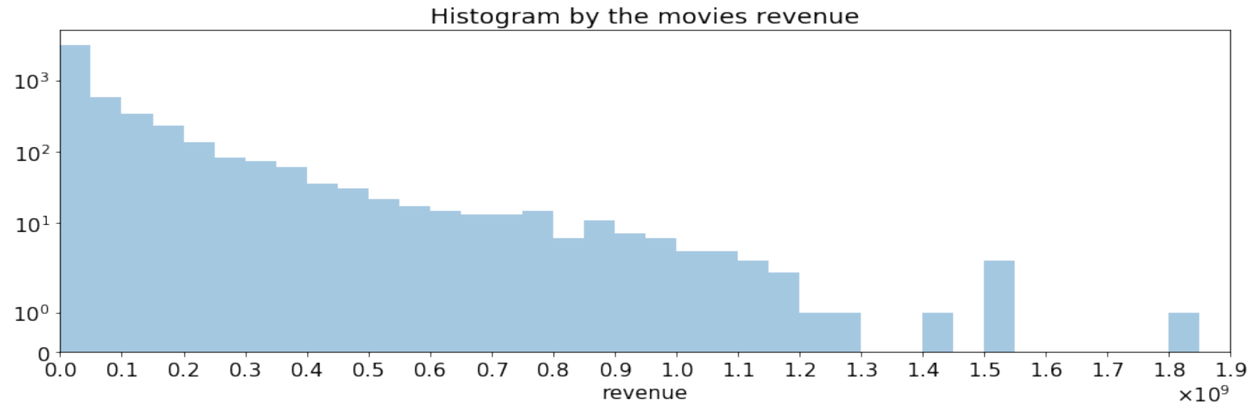
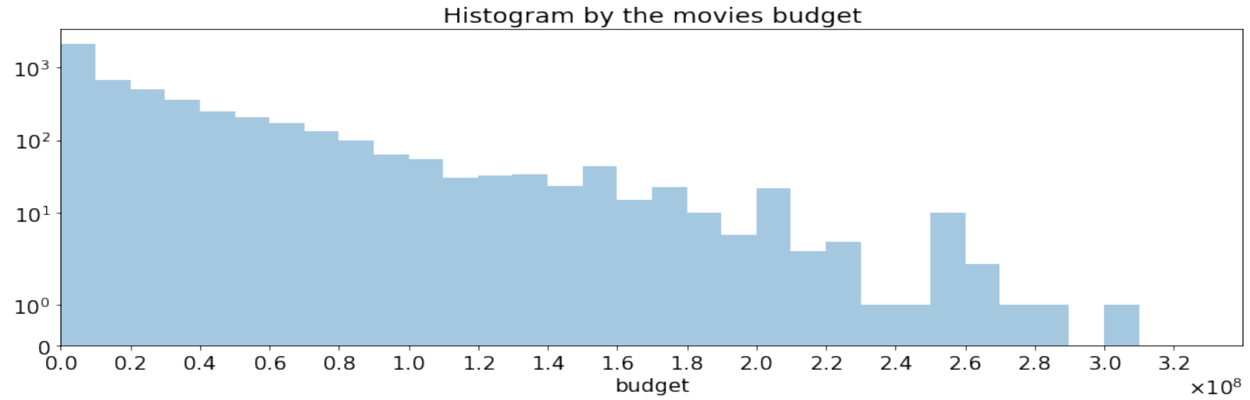
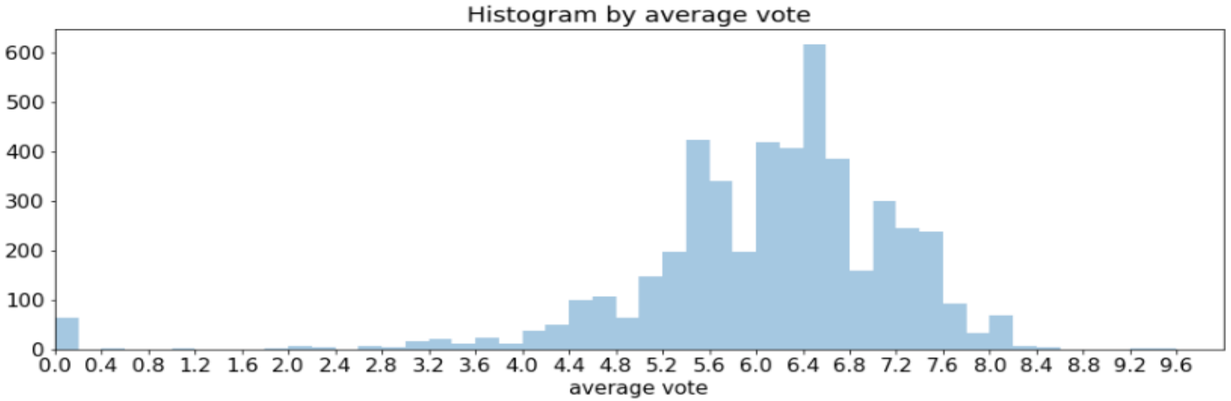
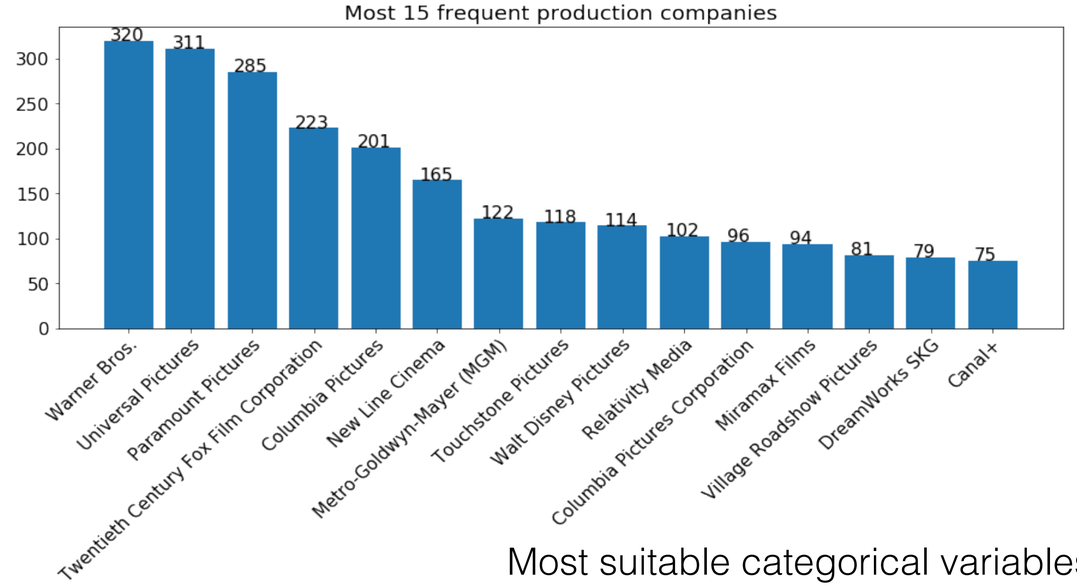
Numerical attributes

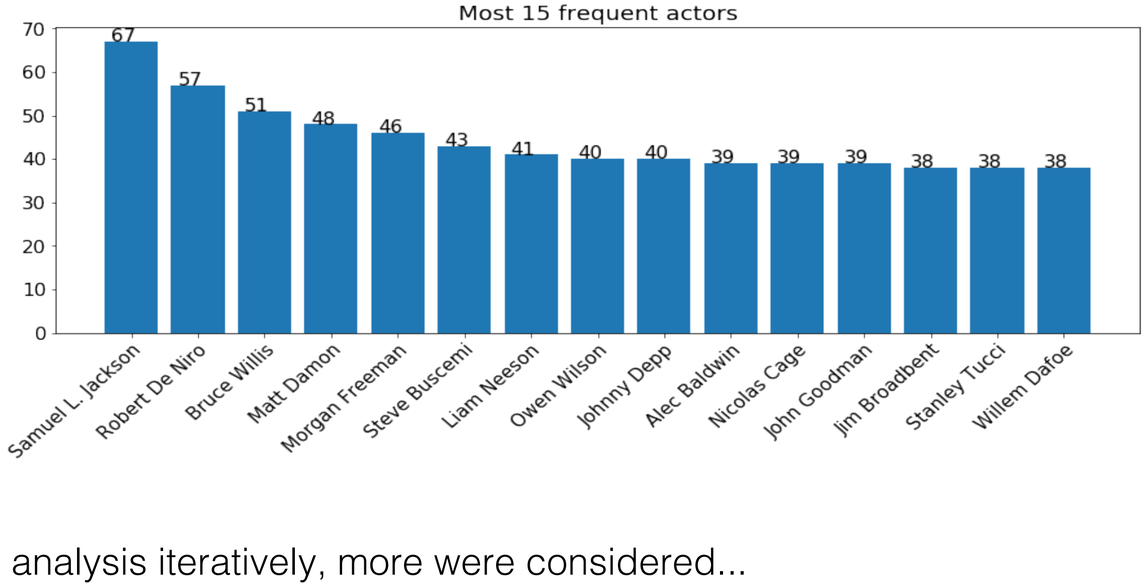




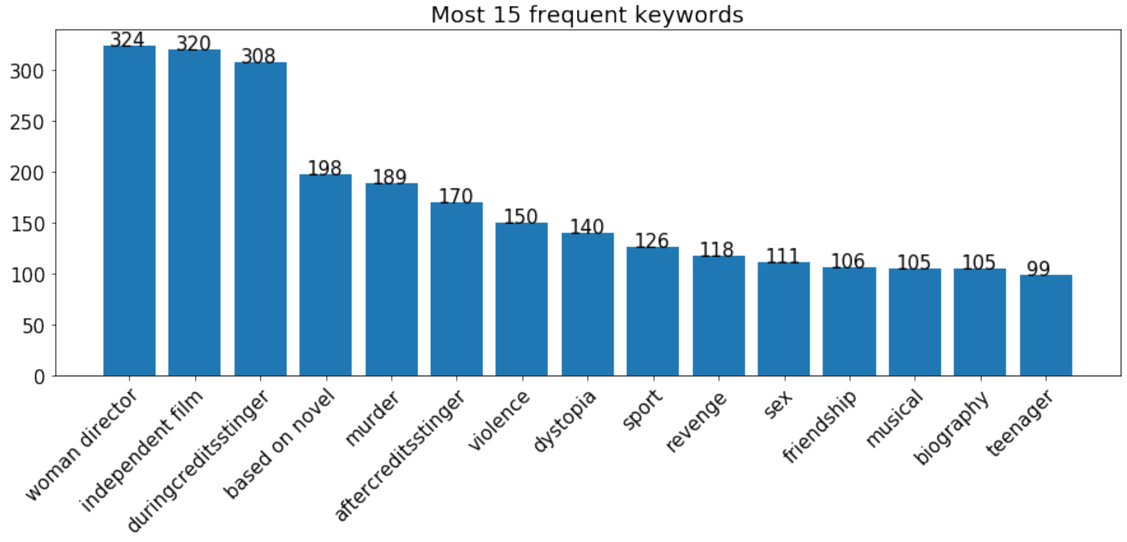


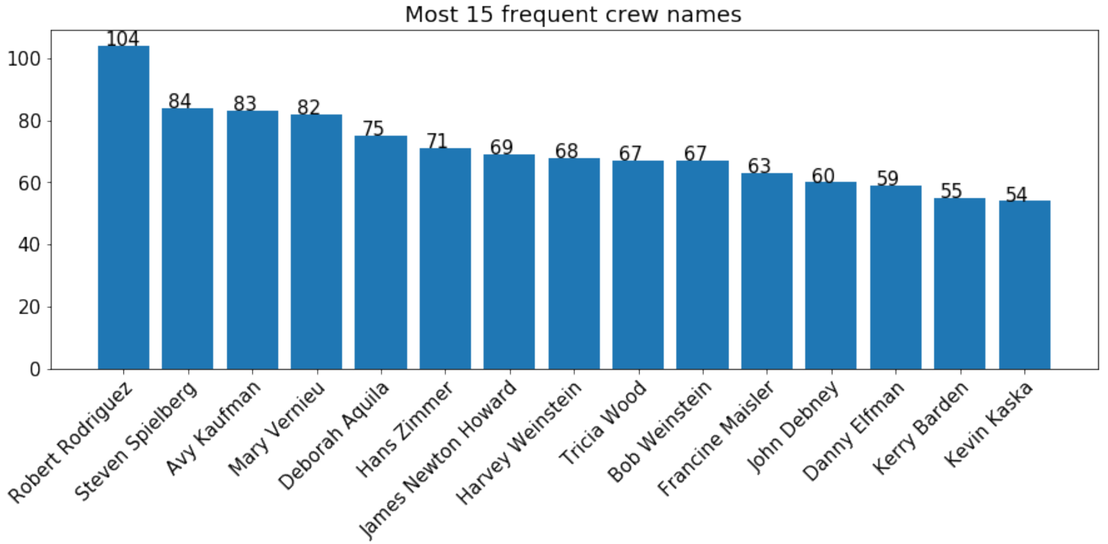
Categorical attributes



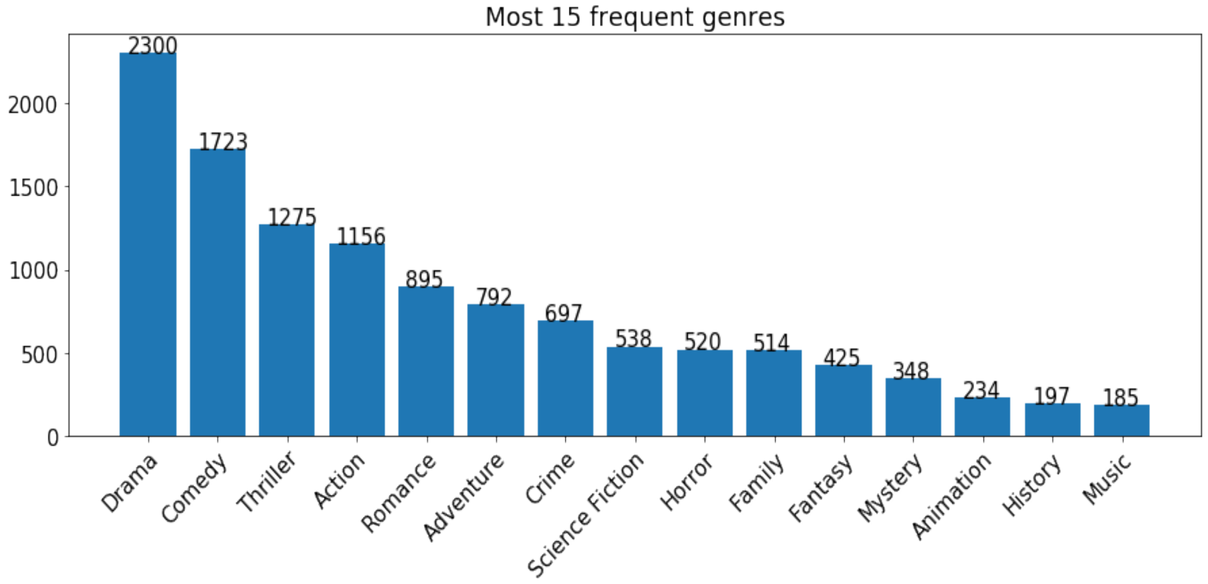


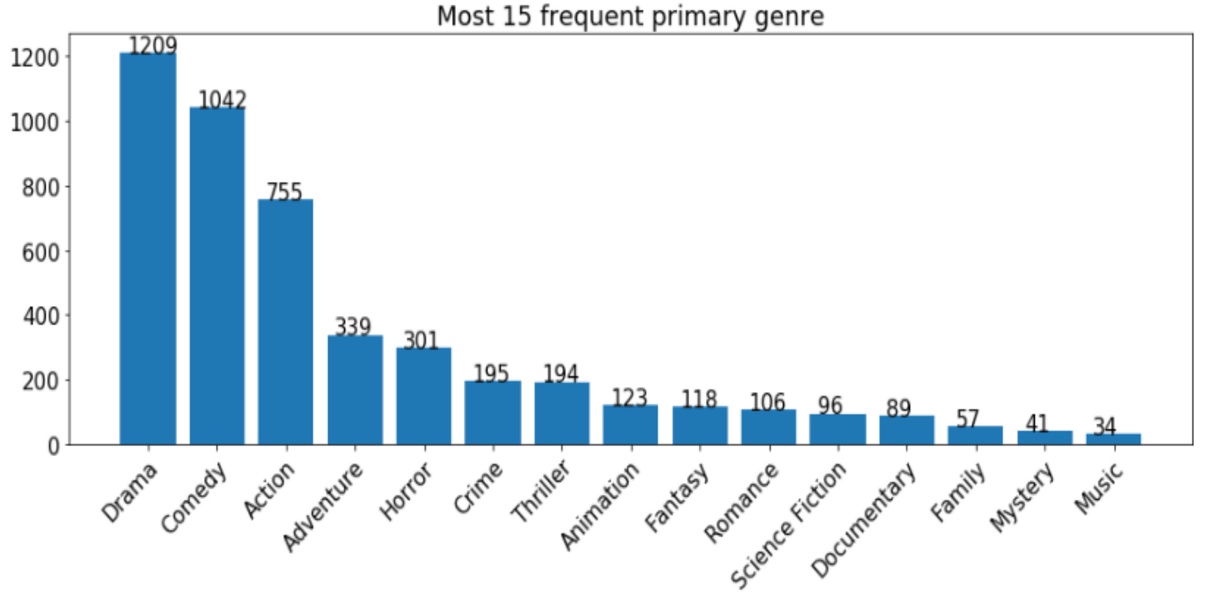
Most suitable categorical variables selected for analysis iteratively, more were considered...



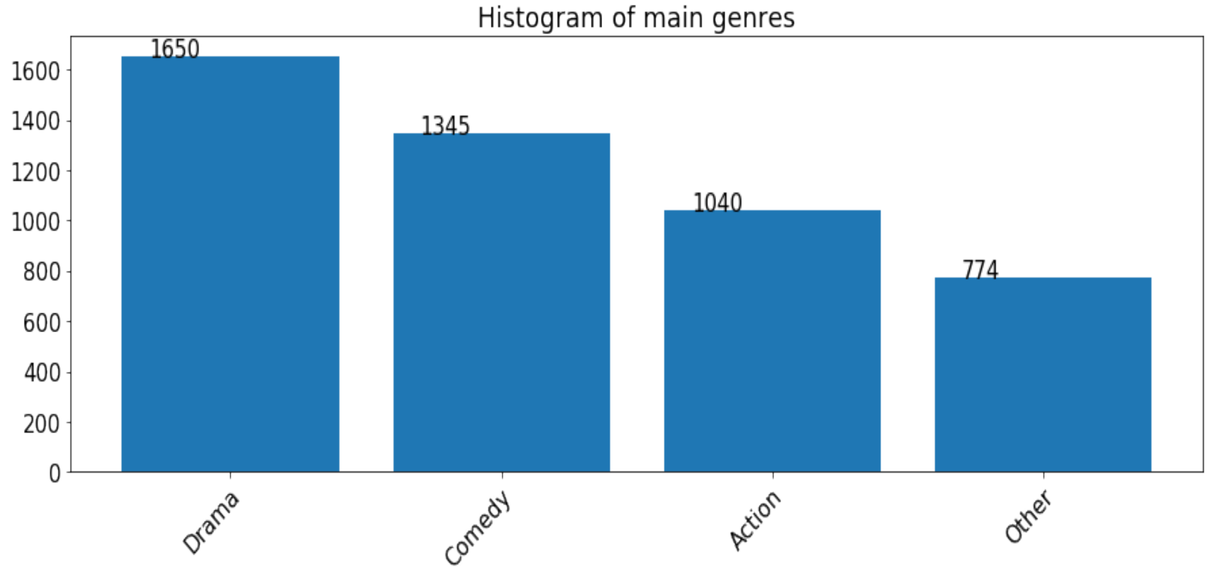


Genres





- For classification simplification we include all genres with low population into combined category «other»



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Data exploitation

1. Investigation of possibility of genre classification using movie graph.

2. Movie recommender system.

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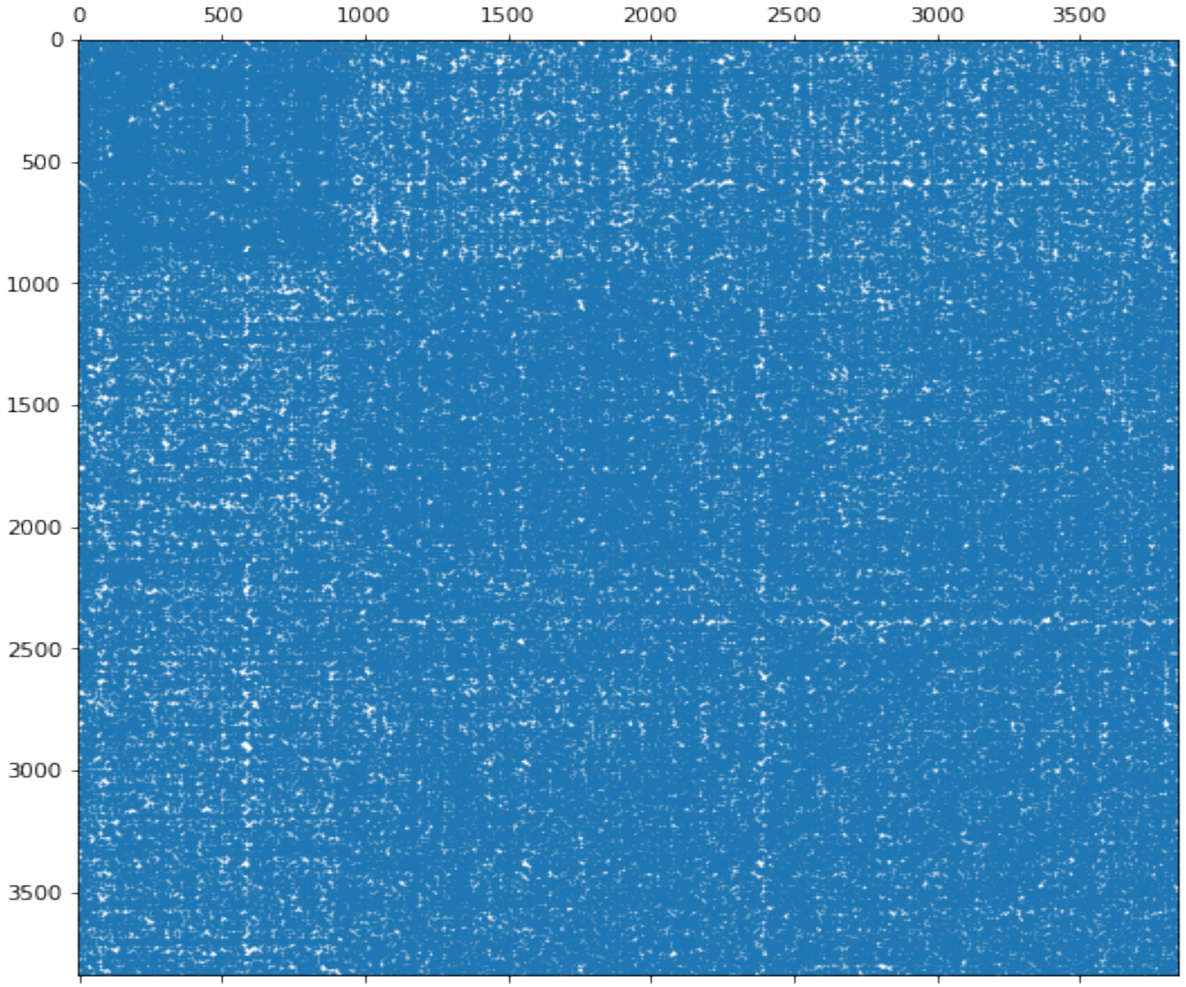
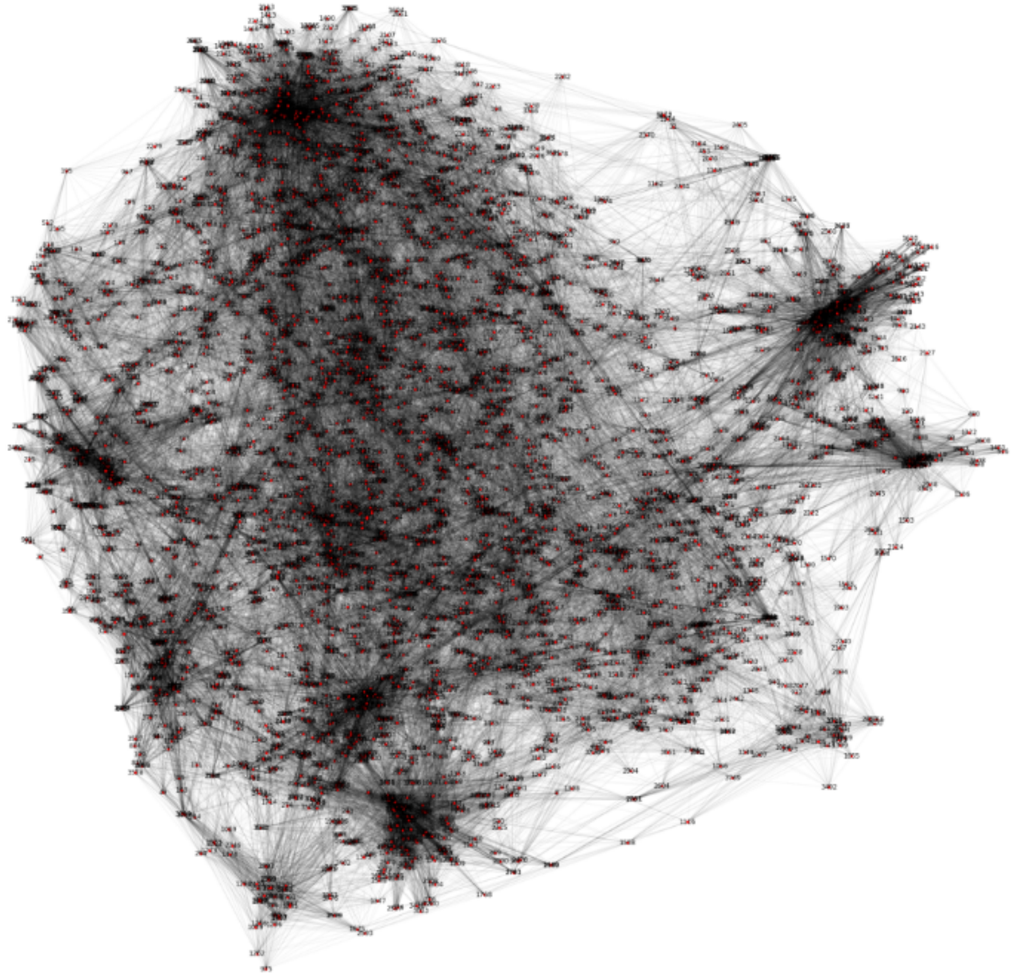
1. Genre classification graph

- Feature selection
- Reducing extremely high dimensionality with applying PCA
- Distance calculation using cosine metric
- Weight matrix calculated from distance matrix using gaussian kernel and knn=50
- Number of selected PCA components and value of knn optimized manually

Movies graph

- Weights matrix shows at least 2 squares representing genres, however, they are not well distinguished





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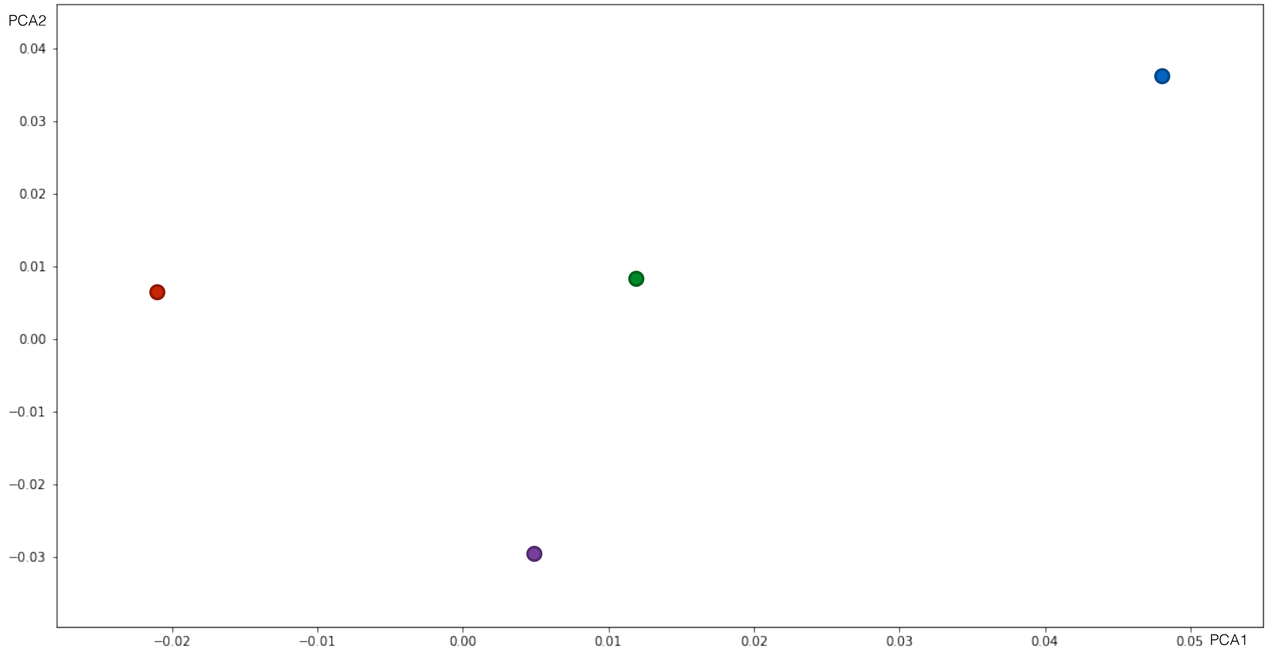
Unique movies suggestion

- Exploring graph structure one can notice that some nodes are fully disconnected
- These nodes represent unique movies and for the purpose of classification they are dropped
- Some of them are:
  “Antarctica: A Year on Ice”
  “Sound of My Voice”
  “The Sound and the Shadow”
  “Wind Walkers”

Unnormalized spectral clustering

- Distances Matrix –Gaussian Kernel & Knn=50 --> Weight Matrix
- Compute unnormalized laplacian L
- Compute the first k eigenvectors of L and put them as columns in the matrix U
- Cluster with k-means (each row of U can be assigned to a cluster)



Clustering accuracy

- Final accuracy is 33%

Reasons for low accuracy:

- Our model is based only on main genre, however movies are associated with multiple genres.
- We cumulate poorly populated genre in other.

Solutions to optimize accuracy:

- Tune hyper-parameters: numbers of actors, crew members and keywords, number of neighbors: plays a crucial role in visibility of the squares in the ordered weight matrix
- Advanced features: audiovisual samples
- Other spectral clustering algorithms

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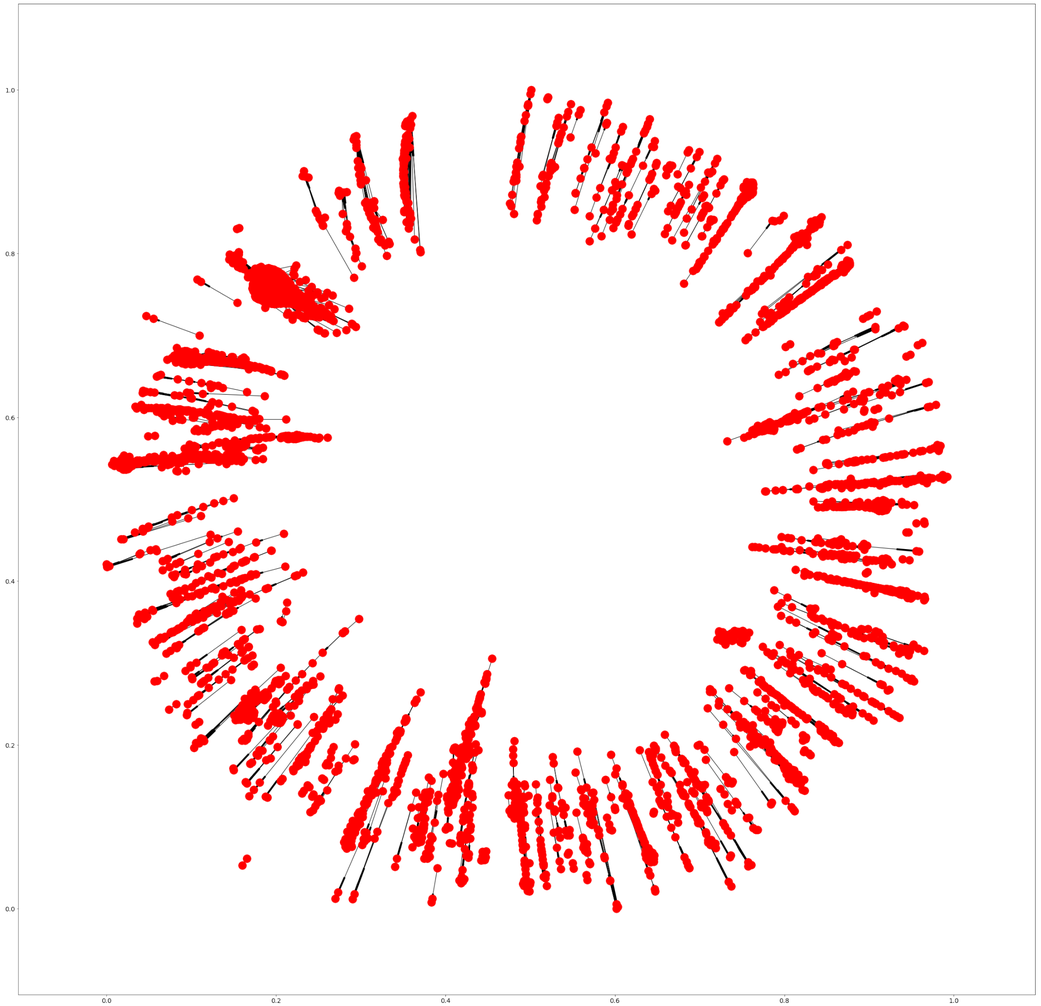
2. Recommender engine



New graph constructed with a cost function based on genres, keywords and votes of the movies.

Over input was tried such as text mining on the overview but it didn’t give exploitable results.

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Some predictions:

Original Movie	Predicted Movie
Avatar	Star Trek Into Darkness
Avengers: Age of Ultron	Captain America: The Winter Soldier
Suicide Squad	The Dark Knight Rises
Star Wars: Episode III - Revenge of the Sith	Star Trek
300	Gladiator

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Conclusions

- Two graphs has been constructed and studied

- Low accuracy of classification tells us that spectral classification applied on this dataset does not give reliable result

- Sample movie suggestion engine leading to reasonable suggestion based on personal review of suggestions