

Spectral analysis of 5000 movies network

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1 **Goal:**

2 Analysis of the graph representing a network of movies and their relations using de-
3 scriptions of 5000 selected movies.

4 **Data description:**

5 The studied *TMDB 5000 Movie Dataset* contains information about 5000 selected
6 movies provided by users and reviewers from *The Movie Database (TMDB)*. Namely,
7 each of the selected movies has the following attributes: *budget, genres, homepage, id,*
8 *keywords, original language, original title, overview, popularity, production companies,*
9 *production countries, release data, revenue* and personnel aspects of *cast* and *crew* mem-
10 bers listing their names, genders and role or contribution to the movie production and
11 other details. The majority of the data is in the text format. Dataset is available at
12 the Kaggle web page.

13 **Project description:** The aim is to create a graph in which nodes represent movies
14 and edges represent similarity between the movies they are connecting. Construction
15 of edges and induced impact on below-described results will be examined. Since movie
16 attributes are not numerical, it is necessary to calculate *overlap* matrix for each feature
17 separately using a feature-specific *overlap* calculating function which will be developed.
18 Generated series of *overlap* matrices will be combined into one single weight matrix.
19 However, the choice of combining method is arbitrary. Therefore, several examples of
20 combining method will be considered. Once the graph is created, e.g. the weight matrix
21 is established, it will be sparced using *k-nearest neighbors* and Laplacian matrix and
22 its corresponding eigendecomposition will be calculated. The constructed graph will
23 be visualized using PCA and using Laplacian eigendecomposition in order to observe
24 *clusters of similarity* in terms of genres, popularity etc. Furthermore, studying con-
25 nectivity of the graph and degrees of nodes it is possible to estimate how *mainstream* a
26 movie is. Also, a study of choice of a *category representative* may be conducted choos-
27 ing a movie which represents the cluster in the best way. For example, if *k-nearest*
28 *neighbors* method is utilized with *k* equal to 1, we can obtain directed disconnected
29 graph with clusters of movies, and the node to which the most of the edges oriented
30 point, is appointed as a *category representative*. Using a *category representative* allows
31 a viewer to get an impression on entire category based on watching only a single movie.