

Machine Learning

*Master of Arts in Banking and Finance*

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**Development of a movie recommendation engine**

Group term paper

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**Abstract**

Today, platforms such as Netflix or Amazon offer tens of thousands of films which can be streamed online. In view of this huge amount, the user faces an information overload problem which makes the choice of a movie best suited to his interests and needs time consuming and complicated. In order to increase convenience and quality of movie selection, we present three approaches of a moving recommendation system using machine learning algorithms. [To be finished by my colleagues :-)…]

**List of figures**

[tbd]

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# Introduction

The data available in the internet is constantly increasing at a fast pace (Bridle, 2010, p. 4). Consumers informing themselves in the internet are confronted with a large amount of information which can easily become overstraining (Bawden & Robinson, 2009, p. 183). Information overload can be the consequence (Cui, 2017, p. 1). Therefore, consumers need to invest much time and resources in order to analyze the information and choosing a product can become complicated (Chan as cited in Li, 2016, p. 1; Keselmann, Rosemblat und Kiligoclu as cited in Li, 2016, p. 1). A field which is affected by this evolution is movie selection (Cui, 2017, p. 1). Platforms such as Netflix or Amazon offer a huge number of films which customers can stream online (Peng, Liangshan & Xiuran, 2013, p. 1). Thus, for consumers, it is difficult to identify the product best suited to their needs.

Information overload can be reduced by applying recommendation systems, which screen the available information. These algorithms allow to individualize recommendations considering consumer characteristics such as personal taste and needs. Regarding a large number of subjects, recommendation systems have been successfully implemented in order to improve recommendation results, such es in the field of movies (Wei, Zheng, Chen & Chen, 2016), music (Mao, Chen, Hu and Zhang, 2016) and news (Wang & Shang, 2015). Netflix for example considers the films a client has consumed and suggests further movies which are comparable to them (Reddy, Nalluri, Kunisetti, Ashok & Venaktesh, 2019, p. 392).

Various methods can be used to implement a recommendation system. Three important categories are content-based, collaborative and hybrid algorithms. Content-based systems analyze the user’s past consumption behavior and suggest movies based thereon. Collaborative filtering examines the past ratings and experiences of consumers and compares it with further clients. Based on the choices of the users being the most comparable, suggestions are generated. In order to avoid the individual drawbacks of both methods, hybrid models have been proposed. (Reddy et al., 2019, p. 392)

The aim of this paper is to develop a movie recommendation system using machine learning algorithms. Our product shall help consumers save time and resources invested in choosing a movie, improve convenience of the process and allow them to find a film better suited to their tastes and needs.

We propose three different approaches to overcome the disadvantages of the individual methods. At first, we implement a demographic filtering technique, then content-based and finally collaborative filtering algorithms. The demographic filtering method allows to suggest films for persons with unknown characteristics. As content-based methods we apply a k-NN algorithm as well as a plot-based recommender. Both exploit the consumer history of the user. In order to make possible comparison with experiences of other consumers we implement the collaborative filtering method. [Finally, … tbd]

Different data sets regarding movies exist and can be used to develop a movie recommendation system. We have chosen the TMDB (The Movie Database) 5000 movie dataset of the online-community Kaggle because it contains many variables such as revenues and ratings. This allows a large variety of machine learning algorithms to be implemented. TMDB 5000 consists of 4808 individual movies. An alternative would have been the IMDB (Internet Movie Database) Movie dataset. However, as it has over 40 characteristics for every individual film, it would have become too complicated to clean and prepare the data. (https://www.kaggle.com)

The further parts of this paper are structured as follows. At first, we describe the dataset in more detail. In the application section that follows, we describe the techniques used and their actual implementation. Finally, we end with the results and conclusion.

Due to the limited scope of this article, we will not test all the predictions made by our recommendation. For the same reason we neither merge the three approaches in order to receive a single recommendation. Instead, the user should assess the three individual propositions the algorithms deliver him on his own.

Many papers which present movie recommendation systems using machine learning methods have been published in recent years. A k-NN collaborative filtering algorithm was for instance used by Cui (2017). Reddy et al. (2019) applied a content-based method based on genre correlations. Wang, Sang, Zeng and Hirokawa (2017) have implemented a support vector machine method and improved particle swarm optimization.

# Data

# Application

# Conclusion

# List of references

Conference papers.

Question Daniel: Shall I add weblinks?

* Bawden, D., Robinson, I. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of Information Science, 35*(2)*,* 180-191.
* Bridle, P. (2010). Information contextualizer: making sense of the information overload. *Development and Learning in Organizations, 24,* 4-5.
* Cui, B.B. (2017). Design and Implementation of Movie Recommendation System Based on Knn Collaborative Filtering Algorithm. *ITM Web of Conferences, 12,* 1-5*.*
* Mao, K., Chen, G., Hu, Y., Zhang, I. (2016). Music recommendation using graph based quality model. *Signal Processing, 120,* 806-813.
* Peng, X., Liangshan, S., Xiuran, L. (2013). Improved Collaborative Filtering Algorithm In The Research And Application Of Personalized Movie Recommendations. *Fourth International Conference on Intelligent Systems Design and Engineering: Applications,* 349-352.
* Reddy, S., Nalluri, S, Kunisetti, S. Ashok, S., Venkatesh, B. (2019). Content-Based Movie Recommendation System Using Genre Correlation. *Smart Intelligent Computing and Applications: Smart Innovations, Systems and Technologies, 105,* 391-397.
* Wang, X., Luo, F. Sang, Ch., Zeng, J., Hirokawa, S. (2017). Personalized Movie Recommendation System Based on Support Vector Machine and Improved Particle Swarm Optimization. *Institute of Electronics, Information and Communication Engineers: Transactions on Information and Systems, 100*(2), 285-293.
* Wang, Y. Shang, W. (2015). Personalized news recommendation based on consumer’s click behavior. *12th International Conference on Fuzzy Systems and Knowledge Discovery,* 634-638.
* Wei, S., Zheng, D., Chen, D., Chen, C. (2016). A hybrid approach for movie recommendation via tags and ratings. *Electronic Commerce Research and Applications, 18,* 83-94.

*Application extension.*

* Jinming, H. (2010). Application and Research of Collaborative Filtering in E-commerce Recommendation System. *3rd International Conference on Computer Science and Information Technology, 4,* 686-689.

# Appendix