

Posudek diplomové práce

Matematicko-fyzikální fakulta Univerzity Karlovy

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Název práce Probabilistic Models for Recommender Systems
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Studijní program Informatika **Studijní obor** Umělá inteligence

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Role Oponent

Text posudku:

The topic of the thesis are recommender systems (RS), more specifically probabilistic algorithms for recommendations. Proposed method is then evaluated on two well known datasets for movie recommendations. The author first provides a rather deep review of existing work with the special focus on latent dirichlet allocation (LDA) and derived method that serve as hybrid recommender systems. The text has quite impressive level of technical depth and the author exhibited good knowledge of the working principles behind machine learning and probability theory.

In several cases, however, the organization of the text could be improved - e.g. describing details of LDA only after explaining the follow-up models. Also, dividing the thesis into 9 chapters seems too much (at least chapters 3-6 could be merged together, which could also simplify the text organization issues mentioned before). The language is generally OK, just a few issues with e.g. using past tense for future chapters (page 11), mentioning "section 0" in introduction, distinguished vs. distinguishing (section 3.1). Overall, I would like to appraise the combination of technical depth (while describing algorithms) and simplified "non-expert readable" explanations of the main ideas behind the equations which is prevalent throughout the thesis. Even though, some parts of the text would deserve a better explanation. For instance, I did not understand the difference between in-matrix and out-of-matrix evaluation and Section 8.4 would deserve a proper introduction.

The main proposal of the thesis is to merge two recent related work into a unified solution: CTMP topic model and BOPE optimization algorithm. This is followed by switching the underlying data from tags associated to the movies to the plot descriptions collected from IMDB. This version is subsequently evaluated and author claims to gain some 7-8% improvement over the original CTMP implementation w.r.t. precision and recall @ top-k. Regarding to this, I have several concerns. First, switching to a plain text, there has been a significant development of NLP feature extractors (e.g., based on recurrent neural networks or transformer architecture) able to extract features that could be subsequently used in hybrid RS. However, this research direction is not mentioned at all in the thesis.

Second, the evaluation protocol is rather outdated as compared to the state-of-the-art standards in RS domain (e.g., using time-agnostic cross-validation, no evaluated beyond-accuracy metrics, no ranking-aware metrics such as nDCG, MAP). Seemingly, the task was viewed more as a machine learning problem, disregarding specifics of the recommender systems domain. Unfortunately, this is true also for many research papers focusing on algorithmic development of RS, so I would not attribute this comment solely to the author of the thesis. One additional comment on this side would be that rather than focusing on precision & recall at the scale of top-10 to top-100, it is more important (from the practical point of view) to report on top-1 to top-10 results.

I would be rather careful with the statements on interpretability of proposed model. While I understand that in general, e.g. the top words of the covering topics can be utilized as explanations for given recommendations, the process is nowhere close to straightforward. This is also illustrated in Tables 8.5 and 8.6 section 8.3.1., where many words re-appears in several topics and also, individual words does not have to relate to a specific movie. I would probably expect a bit deeper analysis of this phenomena in Section 8.3.1.

Nonetheless, despite the described weaknesses, I think this is a nice thesis focusing on algorithmic development of RS. It has some merit, showed necessary technical depth and despite my comments on evaluations, it has a potential for future publications. Therefore I recommend thesis for defense.

Práci doporučuji k obhajobě.

Práci nenavrhuji na zvláštní ocenění.

Pokud práci navrhuje na zvláštní ocenění (cena děkana apod.), prosím uveďte zde stručné zdůvodnění (vzniklé publikace, významnost tématu, inovativnost práce apod.).

Datum 29.8.2022

Podpis