Commentary on “Deep Learning Based Recommender System: A Survey and New Perspectives”

The following critique pertains to section 3.5 and onward of “Deep Learning Based Recommender System: A Survey and New Perspectives” by authors Shuai Zhang et al., from the university of New South Wales and the Nanyang Technological University.

Introduction

This part of the study continues to present a variety of deep learning models for recommendation systems, as it did up to section 3.4. I found that in this second part the classes of models were more complex and increasingly difficult to understand. In addition, the authors seemed to reduce the number of aiding visualisations with each new section. In previous sections, there were many diagrams that helped in broadly understanding concepts. This time I put much more effort into reading so I could understand.

This article as a whole is both very useful and overwhelming because it introduces many (maybe all at the time of writing) relevant investigations and their proposals. One needs to be able to handle the information input and filter what is of interest.

Commentary

1. On the Level of Abstraction

The first aspect I want to mention is that the layman cannot follow this systematic review thoroughly. Inevitably, she will have to skip certain phrases and formulas that are too far from her knowledge. As an example, take GANs. I, at least, have never worked with them, so seeing the formula of the objective function in a survey made me want to skip it, rather than inspect it. Maybe the authors could have omitted more of these formulas to keep the study in the high level where it lies. To be clearer, here is the formula:

$$J^{G^*,D^*} = \min_{\theta} \max_{\phi} \sum_{n=1}^{N} (\mathbb{E}_{d\sim p_{true}(d|q_n,r)}[logD(d|q_n)] + \mathbb{E}_{d\sim p_{\theta}(d|q_n,r)}[log(1 - D(d|q_n))])$$

I understand that the intuition of GANs is that there are two networks and one tries to fool the other, but I would have to have studied them in a deeper sense to understand this fully.

2. On Privacy

A second topic I would like to address here is that I realised there is a problem that I do not remember reading in the article. A problem regarding our privacy. While reading the section on RNN models, upon stumbling across the session based algorithms with user identifier, I made the analogy to all the recommender systems that are present in our lives that have this kind of information about us. If they are harnessing the power of neural nets (specifically, recurrent ones), it is only natural to ask: *what can be achieved with all this personal information?* This questions and related ones are of interest beyond the realm of recommender systems. Indeed, they are relevant to areas of philosophy and ethics.

People are clearly aware that popular social media platforms, for example, provide them with exceptionally good and even eerie recommendations. It is now commonplace to be recommended an item related with a conversation you had the day before with a friend or relative. Should we start enforcing limits on recommenders by law or should we just let them be and let people decide if they would like to surrender their information, or both?

Imposing laws could be detrimental to the economy and to many enterprises. It could also, in a way, take away the rush that an on point recommendation gives us, but giving the user the option and control over what he shares – which seems to be the norm – could have repercussions on the biases recommenders may adopt. For instance, what if the people that agree to share more of their personal information have certain characteristics different from the ones that choose more privacy? Maybe they are more open to experience and that personality trait could translate to a recommendation bias. This could be studied along with psychological personality models, like the OCEAN model.

Conclusion

The article is an extensive survey of the state of the art (at the time of writing) on deep learning for recommender systems. In my opinion, it reaches its goal of conveying the current knowledge effectively (as it can be done in such a relatively short text), especially because of the authors' consistent and clever categorisation and encapsulation of the content. The only issue I see is that they may be going too deep into the mathematics and optimisation, which is something that should be sought to avoid in a review, in my view.

Regarding the content of the article. It certainly raises questions and doubt over what kind, how much and to whom we give private information, even if the article does not explicitly mention this issue. Work on recommender systems, therefore, should be done with caution and regard to our human nature to, hopefully, maximise well-being, leaving sales and growth as a byproduct.

Vicente Valencia