Is Readability a Valuable signal for Social Recommendations?

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ABSTRACT

Readability assessment has been successfully applied in many educational environments. However, applications outside education are few. In this paper, we present an initial study oriented at analyzing the usability of readability information in social networks. For doing this, we present TweetRead ,a readability assessment system specifically designed for twitter, and incorporate it to the task of hashtag prediction in Twitter, highlighting the relevance of the readability signal in social recommendation tasks.

CCS Concepts

•**Human-centered computing** → **Social recommendation; Social networks;**

Keywords

Hashtag Recommendation; Readability

1. INTRODUCTION

Readability stands for the degree of ease with which a text can be read. Usually represented by a number, it has been an indicator used by teachers to classify and find adequate resources for their students. Several studies have demonstrated the use of readability assessment tools in education related applications, demonstrating its applicability in tasks such as book recommendation, text simplification, or automatic translation. However, applications of readability assessment techniques outside the educational environment are still unexplored. Social network related tasks may be an area which could take benefit of readability measures. It may be natural to think that in an area where users and texts are the main focus, the ease with which a text can be understood by a user may affect the interest of the user on it, and therefore influence further actions taken by the user, such as re-tweeting, giving a live or replying. The authors of [5] already demonstrated that the age of a user, a feature

strongly correlated with readability, has an influence in who people follow in Twitter, showing that Twitter users have a higher chance to follow people of similar age.

Using standard readability measures in text from social networks , and specially in twitter, a social network whose texts are at most 140 long, is not a trivial task. The lack of structure and shortness of those texts make standard natural language analysis techniques inefficient. In this paper, we present TweetRead a novel readability assessment tool specifically designed for tweets. TweetRead takes advantage of social information such as hashtags or mentions for prediction readability of tweets. Furthermore, in order to highlight the usefulness of such a tool in social network related task, we present a hash-tag recommendation system which takes advantage of the developed readability assessment tool.

2. TWEETREAD

TweetRead is based on a supervised learning strategy, that depends on multiple simple features and fusioning them to give a prediction. After several experiments, the logistic regression technique was chosen for performing the fusioning task. The features considered for prediction are the following:

- Flesch [1] readability score, consisting of a weighted sum of the average length of a terms in the tweet and average length of sentence.

- Cosine similarity between tf-idf values of a tweet and the all the tweets for each readability level

- Average readability of hashtags in the tweet, considering the readability of a hashtag the average Flesch readability of the tweets it is present on.

- Average readability of users mentioned on tweet

- Frequency of mentions, emoticons and hash-tags on the tweet

3. HASHTAG RECOMMENDATION

Hashtags are character strings used to represent concepts on Twitter, with the only restriction of starting with a # symbol. They conform one of the core features of Twitter and mostly serve for classification and search purposes. Their unrestricted nature, however, creates difficulties [4]. The same concept can be represented by multiple different hashtags, hindering the search process of a concept, e.g. information of the cycling tour of France can be searched using #tdf

or #tourdefrance tags, retrieving different results. Hashtag recommendation aims at showing the user relevant currently existing hashtags, so that he can re-use them and therefore reduce the space of tags generated [4].

Multiple and increasingly complex systems have been developed for hashtag recommendation [2]. However, note that, we do not pretend to present a novel hash-tag recommendation system, instead, we conduct this study to highlight the value of the readability signal in social network related recommendation tasks. Therefore, we take advantage of a currently existing framework presented on [4], which is based on two steps: (1) a hashtag candidate generation strategy based on tf-idf and (2) a re-ranking based on different metrics. We compare strategies presented by the authors, with novel metrics that take advantage of TweetRead. A brief description of each metric is provided below:

- **Similarity** Similarity between the tweet created by the user and the tweet that contained the hash-tag

- **Global popularity** Frequency of the hash-tag among Twitter.

- **Local popularity** Frequency of the hash-tag among the candidates. (Candidates may repeat due to the nature of the method used)

- **Readability** Difference of readability between the tweet created and the tweet containing the candidate hash-tag.

- **Popularity among same group** Popularity of hashtags among users of the same readability level.

- **Similarity and Readability** Combination of similarity and readability

4. INITIAL ASSESSMENT

4.1 TweetRead

Being readability for social content an unexplored area, datasets for its evaluation are currently unexistant. Therefore, we generated our own ground truth. For doing so, we gathered tweets during 8 months using the twitter streaming API, and followed the technique presented in [5] for determining the age of users. This technique is based on patterns such as "happy xth birthday" which can precisely identify the age of a user. For the purpose of this experiment we consider that the age of people exactly corresponds to their readability level, and that every tweet written by a user will have the same readability level. Those ages are split into 6 age groups following Levinston's [3] adult development stages. With this, we generated a dataset of 22k tweets with its corresponding equally balanced readability levels. For evaluating the performance of TweetRead we followed a 10-cross-fold validation framework and measured the precision of the predictions in respect to the ground truth. Table 1 shows that TweetRead significantly outperforms both baselines.

4.2 Hashtag recommendation

For evaluating the strategies for hashtag recommendation, we used the same dataset as in the previous example, but we followed a leave-one-out strategy this time. For each tweet, top N hashtag recommendations were computed. Recall measure was used to evaluate performance, determining with

Random	Flesch	TweetRead
17%	27%	81%

Table 1: Comparison of readability measures in terms of precision. 6 readability levels
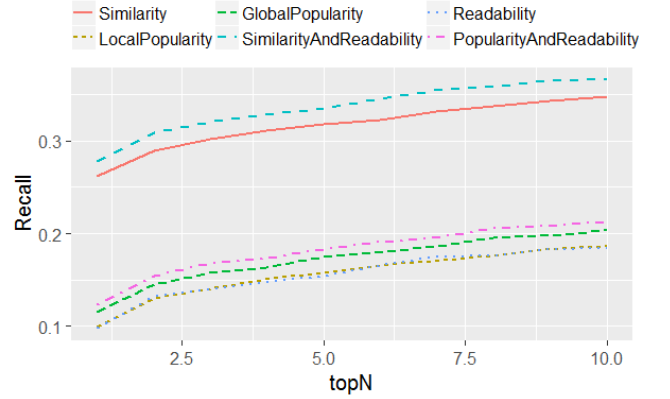

Figure 1: Comparison of re-ranking strategies for hashtag recommendation.

it to what extend where the correct hashtags recommended in the top N.

As it can be seen in Figure 1, even if readability by its own is not a good re-ranking strategy, it is a good complement to other strategies, improving the results when combined with both popularity and similarity metrics.

assessment of hashtag recomendation, table comparison each metric

5. CONCLUSION AND FUTURE WORK

In this paper we presented TweetRead a novel readability assessment tool specifically designed to predict the readability of tweets. In addition, we performed an initial study to demonstrate the benefit of using a readability signal in the hash-tag recommendation task with promising results.

In the future, we plan to explore other applications of readability in social networks, such as user recommendation, advertisement targeting or re-tweet prediction. We will also explore techniques to further enhance TweetRead and adapt it to other social networks beyond Twitter.

6. REFERENCES

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