Can Book Reviews Be Used to Evaluate Books' Influence?

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Introduction

Citation frequency has become a popular index for quality evaluation of academic publications, e.g. articles, journals or books. Traditional altmetrics researches pay less attention to book-level evaluation, and they do not make use of content information. In this paper, we present a novel method, reviewmetrics, namely altmetrics to evaluate academic books based on reviews. We combine star and reviews with the information of helpfulness which is given by readers reflecting the degree of how helpful this review is (Yin, Bond, & Zhang, 2014). Correlation analysis was also conducted with citation frequencies of academic books, so as to prove the validity of reviewmetrics.

Methodology

Framework

The purpose of the study is to evaluate the influence of academic books by mining book reviews. We conduct correlation analysis between citation frequencies and academic book scores calculated by reviewmetrics to prove the validity. Reviewmetrics includes combinations of factors like numbers of positive and negative reviews, star values and aspect values. Every combination has two schemes. Scheme 1 does not take information of helpfulness into consideration; Scheme 2 will consider information of helpfulness. The details are shown in Figure 1.

Data

We collected citation frequencies of academic books from three disciplines, including economics, management and literature, from reports on the academic influence of Chinese humanity and social science books (Su, 2011). We chose books that were cited more than 10 times as candidate books. We checked every candidate book in Amazon, and if it had more than 10 reviews, it would be selected as a final research book. In total, we have selected 182 books, including 40 economics books, 44 management books and 98 literature books. The corpora were collected in October, 2014. They cover citation frequencies, reviews, stars and helpfulness of the books.

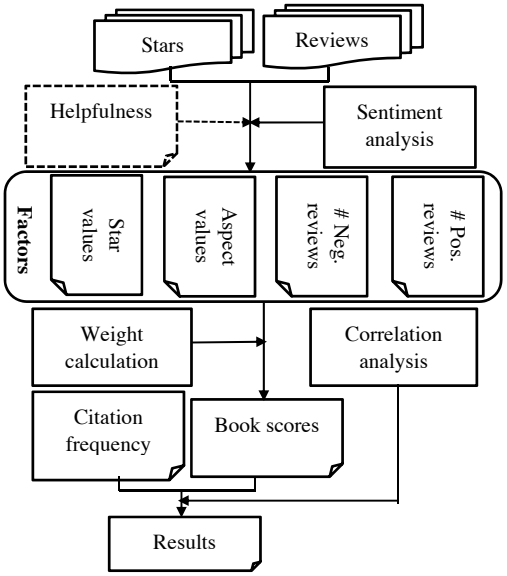

Figure 1. Frameworks ofcorrelation analysis.

Factor calculations

Calculations of numbers of positive reviews and negative reviews

We identify the sentiment polarities of reviews by conducting document-level sentiment analysis. Specifically, SVM (Hearst et. al, 1998) is used as a classification model, and TF-IDF (Salton & McGill, 1983) is used to select features and calculate their weightings. After sentiment classification, we get sentiment polarity of each review, and then we get numbers of positive reviews and negative reviews of each book.

Calculations of aspect values and star values

In the pre-processing step of calculations of aspect values, it has two subtasks: aspect extraction and aspect sentiment classification. Frequent nouns method is used to extract aspects. Frequent nouns are chosen as candidate aspects after POS (Part-Of-Speech) tagging; and top 10 of them are chosen as real aspects. For aspect sentiment classification, we use method proposed in (Ding et al, 2008) to calculate sentiment polarity sp_{ij} of aspect s_i in review r_j.

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As we have got the aspects and their sentiment polarities in every review, we can calculate the aspect values and star values of each book. The details are shown in Table 1.

Table 1.Calculations of book scores.

aspect values	$VAB_{it} = \sum_{j=1}^{N} sp_{ij} \Big/ \sum_{j=1}^{N} \lvert sp_{ij} \rvert$ $i = 1,2,\dots,10, t = 1,2,\dots M$
	$VAB'_{it} = \sum_{j=1}^{N} (sp_{ij} * h_j) \Big/ \sum_{j=1}^{N} \lvert sp_{ij} \rvert$
star values	$VSB_{jt} = \sum_{j=1}^{N} star_j / \mathrm{N}$
	$VSB'_{jt} = \sum_{j=1}^{N} (star_j * h_j) / \mathrm{N}$

For aspect values, VAB_{it} denotes aspect values of aspect s_i about book b_t without considering the information of helpfulness ($VAB_{it}{}'$ means with helpfulness), N means number of reviews with aspect s_i about book b_t; i denotes the numbers of aspects; M means the numbers of books of each discipline, $h_j$means helpfulness score of review r_j. For star values, VSB_{jt}denotes star values of review $r_j$about book $b_t$without considering the information of helpfulness (VSB'_{jt} means with helpfulness), $star_j$ means star score of review r_j, it range from 1 to 5, N denotes the numbers of reviews about book b_t.

Calculations of book scores

We use the entropy method to calculate factor weightings (Hongzhan et al., 2009), and then get book scores. The details are shown in Table 2.

Table 2.Calculations of book scores.

Steps	Formulas
(1) Normalization	$p_{ij} = \frac{v_{ij}}{\sum_{i=1}^{N} v_{ij}}$ $i = 1,2,\dots,N, j = 1,2,\dots,m$
(2) Factors entropies	$e_j = -\frac{1}{\ln(n)} \sum_{i=1}^{N} p_{ij} \ln(p_{ij})$
(3) Factor weightings	$w_j = 1 - e_j / m - \sum_{j=1}^{m} e_j$
(4) Book scores	$SB_i = \sum_{j=1}^{m} p_{ij} * w_j$

where, p_{ij} denotes proportion of book b_i in factor f_j, v_{ij} denotes value of book b_i in factor f_j, N means the numbers of books, m means the numbers of factors.e_j denotes entropy of factorf_j.w_j denotes weighting of factorf_j, SB_i denotes book scores of book b_i.

Experimental result analysis

We conduct correlation analysis between citation frequency and book scores calculated by reviewmetrics about three disciplines, including consider the information of helpfulness or not. The results are shown in Table 3.

On the whole, with the information of helpfulness, reviewmetrics of three disciplines have significant Pearson correlations with citation frequency ($p < 0.1$).

Table 3. Results of correlation analysis.

Domains	Without H.	With H.
Economics	**0.383***	**0.378***
Management	**0.401****	**0.417****
Literature	0.197	**0.240***

Conclusions

In this paper, we propose a novel altmetrics method: reviewmetrics on the basis of book reviews to evaluate its influence. We prove reliability of our method by conducting correlation analysis between our method and citation frequencies. Two main conclusions can be drawn according to our above mentioned analysis: **WH (with helpfulness) conclusion**: the information of helpfulness is really useful to filter low quality reviews. **OC (overall correlation) conclusion**: It is reliable to use reviewmetrics to evaluate influences of academic books.

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