Ranking Social News Articles Based on Voter Credibility

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Abstract

Given the wide spread of web based tools and social news media services which are facilitating grassroots journalism, there is a growing interest in selecting credible news content among a huge number of articles. Currently, most of social news services rely on reader votes to select articles for their front pages. However, the fundamental problem is that users' votes often stand for popularity rather than credibility. In this paper, we propose a system to address this problem using a weighted voting system. Specifically, we trace thousands of users and their votes, differentiating them depending on how credible the articles voted for are. We then calculate each user's voting credibility and use it as the user's voting weight in our system. The results indicate that our method performs better in selecting credible news articles than other methods replying on a "one person, one vote" system. The results suggest feasible solutions to problems in social news media concerning media credibility.

Introduction & Related Work

Recently, news media have been going through a huge change by the emergence of the web-based publication tools and social news media which lower the cost of publication and dissemination of news and information. However, it raises difficulties in selecting credible news content. While staff editors can look into well-organized articles of professional journalist, investigating a large number of news articles including ones from amateur writers is practically impossible in the social news services. Instead, general users play an important role in selecting news content usually through their voting behavior. However, the problem is that users' votes often stand for popularity rather than credibility. Moreover, there has been reported a possible bias caused by a particular group of people, such as so-called digg mafia, or reddit downmod squad. In this paper, we propose a weighted voting based news ranking system to deal with this problem with collective intelligence.

Studies on traditional news credibility focus on finding components for measuring perceived media credibility (Infante 1980; Meyer 1988). As the web changed the ecosystem of journalism, recent studies focus on not only estimating media credibility with the measuring factors specified to online journalism (Kiousis 1999), but also assessing the accuracy of news review instruments (C. Lampe & R. Kelly Garret 2007). However, these studies cannot be computationally applied to news ranking systems. While there have been several computational approaches focusing on the overall media credibility problems (Sohn *et al.* 2008) and the media bias problems (Park *et al.* 2009, Munson *et al.* 2009), most of the studies take advantage of the well-defined news structure or do not cover the entire news credibility, both of which are not guaranteed in non-professional participatory forms of journalism.

Methodology

Daum View

Daum is a leading portal company in Korea and launched View in 2005. While Digg and Reddit encourage users to report news articles on the web regardless of their sources, Daum View automatically gathers articles only from enrolled blogs. As of now, View has approximately 170,000 enrolled bloggers and more than 100 million page views per a month. Daum View is a proper test-bed for the proposed system since it contains a number of articles from amateur journalists.

Assessing Credibility of Seed Articles

In this work, we collect top 100 popular news articles in the current news category published from August 26 to September 2 as seed news set (News Set 1). To assess credibility of the selected news content, we conduct a survey over the web, using normative review instrument

which was brought from Lampe and Garrett (2007). The normative review involves accuracy, credibility, fairness, informativeness, and originality as measuring factors. Additionally, subjects are asked to give weight to each factor based on how important they perceive it is. Table 2 shows the weights we gathered from the survey.

Table 1. Survey Design for News Set 1

News Articles	Top 100 weekly best current news in Daum View (Aug. 26. ~ Sep.2, 2009)
Subjects	369 participants
Period	7 days
Survey Description	Normative review instrument with 5 point Likert scale
	Measuring weights for each element

Table 2. Derived Weights for Measuring Elements

Accuracy	Credibility	Fairness	Informative-ness	Originality
0.225	0.227	0.198	0.202	0.148

Table 3 shows the credibility scores of several articles assessed. As we expected, current "one person, one vote" voting-based rank is not correlated with credibility scores. For example, top 10 popular news contents are exclusively different from top 10 credible news contents.

Table 3. Result from Survey

Current Rank	URL	Credibility Score
89	http://v.daum.net/link/3918133	4.109859
93	http://v.daum.net/link/3930134	3.996898
76	http://v.daum.net/link/3931410	3.882244
45	http://v.daum.net/link/3912458	3.856029
22	http://v.daum.net/link/3931027	3.807791

Collecting User Voting Data and Calculating User Voting Credibility

After assessing credibility of seed articles, we collect actual user voting data for the seed articles. A total of 73,917 votes from 41,698 users were made for the 100 news articles through Daum View. Then, we divide the selected seed news articles into 3 categories based on the credibility scores we gathered through the survey. Considering the meaning of 5 point Likert scale, we assume that articles whose credibility scores are over 3.5 are credible, and that articles whose scores are under 3.0 are less credible. As a result, top 22 and bottom 23 articles are selected for credible and less credible articles respectively. After dividing news articles, we differentiate all votes into three categories - good votes for the credible articles, bad votes for the incredible articles, and neutral votes for in-between articles.

Finally, we calculate each user's Voting Credibility. As denoted in Eq.(1), user i's Voting Credibility (c_i) stands for the sum of voting scores user i has made. Each vote has different voting score based on which article the vote is for. Voting score of the user i's n-th vote ($s_{i,n}$) is +1 when it is a good vote, 0 when it is a neutral vote, and -1 when it is a bad vote. This idea is brought from the eBay's reputation system which is considered powerful even though it calculates customer and seller's behavior with simple negative (-1), neutral (0), and positive (+1) model.

$$c_i = \sum_{n=1}^{k} s_{i,n} \tag{1}$$

As a result, the users' voting credibility scores ranged from -10 to 12, following normal distribution. Among the whole 41,698 number of voters, only 6,577 voters have positive voting credibility scores, while 18,568 and 16,553 voters have neutral and negative voting credibility scores respectively. Figure 1 shows the distribution of User Voting Credibility values.
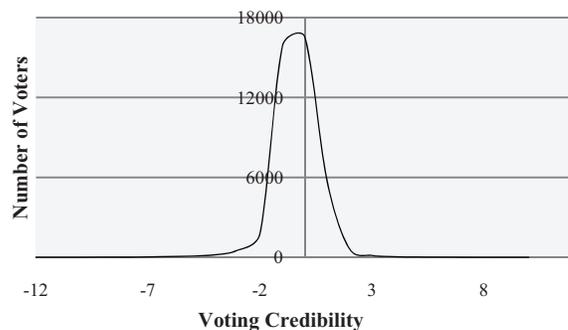

Figure 1. Distribution of User Voting Credibility

Calculating News Credibility Score

The proposed weighted-voting based blog news ranking system relies on the News Credibility Scores in ranking news articles. The article m's News Credibility Score (C_m) stands for the sum of Voting Credibility Scores of voters who voted for article m and is denoted by Eq.(2).

$$C_m = \sum_{k=1}^{n} c_k \tag{2}$$

To apply News Credibility Scores, we select another news set for the evaluation (News Set 2), top 50 best current news articles published between September 9 and September 16 in Daum View. Then, we calculate news credibility scores for the articles in News Set 2 to rank them. The result shows a quite different output with that from current system. As shown in Table 4, news articles which currently have a low rank show up to top of the result. To analyze the result, we evaluate the performance of the proposed system with 3 criteria, (1) accuracy of

calculated news credibility, (2) credibility of top ranked news articles, and (3) journalism expert evaluation.

Table 4. Result of Calculating News Credibility of Evaluation News Set

Current Rank	URL	News Credibility Score	New Rank
47	http://v.daum.net/link/4109401	18	1
25	http://v.daum.net/link/4073986	17	2
38	http://v.daum.net/link/4064109	11	3
30	http://v.daum.net/link/4115830	4	4
43	http://v.daum.net/link/4073627	2	5

Performance Evaluation

Accuracy of Calculated News Credibility

Firstly, we conduct a survey to assess credibility of the articles in news set 2, which includes the 50 best current news articles in Daum View. The survey method was the same as that we used to assess credibility of seed news set. 238 people participated in the survey and assessed credibility of evaluation news set from September 16 to September 23, 2009.

Table 5. Survey Design for News Set 2

News Articles	Top 50 weekly best current news in Daum View (Sep. 9. ~ Sep.16, 2009)
Subjects	238 participants
Period	7 days
Survey Description	Normative review instrument with 5 point Likert scale

The accuracy of calculated News Credibility Scores is evaluated by comparing correlation between credibility of news set 2 assessed by a survey and calculated News Credibility Scores to that between the assessed credibility and the number of votes gained from "one person, one vote" voting-based ranking system. As we assumed, the number of votes from general users is proved not to have any significant correlation with the credibility scores. However, the result from weighted-voting based system showed a significant correlation (0.492) with credibility scores.

Table 6. Result of Pearson Correlation

Ranking System	Pearson Coefficient Correlation	Sig (p)
One person, one vote	.016	.872
Weighted Voting	.492**	.000

** $p < 0.01$

Assessing Credibility of Top-Ranked News Articles

Considering that top 10 or 20 articles are important because they gather a lot more page views than articles on the other pages, we also assess the credibility of top ranked articles. Top 10 and 20 articles in the evaluation news set are selected with the proposed system and the "one person, one vote" based voting system respectively. We compare the mean values of credibility of top-ranked news content and analyze it with independence t-test.

As shown in the table below, top ranked articles by proposed method have significantly higher credibility scores (4.354 for top 10 articles and 4.071 for top 20 articles) than those by "one person, one vote" voting-based system do. The difference is bigger when it comes to top 10 news content.

Table 7. Result of t-test for Credibility of Top-Ranked Articles

		Mean	t value	Sig (p)
Top10	One person one vote	3.083	50319	.000**
	Weighted Voting	4.354		
Top20	One person one vote	3.238	4.962	.000**
	Weighted Voting	4.071		

** $p < 0.01$

Expert Evaluation

We also evaluate the performance of the proposed system with journalism experts. We firstly set 10 weeks between August 12, 2009 and November 3, 2009, collect weekly current news stories, and rank them with the "one person, one vote" voting-based ranking system and the proposed method respectively. Then we extract 5 top ranked news stories from each system for each week and finally gather 50 pairs of news content. However, we exclude 3 pairs among them because either news in the pair is not current news content which the survey instrument is designed to evaluate. To assess credibility of selected news content, 39 journalism experts participated in the survey. Journalism experts are selected among professional journalists, professors in journalism department, and students who are in Master's or Ph.D. courses in journalism. In this process, we adopt the same survey method we used to general people. Each news story is assessed by at least 3 experts.

After gathering credibility scores for 94 news articles in 47 comparing pairs, we conduct paired t-test (2-tailed) to see if each news stories from the proposed method has a higher credibility score than that from "one person, one vote" ranking system. When we compare the result in each news article level, the stories ranked by our method show higher credibility scores in 27 pairs, equal scores in 3 pairs, and lower scores in 17 pairs, not having statistically significant differences as shown in Table 8.

Table 8. Result of Paired t-test (News Article Level)

Samples	N	Mean	t	Sig (p)
Top5 (one person, one vote weighted vote)	47	3.2817 3.0510	1.516	.136

Then, we also compare the credibility of news content in a news group level, assuming that it is the overall credibility which is more important than examining whether a ranked news story in our system has more credibility than the news content at that specific rank in "one person, one vote" based ranking system. We compared mean values of top 5 news selected by each system for 10 different weeks.

Table 9 shows that the mean values of credibility scores of news contents selected by our method are higher (significant at the 10 percent level) than those selected by "one person, one vote" based ranking system. However, the overall credibility scores were far lower than that assessed by general people.

Table 9. Result of Paired t-test (Top-Ranked News Group Level)

Samples	N	Mean	t	Sig (p)
Top5 (one person, one vote weighted vote)	10	3.2512 3.0047	2.035	.072[+]

Conclusion

Our work proposes a new approach to ranking blog news articles utilizing weighted voting system. We assesse credibility of news articles and calculate each user's voting weight based on the assessed scores of the articles the user voted for. The result shows that the calculated news credibility scores have significant correlation with news credibility values perceived by general people. Also, the proposed system selects meaningful contents for its front page both to general users and to experts. However, experts assess overall credibility of news content written by bloggers less high than general people do as it is shown in Table 8, and 9. It is possibly because there are differences in perceiving credibility of news stories between general people and experts, which supports Finberg, Stone, and Lynch′s finding (2002) that internet users consider online news as credible as traditional one, while expert journalists do not.

Although our method is not fully-automated, it is shown to be promising because the computational solutions, such as finding credibility indicators on the web, are yet too complex (Bowman & Willis, 2003). We hope to find methods to calculate users' voting credibility more accurately in our future work.

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