ABSTRACT

Question & Answer (Q&A) behaviors on social media have huge potential as a rich source of information and knowledge online. However, little is known about how much diversity there exists in the topics covered in such Q&As and whether unstructured social media data can be made searchable. This paper seeks the feasibility of utilizing social media data for developing a Q&A service by examining the topic coverage in Twitter conversations. We propose a new framework to automatically extract informative Q&A content using machine learning techniques.

Categories and Subject Descriptors
H.3 [Information Storage and Retrieval]: H3.1 Content Analysis and Indexing;

General Terms
Human Factors, Measurement, Experimentation

Keywords
Social Media; Community Question Answering; Twitter

1. INTRODUCTION

Community Question Answering (CQA) services such as Yahoo! Answers (http://answers.yahoo.com) and Naver’s Knowledge-IN (http://kin.naver.com) have long been an important source for finding answers to user-generated questions. The basic idea of CQA services is to provide a platform that connects askers to possible answerers and to develop a reputation system that enhances the quality of answers. However, one of the critical factors for the success of CQA services is their searchability. By making the content searchable, CQA has become publicly useful.

With the rapid growth of CQA services, however, the responsiveness and the quality of answers have been challenged. Answering behaviors in CQA usually follows a power-law distribution, in which a disproportionately small number of active users account for most of the answers on the sites. Due to this limitation in incurring wide participation, the ratio of answered questions has decreased and the credibility of the answered Q&A content has degraded, as CQA services have grown [5, 1].

The challenges facing CQA services have recently shed light on social media-based Q&A. Recently, researchers have found that social media users utilize their social networks as a place for asking questions [2, 4, 3]. The characteristics of question answering behaviors in social networks have advantages against the existing CQA sites in terms of credibility and responsiveness. While most of the askers receive answers from strangers in CQA, social media users receive answers from their trustworthy friends in the network. In addition, the questions are distributed across the asker’s entire social network, allowing everyone in the network to contribute, which makes the system more responsive.

Despite the potential benefits of utilizing social media data, it is unclear whether Q&A conversations on social media can be mined effectively as a stand-alone service. It is important to know whether (1) social media data cover a wide range of topics as existing CQA services and whether (2) there is a framework to extract high-quality Q&A content from the massive amount of unstructured and heterogeneous social media data. In this paper, we test the feasibility of turning social media into a valuable Q&A platform by addressing these challenges based on a large amount of data gathered from the Twitter microblog network.

2. METHODOLOGY

We collected tweets from September 1st to 30th in 2013 using the Twitter Streaming API with the parameter value set to the question mark and preset question bigrams. To avoid any bias in the data collection process caused by the posting time, we randomly sampled postings from the collected status id and finally gathered 22,118 postings and the corresponding answers. Then, we evaluated the informativeness of each Q&A conversation with a group of elite workers in Amazon Mechanical Turk, assuring the quality of answers with a set of gold standard answers. Of the collected Q&A tweets, 3,570 (17%) of the Q&As were evaluated to be ‘informative’ by the workers in the Mechanical Turk. Among the data, we used 70% of our data as our training set, and the remaining data as a test set.
3. RESULTS
We present results on the topic coverage of Twitter Q&A conversations and searchability of informative Q&A content.

3.1 Topic Coverage
In order to test whether Twitter-based Q&A conversations cover a wide range of topics, we need a comparable guideline. We collected 205,609 Yahoo! Answers items posted during the same period as those for our Twitter datasets. We then randomly sampled the equal amount of Q&A content from Yahoo! Answers and the Twitter data. We merged two datasets and executed Latent Dirichlet Allocation on the merged set with the number of topics set to 20. We then manually labeled each topic by observing the highly probable terms in the topic and excluded topics that were not clearly defined. Finally, we assigned labels to 12 topics, and counted the number of postings in each topic on Twitter Q&A and Yahoo! Answers, respectively.

Our analysis demonstrates that the overall probability distributions of informative Q&As on Twitter cover a wide range of topics as the well-established CQA service. Furthermore, Twitter-based content even showed competitive advantage to Yahoo! Answers on several topics like entertainment, local information, music, technology.

3.2 Informative Q&As
The features are categorized into 3 groups in Table 1: text, user, and context-related. To train the model, we used Support Vector Machine, Neural Network, and Random Forest (RF). Table 2 shows the performances of the best performing classifier (RF), varying the subset of features. Among the set of features examined, the prob. of the question to be informative-seeking, slang ratio, pronoun ratio, unique token ratio and topic similarity are shown to be powerful predictors according to the Mean Decrease Accuracy measure. The result shows that our proposed classifier successfully classifies informative Q&As from the overall contents. However, it is still unclear whether Q&As on Twitter can be useful outside Twitter. Table 3 presents the examples of classified Q&As to help understand the usefulness.

4. CONCLUDING REMARK
We conclude that unstructured data within social media is promising for finding answers to information-seeking questions. We demonstrated this feasibility based on the fact that Twitter conversations on Q&As involve a wide range of topics and they could also be identified automatically. Moreover, the limited length of postings on Twitter might be a strong point in its favor when it is applied to a mobile-centered search service, where people prefer shortened summaries to long articles.

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5. REFERENCES