Classification of Social Blogs Comments Using Text Mining

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Abstract

In this work, a novel e-governance framework that captured the societal impact of public sector regulations in an attempt to decipher the public’s stance towards governmental decisions was proposed. This was done by exploring text mining techniques towards firstly capturing the public’s opinions (communicated online) about governmental decision and secondly analyzing the polarity of the mined opinions so that they are considered in subsequent governmental decisions. Citizens’ opinions and comments that were posted on online blogs and Facebook were decomposed in order to evaluate how government decisions were perceived by the public and hence, how the public’s implicit feedback should be interpreted by government bodies in their subsequent actions. The motivation for our study is that up-to-date government social web sites are not consistently evaluated in the government decision-making process and those citizens’ voices are most of the times heard in a limited audience.

Keywords: e-governance, text mining, blogs, government, decision-making

1. Introduction

Text Mining [1] is a process of extracting new, valid, and actionable knowledge dispersed throughout text documents and utilizing this knowledge to better organize information for future reference. Mining implies extracting precious nuggets of ore from otherwise worthless rock [2] and Text Mining is the gold hidden in mountains of textual data [3]. This study proposes a framework for discovering previously unknown and hidden information from public opinions and views.

With the increasing awareness among citizens about their rights and the resultant increase in expectations from the government to perform and deliver, the whole paradigm of governance has changed. Government, today, is expected to be transparent in its dealings, accountable for its activities and faster in its responses. This has made the use of Text Mining imperative in any agenda drawn towards achieving good governance. It has also led to the realization that such technologies could be used to achieve a wide range of objectives and lead to faster and more equitable development with a wider reach. [4]
PHASE 1: PUBLISH- using ICT to expand access to government information. Publish sites seek to disseminate information about government and information compiled by government to as wide an audience as possible. In doing so, publish sites serve as the leading edge of e-Government.

PHASE 2: INTERACT- broadening civic participation in government. Interactive e-Government involves two-way communications, starting with basic functions like email contact information for government officials of feedback forms that allow users to submit comments on legislative or policy proposals.

PHASE 3: TRANSACT- Allowing citizens to obtain government services or transact business with the government online. A transact website offers a direct link to government services, available at any time. Transact sites can enhance productivity in both the public and private sector by making processes that require government assistance or approval simpler, faster and cheaper.

We were able to achieve only Phase 1 (Publish-Text Mining Interaction) in this work. This is reflected in the following section. The other phases will be addressed in future work.

2. Methodology
This study proposes a framework which integrates text and data mining methods for modelling the public’s opinions, feedbacks and evaluations of the government decisions. The citizens’ feedbacks are then mined and analysed in order to derive the sentiment orientation of the public opinions and the underlying correlation between mined opinions and the formulation of new governmental decisions on related issues as shown in Figure 2.

2.1 Document Collection
The first phase in Figure 2 is the document collection. In this phase, the citizens’ opinions, complaints and comments were extracted as documents collected through the online web application. These text documents were stored in different formats (such as pdf, doc, txt, html and xls) depending on the nature and type of the data as shown in Figure 3.

Figure 2: Framework for Text Mining Aided E-Government Content Management
2.2 Text Pre-processing

This is otherwise known as tokenization or text normalization. Documents are transformed into a suitable representation for the clustering and classification tasks. During term extraction, character text is first parsed into words. This process also strips away words that convey no meaning. Adjectives, adverbs, nouns and multi-word are extracted from the document. Noisy data, such as, tags, punctuation marks, white spaces, special characters and digits are extracted as well. Also, certain words occur very frequently in text data. Examples include “the” and “a”. These words are removed from the term collection because they have no meaningful content. By creating a list of such stop words and eliminating them, the number of indicator variables created is reduced. Many of these stop words do not appear in the claim description data, but appear frequently in text data. After removal of stop words, stemming is performed.

2.3 Text Transformation

Word frequency and inverse document frequency are two parameters used in filtering terms. Low term frequency (TF) and document frequency (DF) terms are often removed from the indexing of those documents. In “Bags of words” representation each word is represented as a separate variable having numeric weight. The most popular weighting schema is normalized word frequency tfidf:

\[ tfidf(w) = t.f. \log \left( \frac{N}{df(w)} \right) \]  

(1)

\( t.f(w) \) is the term frequency (number of word occurrences in a document); \( df(w) \) represents document frequency (number of documents containing the word); \( N \) gives the number of all documents; \( tfidf(w) \) is the relative importance of the word in the document. The Transform Cases Operator transforms cases of tokens in a document.

This operator transforms all characters in the document to lower case.

2.4 Feature Selection and Attribute Generation

In this stage, a subset of the features was selected to represent a document. This created an improved text representation since many features have little information content. Stop Words were removed, and words stemmed down to their roots. Stemming identifies a word by its root and reduces dimensionality (number of features). Features were selected based on classification and some irrelevant attributes were removed.

3. Case Study

The framework for text mining aided e-government content management was tested using a Nigerian blog site (Nairaland) and the President’s Facebook page (www.facebook.com/jonathangoodluck). The aim was to generate a consistent line of thought from the hitherto unstructured/uncoordinated comments by diverse individuals. K-means clustering using Euclidian distance was applied to the matrix of extracted terms from comments on Nigerian President’s Facebook page. Each cluster that is created from a k-means clustering procedure has a centre referred to as the centroid. The centroid is the vector of average values for the cluster for each variable entering the clustering procedure. This corpus consisted of 76 comment lines from the citizens on the Governorship Election in Ekiti State in Nigeria, held in June 2014.
These files were then text-processed by first transforming them to lower cases and then tokenised. The tokens were filtered by length using minimum of four characters and maximum of twenty-five characters to reduce and eliminate irrelevances. Stop words, such as ‘a’, ‘an’, ‘and’, ‘the’, and so on, were also removed/filtered from the entire document. The remaining tokens were finally stemmed down using Snowball stemmer. These were then clustered together using K-means clustering algorithm. Each cluster that was created from a k-means clustering procedure has a centre referred to as the centroid. The centroid is the vector of average values for the cluster for each variable entering the clustering procedure. The clustering procedure was used to create six clusters.

The Pruning method used was absolute: words that appeared in less than 5% of all documents as well as those words that appeared in more than 10% of all documents were ignored (pruned). Words that have high representation within a cluster were highlighted. The most commonly occurring words were identified and used to label the cluster as shown in Figure 6.

Table 1: The Cluster Model

<table>
<thead>
<tr>
<th>Cluster Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1: 52 items</td>
</tr>
<tr>
<td>Cluster 2: 6 items</td>
</tr>
<tr>
<td>Cluster 3: 5 items</td>
</tr>
<tr>
<td>Cluster 4: 3 items</td>
</tr>
<tr>
<td>Cluster 5: 5 items</td>
</tr>
<tr>
<td>Cluster 6: 5 items</td>
</tr>
<tr>
<td>Total number of items: 76</td>
</tr>
</tbody>
</table>

The clusters above revealed positive comments on the outgone election in Ekiti State, Nigeria. Most of the comments were based on congratulating the Governor-elect of Ekiti State and the President on the success of the election. The masses liked the way the election was conducted: it was very free and fair. Respect was given to the President (Jonathan) by the way the political election was conducted. There was security and no rigging and killing. From people’s point of view, it was a true democracy (People were educated about what democracy in Nigeria is all about). However, Government was intimated about high rate of killings happening in the country and an advice was given to the President to deploy soldiers to Sambisa forest and rescue the abducted Chibok girls as this election was a huge success.
4. Conclusion and Future Work

In this work an e-governance framework was proposed and implemented, which captured people’s opinions and feedback (opinion pool from various sources). The process involved converting these text data to structured data. Text mining techniques were used on the structured database that resulted from the feature extraction of those text data. The extracted features were then clustered for knowledge discovery using K-Means clustering algorithm. This knowledge obtained from the clustered text data can be used for strategic decision support for e-governance. We were able to achieve only Phase 1 (Publish-Text Mining Interaction) in this work. Interaction of text mining with other phases (Interact and Transact Phases) will be addressed in future work.

References


[5] D. Robb, “Taming Text”, 2005, Retrieved from http://vnweb.hwwilsonweb.com/hww/jumpstart.jhtml?recid=0bc05f7a67b1790e8bd354a88a41ad89a928d23360302a4959035699f17e2ba8a63e2dd032c73f8a7fmg


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