Improving Reliability of Web 2.0-based Rating Systems Using Per-user Trustiness


Motivation

The reliability of Web 2.0-based rating system is vulnerable when there are uncooperative users in the system (e.g., bad mouthing or ballot stuffing). Tackling this issue, we propose a simple yet practical solution. In addition to aggregating rating results from all reviewers, the proposed scheme also takes into account the trustiness of each user while aggregating.

Proposed solution

We assume that if a reviewer’s opinions are more similar to the general public, we might have more confidence on him!

In this system

➢ There are \(X\) reviewers and \(Y\) items
➢ Reviewer \(x\) gives item \(y\) a rating \(g_{x,y}\)
➢ The rating value \(g_{x,y}\) is an integer between the range 1 and \(G_{\text{max}}\)
➢ Each reviewer has a trustiness value to identify his reliability while each item’s current score is \(G^*\)

\[
C(x,y) = \begin{cases} 
0, & \text{reviewer } x \text{ has not rated item } y \\
1, & \text{reviewer } x \text{ has rated item } y
\end{cases} \quad (1)
\]

The trustiness value of reviewer \(i\) is

\[
T(i) = \frac{\sum_{k=1}^{Y} C(i,k) \left(1 - \frac{g_{i,k} - G_{\text{max}}}{G_{\text{max}}}\right)}{\sum_{k=1}^{Y} C(i,k)} \quad (2)
\]

\[
\delta_{m,i,g} = \begin{cases} 
0, & \text{the rating from reviewer } m \text{ on item } j \text{ is not } g \\
1, & \text{the rating from reviewer } m \text{ on item } j \text{ is } g
\end{cases} \quad (3)
\]

The score of item \(j\) is

\[
G_j = \arg \max_g \sum_{m=1}^{X} C(m,j) T(m) \delta_{m,i,g} \quad (4)
\]

where \(g=1,2,\ldots, G_{\text{max}}\)

Example

Comparison between Majority Voting model and Trustiness-Based model

<table>
<thead>
<tr>
<th>(T(i))</th>
<th>(\text{rating})</th>
<th>(T(i))</th>
<th>(\text{rating})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(g_{1,i})</td>
<td>1</td>
<td>3</td>
<td>(g_{5,i})</td>
</tr>
<tr>
<td>(g_{2,i})</td>
<td>0.4</td>
<td>5</td>
<td>(g_{6,i})</td>
</tr>
<tr>
<td>(g_{3,i})</td>
<td>0.3</td>
<td>3</td>
<td>(g_{7,i})</td>
</tr>
<tr>
<td>(g_{4,i})</td>
<td>0.9</td>
<td>4</td>
<td>(g_{8,i})</td>
</tr>
</tbody>
</table>

Table 1. A rating example

In Majority Voting model, article \(j\)'s final score is 5!

In Trustiness-Based model, article \(j\)'s final score is 3!

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