**Introduction**

Ratings given on a web-site can sometimes be biased. For example if a product is given a 5 star rating and description reads really bad review for the product then the rating is biased. The primary objective of this document is to consider various attributes of a rating and review and arrive at an overall score for the review added by the user.

**Attributes**

There are primarily 4 attributes considered to arrive at the algorithm:

* **verified\_purchase:** if a user writing the review has actually purchased the product. If an entity is verified purchase weight (w) is more.
* **helpfulness\_count:** how many people found the review helpful.
* **words\_count:** total word count of the description.
  + w(helpfulness) > w(words count)
* **rating\_confidence:** This is a factor of rating and sentiment analysis.

**Algorithm:**

We give highest weightage if an entity is a verified purchase. And Helpfulness has more weight than words count.

These are the scores that are calculated:

1. **helpfulness\_score:**

If verified purchase, then weight is 5 for helpfulness\_count, else it is 1.

*If verified\_purchase:*

*helpfulness\_count / 100) \* w(5)*

*else*

*helpfulness\_count / 100) \* w(5)*

1. **words\_score:**

If verified purchase, then weight is 2 for words\_count, else it is 0.5.

*If verified\_purchase:*

*words\_count / 100) \* w(2)*

*else*

*words\_count / 100) \* w(0.5)*

1. **rating\_confidence:**

Rating confidence is a deviation factor of ratings and sentiments. If rating is too far from sentiment, then we cannot trust the rating then rating confidence becomes 0 else it is a factor of rating/10 that needs to be added to overall score.

Example:

If rating is 5 but sentiment is 1 (very sad), it implies that even thought user has given high rating, the title and description have implied that user is sad.

***rating\_confidence = IF (ABS (rating – sentiment) ) < 2 THEN rating/10 ELSE 0***

1. **review\_score:**

This is an average of helpfulness\_score, words\_score, rating\_confidence:

Review\_score =  **(**helpfulness\_score + words\_score + rating\_confidence) / 3

**Sample Data:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SKU** | **ReviewId** | **Rating** | **verified purchase** | **helpful reviews** | **no. of words** | **sentiment** |
| SKU1 | R1 | 3 | TRUE | 200 | 450 | 4 |
| SKU1 | R2 | 4 | FALSE | 100 | 100 | 5 |
| SKU1 | R3 | 2 | TRUE | 150 | 300 | 1 |
| SKU1 | R4 | 5 | TRUE | 25 | 50 | 4 |
|  |  |  |  |  |  |  |
| SKU2 | R5 | 1 | FALSE | 90 | 500 | 4 |
| SKU2 | R6 | 1 | FALSE | 25 | 400 | 1 |
| SKU2 | R7 | 3 | FALSE | 140 | 300 | 5 |
| SKU2 | R8 | 4 | TRUE | 60 | 75 | 5 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SKU** | **ReviewId** |  | **helpfulness\_score** | **words\_score** | **rating\_confidence** | **review\_score** |
| SKU1 | R1 |  | 10 | 9 | 0.3 | 9.5 |
| SKU1 | R2 |  | 1 | 0.5 | 0.4 | 0.75 |
| SKU1 | R3 |  | 7.5 | 6 | 0.2 | 6.75 |
| SKU1 | R4 |  | 1.25 | 1 | 0.5 | 1.125 |
|  |  |  |  |  |  |  |
| SKU2 | R5 |  | 0.9 | 2.5 | 0 | 1.7 |
| SKU2 | R6 |  | 0.25 | 2 | 0.1 | 1.125 |
| SKU2 | R7 |  | 1.4 | 1.5 | 0 | 1.45 |
| SKU2 | R8 |  | 3 | 1.5 | 0.4 | 2.25 |

As evident above, for SKU1, the verified purchase R3 with its helpful reviews and no of words has the highest score.

In SKU2, the lowest score R6 is with a sku, which is not verified purchase, has low helpful reviews. In R5, the rating\_confidence is 0 because Rating is low whereas sentiment is ‘Happy’ (with score of 4).