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*It Depends!*

Context and Voting Patterns in Online Content

Ruben Sipos  
Arpita Ghosh  
Thorsten Joachims

Cornell University
The Era of User-Generated Content

- Reddit
- Amazon
- Yelp
- Facebook
The Era of User-Generated Content

3 of 3 people found the following review helpful

★★★★★ Never had an E-reader? , January 1, 2014

By M. Goff "Extraordinaire" (The Beautiful Garden State)

You simply don't know what you're missing. Kindle Paperwhite is to books what mp3's and the Ipod is to music, the end of the line technology wise. We can stop now, the perfect technology has been made, let us move on to the next problem that needs solving.
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Surfacing the Good Content

\[ P(\text{yes} \mid q_r) = p_r \]

rank by sorting using the ratio ("RatioSort")

\[ \hat{p}_r = \frac{\text{number of yes votes on } r}{\text{total number of votes on } r} \]
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Was this review helpful to you? Yes  No
Data

• What is missing in existing datasets?
  – What did the user see?

• Fine-grained temporal snapshots
  – Amazon.com
  – ~600 products, ~5 months
  – daily snapshots of helpfulness vote counts
  – including estimate of converged rankings (4 months later)
Are there biases in voting polarity?

- H0: Vote polarity only depends on content quality!
  \[ P(\text{yes}|q_r) = \logit^{-1}(q_r) = p_r \]

- H1: Other factors bias vote polarity (e.g. presented rank)!
  \[ P(\text{yes}|q_r, \beta, \sigma^{pres}) = \logit^{-1}(q_r + \beta \sigma^{pres}) \]

- Statistical test
  - likelihood ratio test
  - H1 model ($\beta \neq 0$) is significantly better ($p<0.001$)
  - beware of biases!
The ordering of reviews (i.e. their surrounding context) significantly changes users’ voting behavior (two-tailed paired Student t-test).
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Unmatched Efficiency
Excellent item! Hard to find, but I'm very glad I made this purchase! Go ahead and click buy, your mind will thank you!
Published 2 minutes ago by Amazon Customer

Less distractions with a dedicated reader.
I've been using the Kindle reader app for a few years on every other platform. It became too easy to get distracted by other programs, whether on a computer or a mobile device. Read more
Published 1 hour ago by Amazon Customer

Perfect!
Love it! It is perfect, impressive quality, easy to use, very addictive... A must buy for people who are already reading or want to start reading more!
Published 2 hours ago by Dennis

DjVu?
Hello, I'm going to purchase and wondering does Kindle work with the DjVu format? Thank you for your patience.
Published 2 hours ago by Dennis

Nice
This is awesome reader. Very beautiful screensavers, light weight and useful send-to-kindle. Will want show time in full screen mode, and what is "loc" when I read?
Published 3 hours ago by Dmitry
Polarity Evolution

only first 30 days

only last 30 days
A Model of Polarity

\[ P(\text{yes}|q_r, \beta, \delta^{\text{ctx}}) = \logit^{-1}(q_r + \beta \delta^{\text{ctx}}) \]

- **global context**
- **model fit**
- **tradeoff**

- **content quality**
- **context**
Polarity and Local Context

context

Unmatched Efficiency
Excellent item! Here's the deal, but I'm very glad I made this purchase. One head and click buy, your mind will thank you.
Published 2 minutes ago by Amazon Customer

Less distractions with a dedicated reader.
I've been using the Kindle reader app for a few years on our phone platform. It became too easy to get distracted by other programs, whether on a computer or a mobile device. Read more
Published 1 hour ago by Amazon Customer

Perfect
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Published 2 hours ago by Nikoloz

DjVu format
Hello, I'm going to buy this device. Is there a rendering done Kindle white paper support for DjVu format? Thank you for support.
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This is an awesome reader. Very beautiful screensaver, light weight and useful send-to-kindle. What is the show time in full screen mode, and what is it when I read?
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Observed Participation

global context

local context

diagonal
Participation Evolution

only first 30 days

only last 30 days
A Model of Participation

\[ P(\text{vote}|z_p, \alpha, \delta_{\text{ctx}}) = \logit^{-1}(z_p + \alpha |\delta_{\text{ctx}}|) \]

attention bias  
tradeoff  
context
Summary

• Context provides possible explanation of biases in
  – polarity of vote
  – participation in voting

• New model for voting polarity and participation
  – polarity
    \[ P(\text{yes}|q_r, \beta, \delta_{ctx}) = \logit^{-1}(q_r + \beta \delta_{ctx}) \]
  – participation
    \[ P(\text{vote}|z_p, \alpha, \delta_{ctx}) = \logit^{-1}(z_p + \alpha \delta_{ctx}) \]

• What does this model imply for content ranking?
**RatioSort** with Biased Votes

- **Simulate:**
  - context-independent model
  - context-biased model

Preliminary results.

- generate reviews’ $q$
- for each time
  - for each review
    - cast vote?
    - is helpful?
  - estimate all $q$
- rank (sort by $q$)

![Graph showing the loss of utility over total votes on all reviews.](image)
Designing a Ranking Algorithm for Context-Biased Voting

- Can we do better than RatioSort?
- Replace ratio estimator with MLE
- Include participation information
Conclusions

• Context provides possible explanation of biases in
  – polarity of vote
  – participation in voting
  – causal dependence $\rightarrow$ experimental validation

• Explore other factors that may bias votes
  – herding [Muchnik et al., 2013]

• Explore other settings [Reddit, Yelp]

• Exploit the new knowledge
  – improved ranking algorithms
Bonus Slides
Observed Datapoints

all data

only last 30 days
A Model of Participation (recolored)

\[
P(vote | z_p, \alpha, \delta^{cxt}) = \text{logit}^{-1} (z_p + \alpha |\delta^{cxt}|)
\]
Quality vs. Presented Rank
Data Stats

[Graphs showing data trends over daily snapshots]