Discovery: Algorithms are not enough

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Outline

We develop and deploy discovery algorithms to “engage” users.

• User engagement

• Engaging through diversity: serendipity

• Engaging through diversity: awareness
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What is user engagement?

User engagement is a quality of the user experience that emphasizes the positive aspects of interaction – in particular the fact of being captivated by the technology (Attfield et al, 2011).

- **user feelings**: happy, sad, excited, …
- **user mental states**: flow, presence, immersion, …
- **user interactions**: click, read, comment, buy…

emotional, cognitive and behavioural connection that exists, at any point in time and over time, between a user and a technological resource

(O’Brien, Lalmas & Yom-Tov, 2013)
Characteristics of user engagement

**Endurability**
(Read, MacFarlane, & Casey, 2002; O'Brien, 2008)

**Motivation, interests, incentives, and benefits**
(Jacques et al., 1995; O'Brien & Toms, 2008)

**Focused attention**
(Webster & Ho, 1997; O'Brien, 2008)

**Positive Affect**
(O'Brien & Toms, 2008)

**Aesthetics**
(Jacques et al., 1995; O'Brien, 2008)

**Novelty**
(Webster & Ho, 1997; O'Brien, 2008)

**Reputation, trust and expectation**
(Attfield et al, 2011)

**Richness and control**
(Jacques et al., 1995; Webster & Ho, 1997)

(O'Brien, Lalmas & Yom-Tov, 2013)
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(Bordini, Mejova & Lalmas, 2013)
Use case: Entity search

Yahoo! search for "Barcelona, Spain"
Engaging through serendipity

**Yahoo! Answers**
community-driven question & answer portal
- 67 336 144 questions & 261 770 047 answers
- January 1, 2010 – December 31, 2011
- English-language

**Wikipedia**
community-driven encyclopedia
- 3 795 865 articles
- as of end of December 2011
- English Wikipedia

**Entity Search**
build an entity-driven serendipitous search system based on entity networks extracted from Wikipedia and Yahoo! Answers

**Serendipity**
finding something good or useful while not specifically looking for it, serendipitous search systems provide relevant and interesting results
Engaging through serendipity

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Serendipity
finding something good or useful while not specifically looking for it, serendipitous search systems provide relevant and interesting results
retrieve entities most related to a query entity using random walk
**Serendipity** "making fortunate discoveries by accident"

Serendipity = unexpectedness + relevance

"Expected" result baselines from web search

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Data</th>
<th>Relevant &amp; unexpected / Unexpected</th>
<th>Number of serendipitous results out of all of the unexpected results retrieved</th>
<th>Relevant &amp; unexpected / Retrieved</th>
<th>Serendipitous out of all retrieved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top</strong>: 5 entities that occur most frequently in top 5 search from Bing and Google</td>
<td>WP</td>
<td>0.63 (0.58)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YA</td>
<td>0.69 (0.63)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Top – WP</strong>: same as above, but excluding Wikipedia page from results</td>
<td>WP</td>
<td>0.63 (0.58)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YA</td>
<td>0.70 (0.64)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rel</strong>: top 5 entities in the related query suggestions provided by Bing and Google</td>
<td>WP</td>
<td>0.64 (0.61)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YA</td>
<td>0.70 (0.65)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rel + Top</strong>: union of Top and Rel</td>
<td>WP</td>
<td>0.61 (0.54)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YA</td>
<td>0.68 (0.57)</td>
<td></td>
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</tbody>
</table>
Interestingness ≠ Relevance

**Interesting > Relevant**
- Oil Spill → Penguins in Sweaters WP
- Robert Pattinson → Water for Elephants WP
- Egypt → Ptolemaic Kingdom WP & YA

**Relevant > Interesting**
- Lady Gaga → Britney Spears WP
- Egypt → Cairo Conference WP
- Netflix → Blu-ray Disc YA

Novelty
Engaging through serendipity

- Engagement in search is to view search activities as part of the current overall task of a user, including task of a leisurely or explorative nature

- We never know what we get if we are ready to explore

(slides based on Bordini presentation @ CIKM 2016)
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(Graells-Garrido, Lalmas & Baeza-Yates, 2016)
Twitter is global.

- But we also know that there are **cognitive** and **systemic** biases that shape the behavior of users.
- **What is the effect of those biases and what can we do about it?**

Leetaru et al., 2013.
Context: Chile, a centralized country

- Economic/political/media powers are concentrated in Santiago (the capital).

  *Región Metropolitana (RM)* is the capital region.

- Twitter activity is centralized – RM receives more tweets from other locations than expected due to population distribution.
Context: Chile, a centralized country

- Chart: flow of tweets activities between administrative regions.

- Does centralization affect how people perceive information, and how people behave when browsing informational content in micro-blogging platforms?

- If so, how can we encourage non-centralized exploration?
To find if centralization affects how people perceive timelines, create a geographically diverse timeline.

- **Proposed Method “PM”**: Information Entropy + Sidelines (enforces location).
- **Baseline “DIV”**: Information Entropy only.
- **Baseline “POP”**: Most popular tweets (mostly tweets from Santiago/RM).

After reading timelines side-by-side, which one is more:

- diverse?
- interesting?
- informative?

Participants answered using a Likert scale from -3 to 3.
Main Result

*Statistical interaction between location and condition POP/PM.*

**RM** participants find PM more diverse than POP.

**NOT-RM** do not.

Being from a central or peripheral location *makes a difference.*

For *peripheral/NOT-RM* users, there was no perception of the diversity present by design on the algorithm!
Algorithms are not enough

• Users do not see the diversity in the timelines because they cannot identify themselves (in the location sense), even though they are present.

• There is a diversity and representation awareness problem.

• How to make users aware of their representation in the timeline, as well as the diversity inherent in it?
• Previous work indicates that clustered representations help users to become aware of the diversity in news aggregators.

• We follow that approach. But in previous work the number of clusters has been small - 2 or 3. In our case, we have **15 clusters**!

• How to depict 15 clusters without introducing positional bias on the screen?
• Inspired by [newsmap.jp](http://newsmap.jp), we use treemaps to depict differences in a tweet’s geographical origin, as well as giving every location a balanced amount of exposure.

• We also allow users to filter locations by selecting a specific region. Doing so will show only tweets about the specified location.
“In the wild” study

**Purpose** - to evaluate user involvement with the application as proxy of diversity and representation awareness.

- **Diversity** - do users click on content related to different locations?

- **Representation** - do users choose to see only their location using the filters?

- **Interestingness** - how many interactions with content do users make?

We used a social bot (@todocl) to generate timelines every hour and broadcast them, mentioning featured users, and retweeting their tweets. This allowed us to get users and spread the word.
Experimental Setup

Between-subjects design.
N = 321 (RM = 193, NOT-RM = 128)

Main Results

treemap increases:
- # of interaction events
- # of locations interacted with
- filter likelihood

Users interacted with more content, from more locations, and filtered locations also! (diversity)

Being from RM:
- increases locations interacted with
- decreases filter likelihood

* NOT-RM increases representation awareness - they find themselves!
Engaging through awareness

• Centralization has effects on information perception and user behavior.

• Algorithms are not enough! We need to find **new ways of showing information** to users (not necessarily new techniques – but **new contexts**).

• Clustered representations work to enhance diversity awareness - but how to display clusters depends on cultural and individual differences.

(slides based on Graells-Garrido presentation @ IUI 2016)
Final message

Not every culture has the same notion of relevance and importance in content. Even within a country there are differences. We need algorithms and presentation paradigms.