

# Combining Collaborative Filtering and Search Engine into Hybrid News Recommendations

Toon De Pessemier, Sam Leroux, Kris Vanhecke, Luc Martens

iMinds – Ghent University, Belgium

[toon.depessemier@ugent.be](mailto:toon.depessemier@ugent.be)











*Help, I don't know what to search for!*



Today's news that's interesting for me



*The web, they say, is leaving the era of search and entering one of discovery. What's the difference? Search is what you do when you're looking for something. Discovery is when something wonderful that you didn't know existed, or didn't know how to ask for, finds you.*

CNN Money, "The race to create a 'smart' Google"

- Content pool changes all the time
- The newest content is the most relevant
- Massive peaks in user demand
- Sharding, replication, fail-over

## ■ Search has well-established solutions:

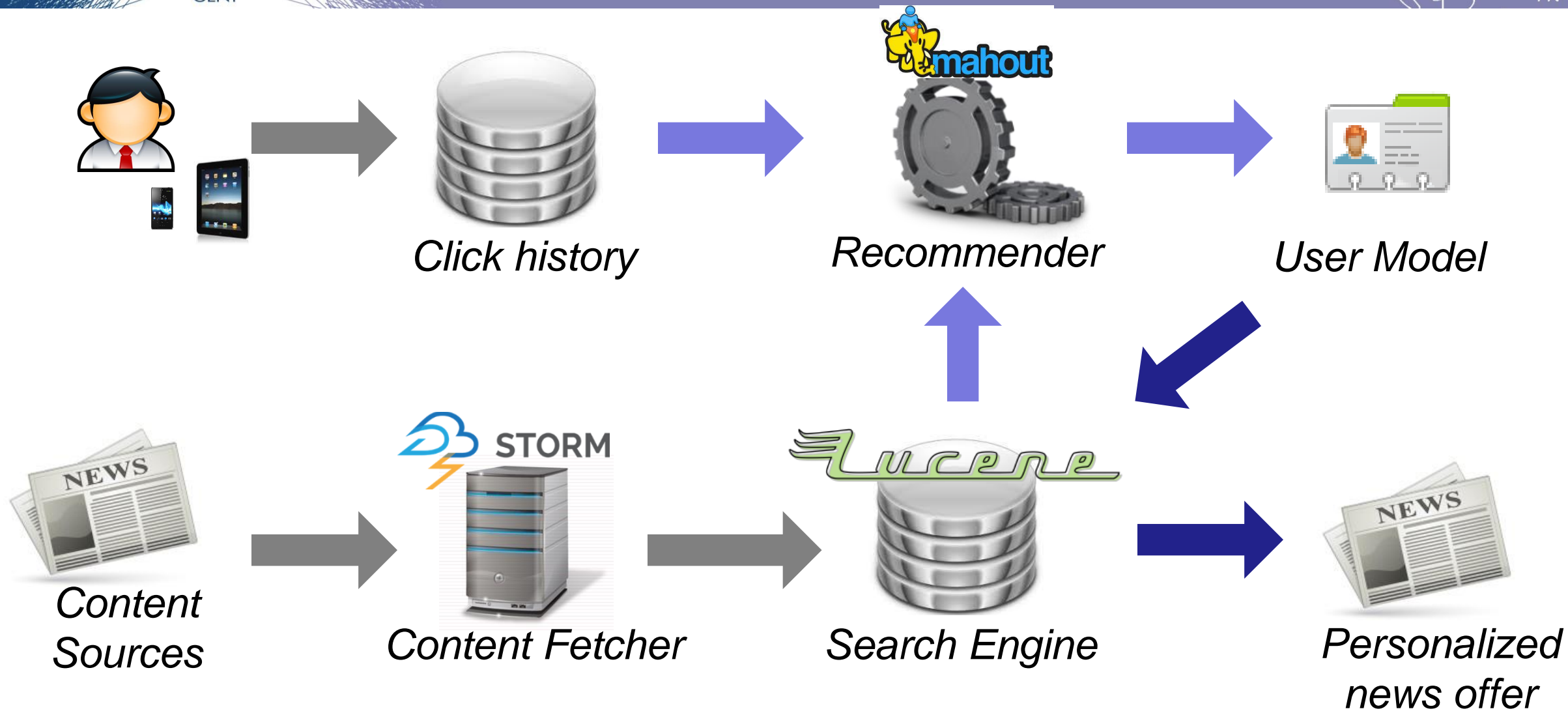
- Able to scale massively
- Short response time
- Fast processing of new content
- In active use by major websites



## ■ Similar (pre-)processing tasks:

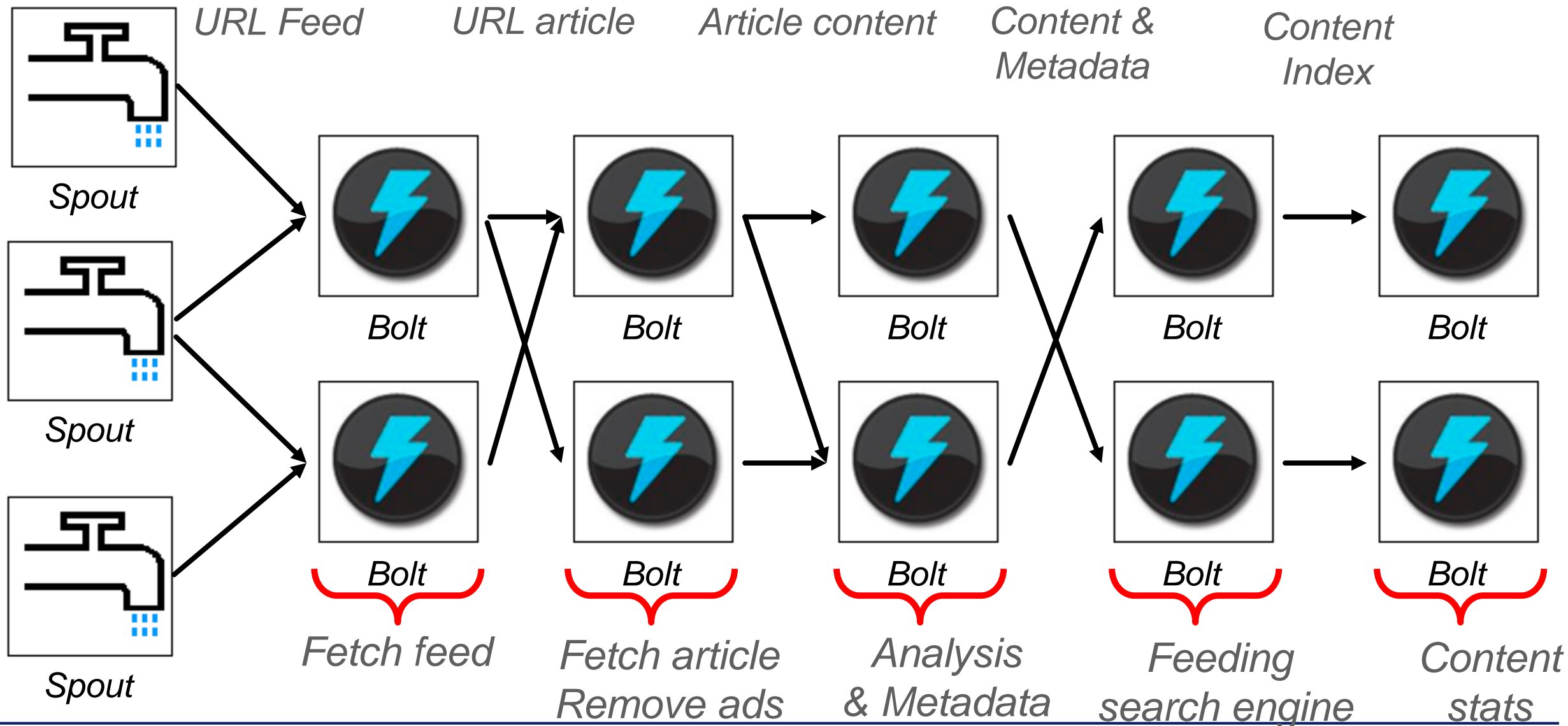
- Sort a set of items by some criteria
- VSM – TF-IDF, tokenization, filtering stop words
- Stemming, N-grams (e.g. United States of America, Tour de France)





- Phase 1: Data Fetching (Storm)
- Phase 2: Building the search query
- Phase 3: Profile expansion and recommendation
- Phase 4: Clustering content





*Syria:4.5*

*Soccer:1*

*Elections:2*

*Crisis:3*



User Profile



*Search query :*

*Lucene*



```
■ buildQuery(Map<String,Double> terms){  
    Query q;  
    for( String term : terms.keySet() ){  
        TermQuery termQuery = new TermQuery(term);  
        double score = terms.get(term).doubleValue();  
        termQuery.setBoost(score);  
        q.add(termQuery);  
    }  
    return q;  
}
```

## ■ Query search engine

- Lucene



## ■ Events with high impact

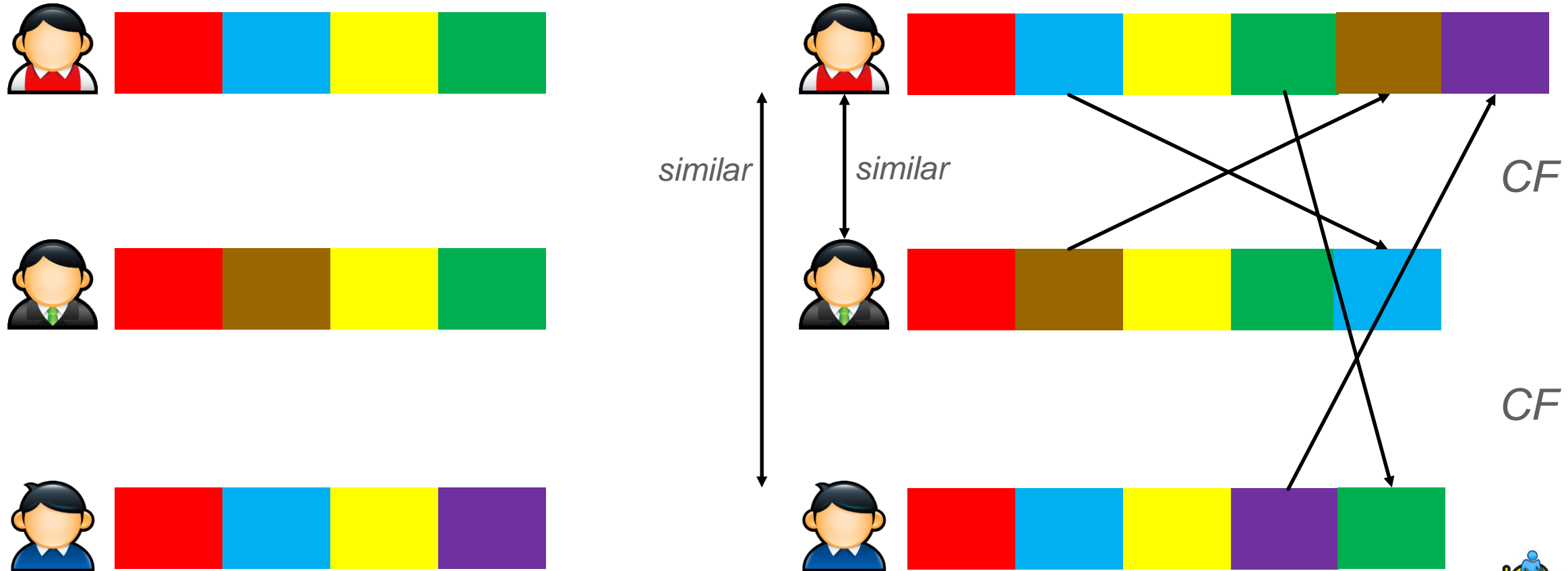
- Trending topics
  - Frequency of occurrence (index)
- Google search queries
  - Popular searches every hour
- Twitter API
  - Accounts of newspapers and important people
  - Retweets and Favorites





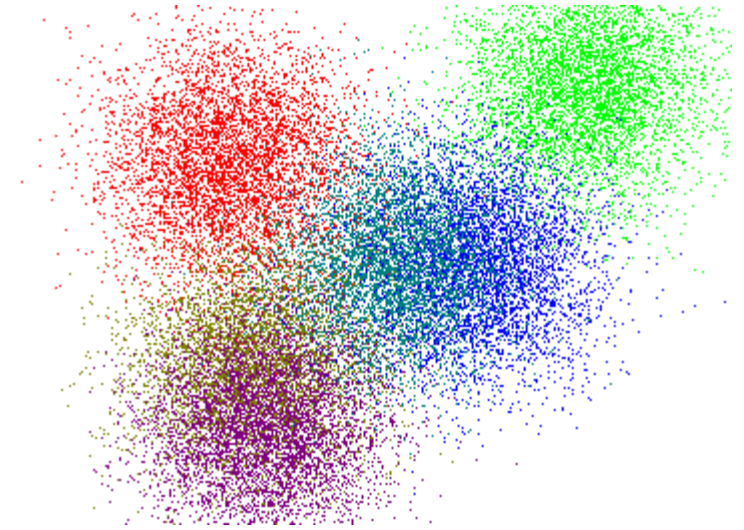
## Original Profile

## Expanded Profile



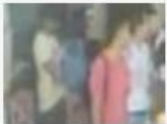
## ■ Clustering of recommended items

- Why? Different sources → similar stories
- Per topic
- After recommendation process (small set)
- Personalized
  - E.g. different clustering level per user
  - Clustering per topic of interest
  - Clusters not static






- Implicit feedback
  
- Mobile website
  - HTML5 and Javascript
  - Content of 3<sup>rd</sup> party in iFrame
  - Smartphone ↔ Tablet
  
- <http://wicaweb5.intec.ugent.be:8080/>

- 


Police question two Bangkok suspects  
10 minutes ago

9

➔
- 


Valeant Snaps Up 'Female Viagra' Maker Sprout for \$1 Billion  
27 minutes ago

3

➔
- 

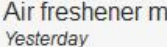
Television networks looking back at Katrina  
1 hour ago

4


➔
- 

Cilla Black: Stars' Tributes At Funeral  
1 hour ago

4


➔
- 

Air freshener maker sniffs at slaughterhouse neighbor plan  
Yesterday

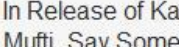
➔
- 

Stocks lower as Fed minutes keep rate increase in play  
Yesterday

3

➔
- 

Rauner again ties CPS bailout to property tax freeze, anti-union measures  
4 hours ago

➔
- 

In Release of Kashmiri Separatists, a Role for Mehbooba Mufti, Say Some  
2 hours ago

3

➔

U.S. News & World Report NEWS

News, Opinion & Analysis

News Opinion National Issues Special Reports Cartoons Photos The Report

Ken Walsh's Washington Newsgram Washington Whispers At the Edge Data Mine The Run 2016

TV documentaries planned for 10th anniversary of Hurricane Katrina



Latest Videos

Protests In St. Louis After Police Shoot Man AP

More videos:

ADVERTISEMENT



# Clustering Similar Items



Police question two Bangkok suspects  
10 minutes ago

9



Valeant Snaps Up 'Female Viagra' Maker  
Sprout for \$1 Billion  
27 minutes ago

3



Television networks looking back at Katrina  
1 hour ago

4



Cilla Black: Stars' Tributes At Funeral  
1 hour ago

4

Air freshener maker sniffs at slaughterhouse neighbor plan  
Yesterday



Stocks lower as Fed minutes keep rate  
increase in play  
Yesterday

3



Rauner again ties CPS bailout to property tax  
freeze, anti-union measures  
4 hours ago

In Release of Kashmiri Separatists, a Role for Mehbooba  
Mufti, Say Some  
2 hours ago

3

U.S. News & World Report

NEWS

News, Opinion & Analysis



News

Opinion

National Issues

Special Reports

Cartoons

Photos

The Report

Ken Walsh's Washington

Newsgram

Washington Whispers

At the Edge

Data Mine

The Run 2016

## TV documentaries planned for 10th anniversary of Hurricane Katrina



### Latest Videos

Protests In St. Louis After Police  
Shoot Man  
AP



### More videos:



ADVERTISEMENT






Back

Similar items

Police Circulate Sketch Of A Suspect After Fatal Blast In Bangkok  
Yesterday



VIDEO: BBC finds shrapnel at Thai blast site  
1 hour ago


Thai authorities rule out international terrorism in deadly shrine bombing  
5 hours ago

Bangkok bombing: City prays for justice for the 20 killed in terror attack on Erawan Shrine  
Yesterday

Thais to Seek Interpol Help for 'Foreign' Bangkok Bomber  
7 hours ago


Thais Downplay Global Terror Links to Deadly Shrine Bomb  
6 hours ago

Thais downplay global terror links to deadly shrine bomb  
6 hours ago



'No foreign role' in Bangkok bomb  
2 hours ago

Thai Police Have Identified Two More Suspects in the Bangkok Bombing  
10 hours ago



Police Hunt 'Foreigner' in Deadly Bombing of Bangkok Shrine  
Yesterday

News Recommendation

Login

BBC

Sign in

News

Sport

Weather

Shop

Earth

More

Search

NEWS

Home

Video

World

UK

Business

Tech

Science

Magazine

Entertainment & Arts

Health

In Pictures

More

Asia

China


India

Asia

Bangkok bomb: Two suspects hand themselves in

15 minutes ago

Asia



The main suspect, in yellow, deposits a backpack on a bench before walking off

Two men identified as suspects in the Bangkok bombing have handed themselves to police,

Bangkok bomb


Top Stories

Police question two Bangkok suspects  
15 minutes ago

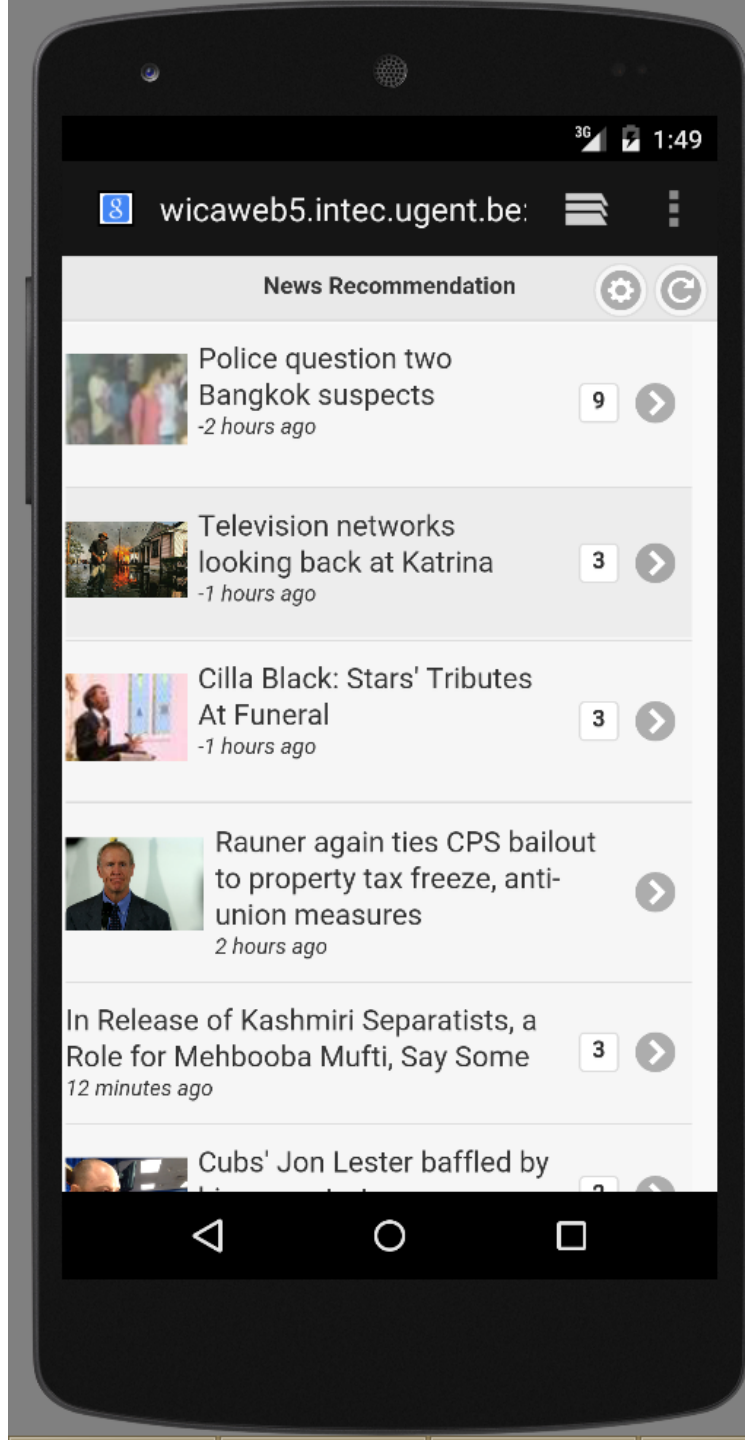
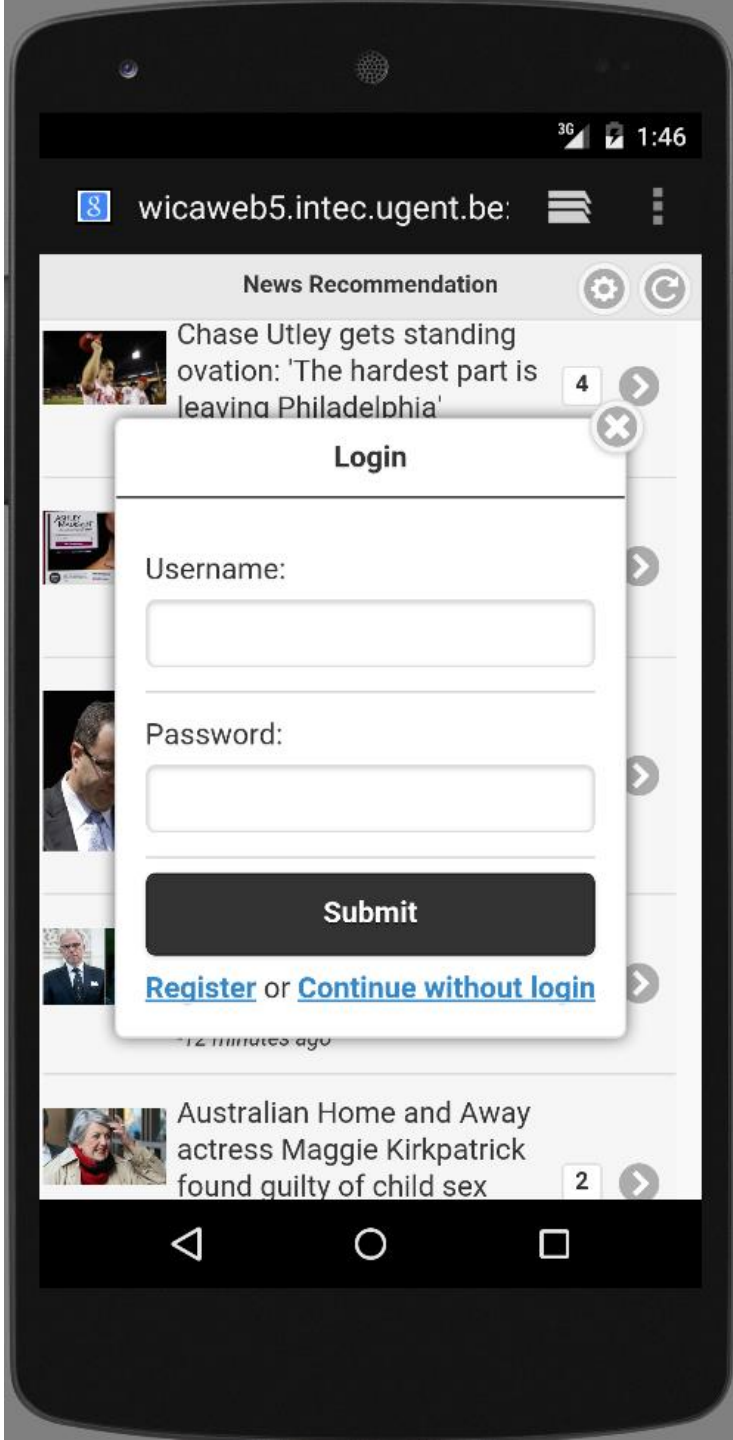
S Korea evacuation after border fire  
3 hours ago

Pope put on spot by Falklands sign  
3 hours ago

Features & Analysis



Pyongyang rocks  
What was the setlist at North Korea's first Western rock gig?



- A real-time news recommender built around search
  - Combining Storm, Lucene, Mahout
  - Scalable service and fast response times
- Profile expansion
  - Hybrid system for serendipity
- Personalized clustering
- Future work:
  - Short-term interests vs. long-term interests
  - User evaluation
- <http://wicaweb5.intec.ugent.be:8080>



A photograph of a man in a dark suit and tie standing at a podium, speaking into a microphone. He is facing an audience seated in rows of wooden chairs. Many audience members have their hands raised, indicating they want to ask a question or participate. The scene is set in a well-lit room with a whiteboard visible in the background. The word "Questions?" is overlaid in a large, grey, sans-serif font across the center of the image.

Questions?