

# Social News Feed Recommender

Milen Chechev, Ivan Koychev  
Sofia University

AIMSA Conference, September 2014

# Outline

- Introduction
- Analysis of the problem
- Recommendation Approaches
- Evaluation
- Conclusions

# Introduction – Social Networks

facebook

twitter

Google+



 delicious

flickr

foursquare

NETLOG™

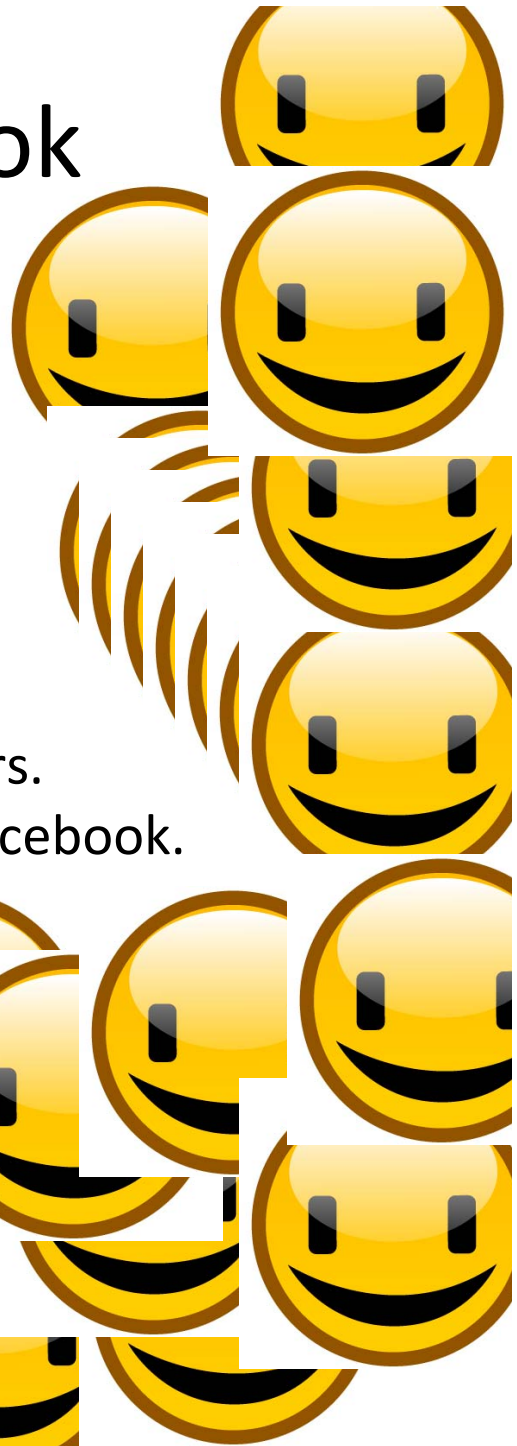
orkut

XING

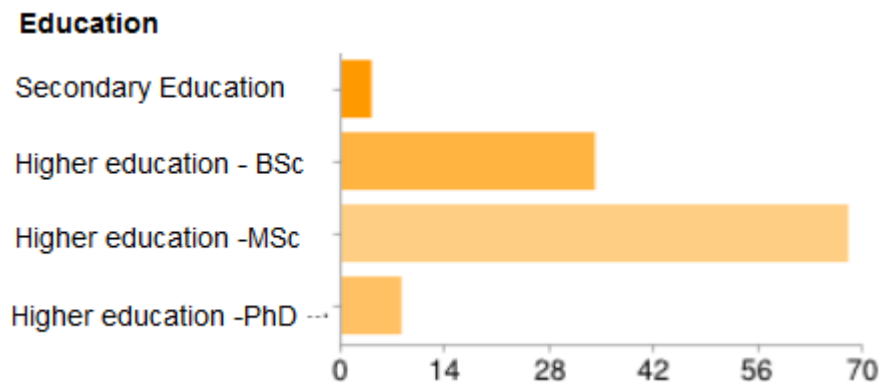
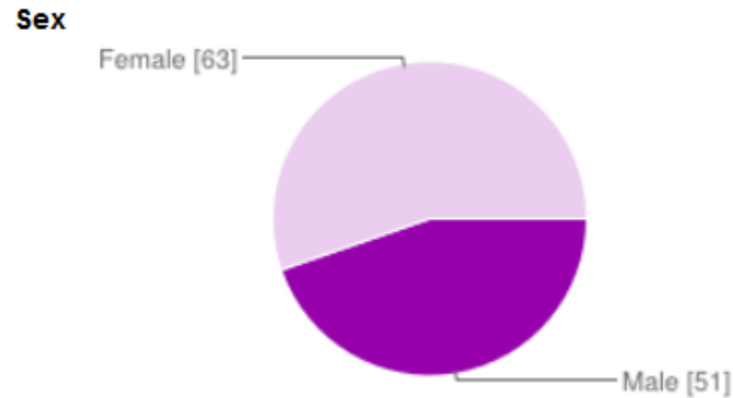
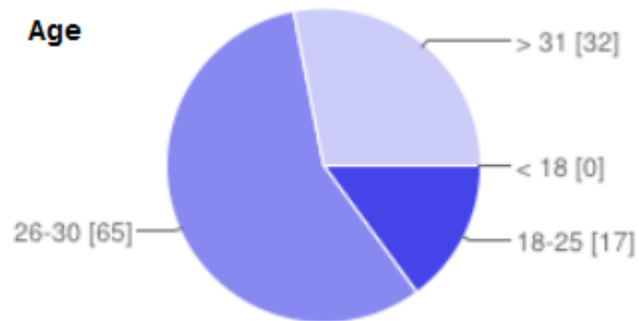
*AIMSA 2014*

# Introduction – Facebook

- Feb 4, 2004 – Facebook is launched
- Dec 2004 - Facebook reaches 1 million users.
- Dec 2005 - Facebook reaches 6 million users.
- Dec. 2006 - Facebook reaches 12 million users.
- Dec 2007 - Facebook reaches 58 million users.
- Dec 2009 - Facebook reaches 360 million users.
- Dec. 2010 - Facebook reaches 608 million users.
- Nov 6, 2011 - Facebook reaches 845 million users.
- Oct 4, 2012 - One billion people are active on Facebook.
- Jan 2014 – 1.3 billion active users



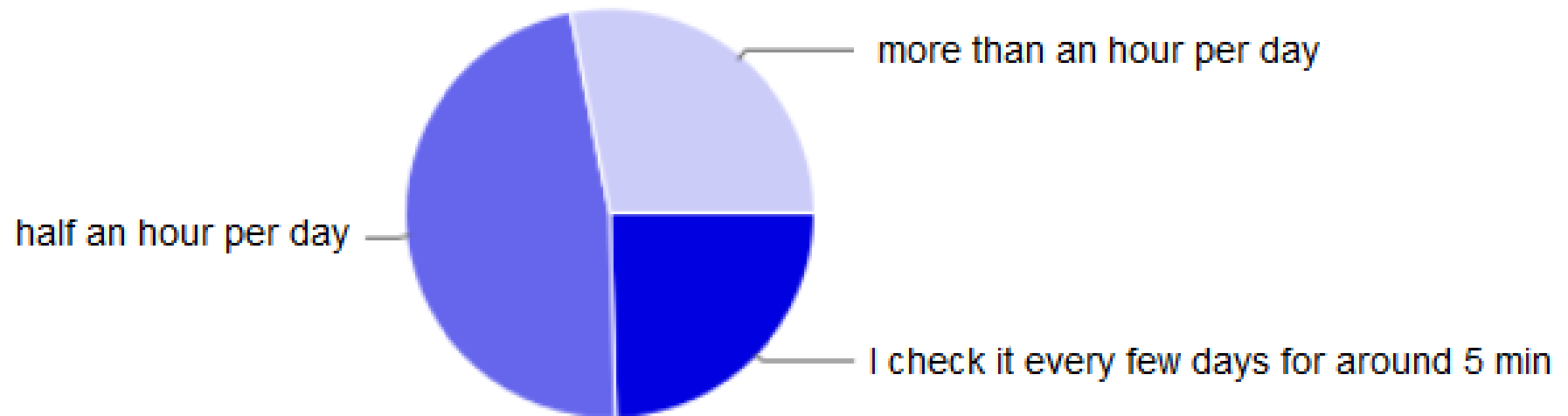
# User Survey



Survey: *Chechev M., Koychev, I. (2013) Recommendations in Social Networks: an Extra Feature or an Essential Need, In Proceedings of MIE'2013, Sofia, Bulgaria*

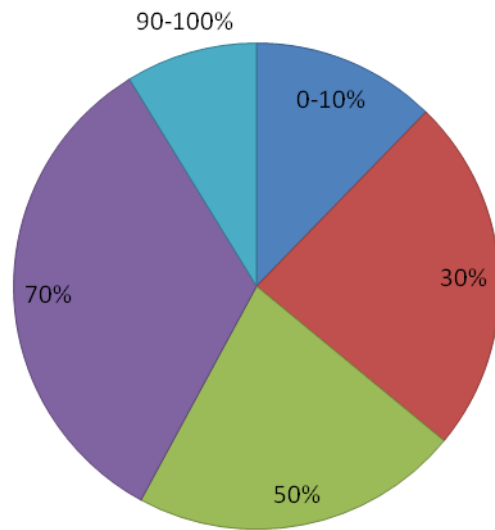
# User Survey – Facebook Activity

**How much time do you spend at Facebook?**

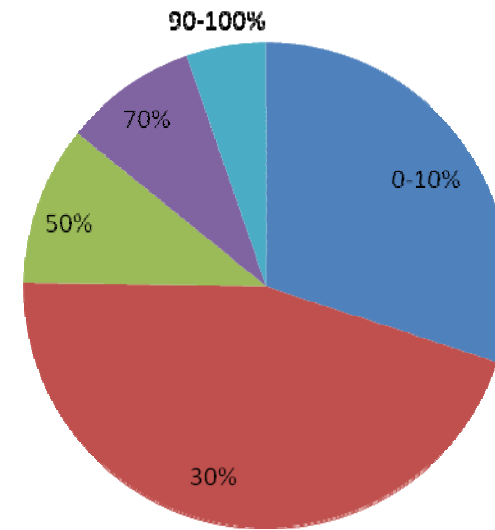


# User Survey – Segmented Facebook Activity

**Reading the news feed**

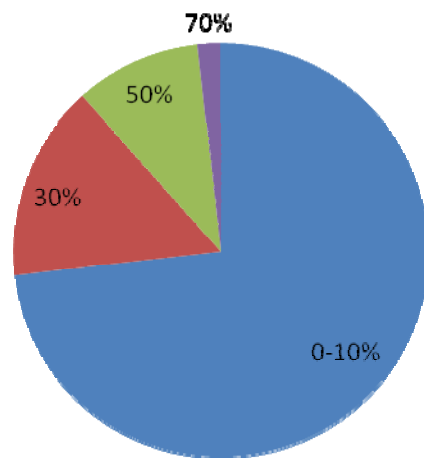


**Browsing friends albums**

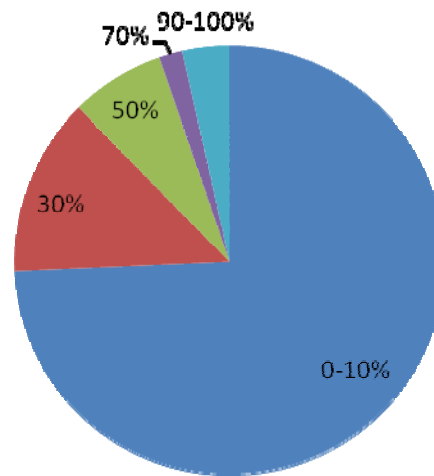


# User Survey – Segmented Facebook Activity 2

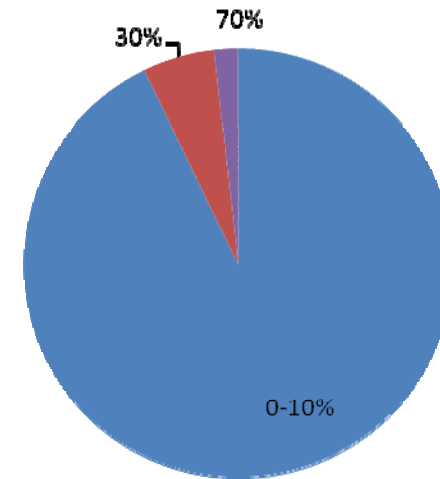
### Chat with friends



### Publishing content



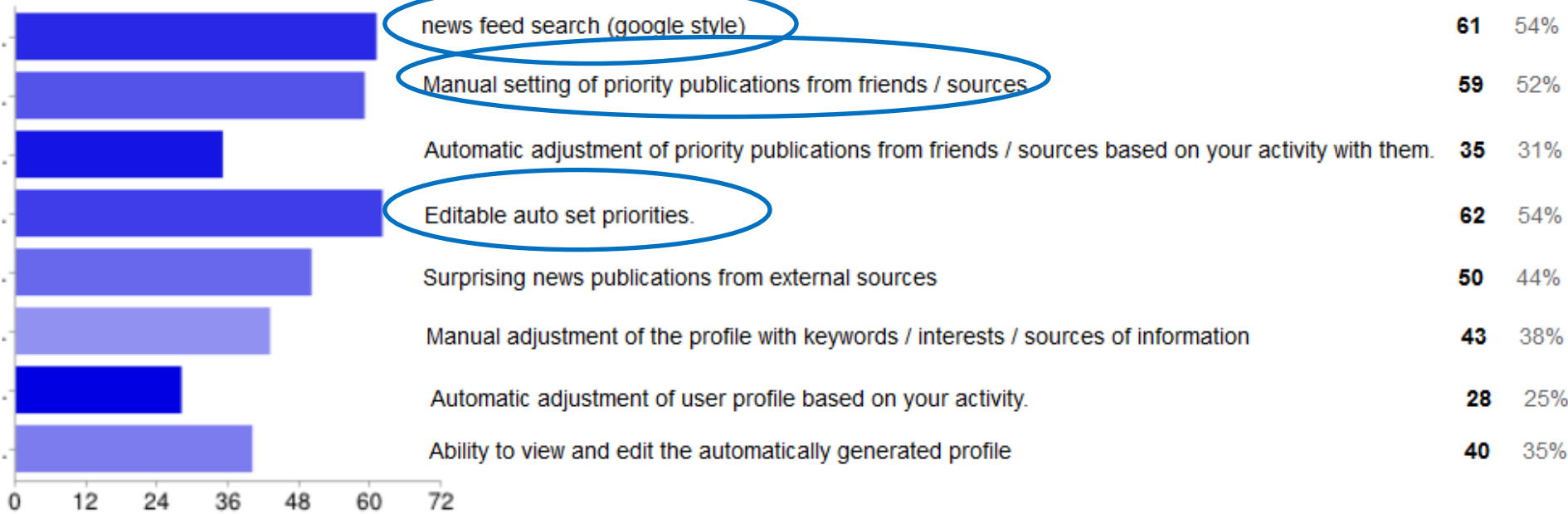
### Playing games





# User Survey –FeaTURE SELECTION

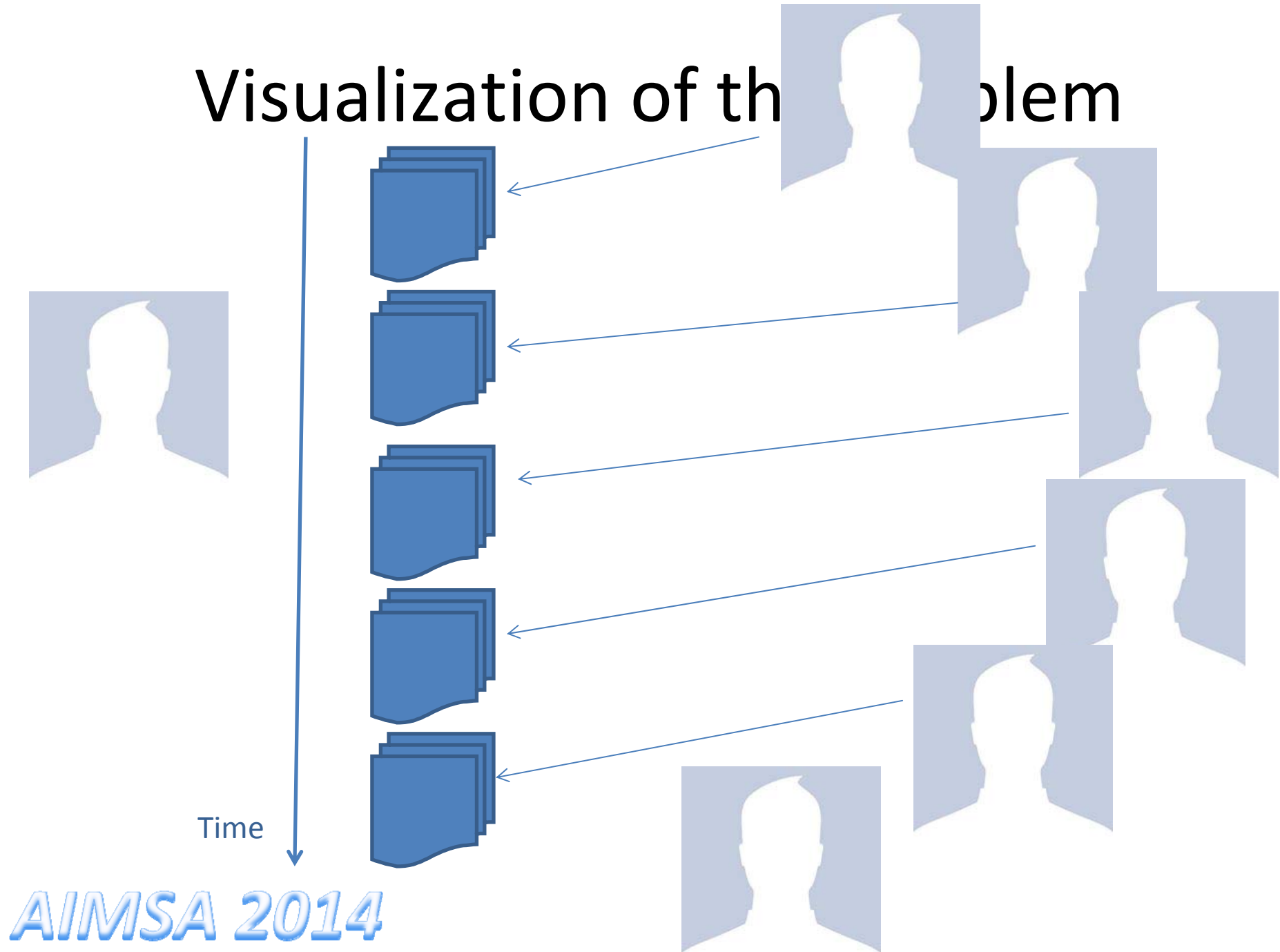
Which of the features will be useful for you:



# Problem Definition

- Large number of friends ( average 350+)
- News feed is difficult to manage
- Users want to have some power on the ranking of the news feed
- Users want to be sure that they are not missing interesting news

# Visualization of the problem



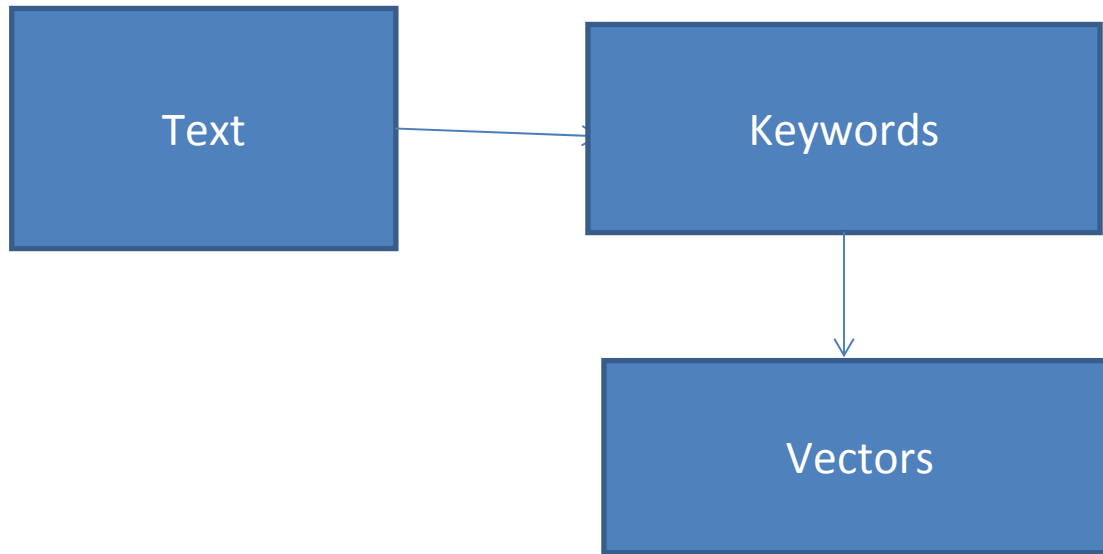
# Recommendation Approaches

- Content Based Recommendation
- Trust Based Recommendation
- Hybrid Recommendation

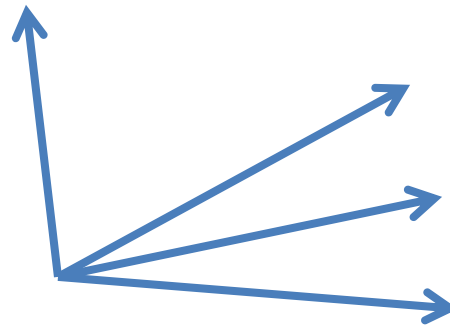
Things to consider:

- Time Factor

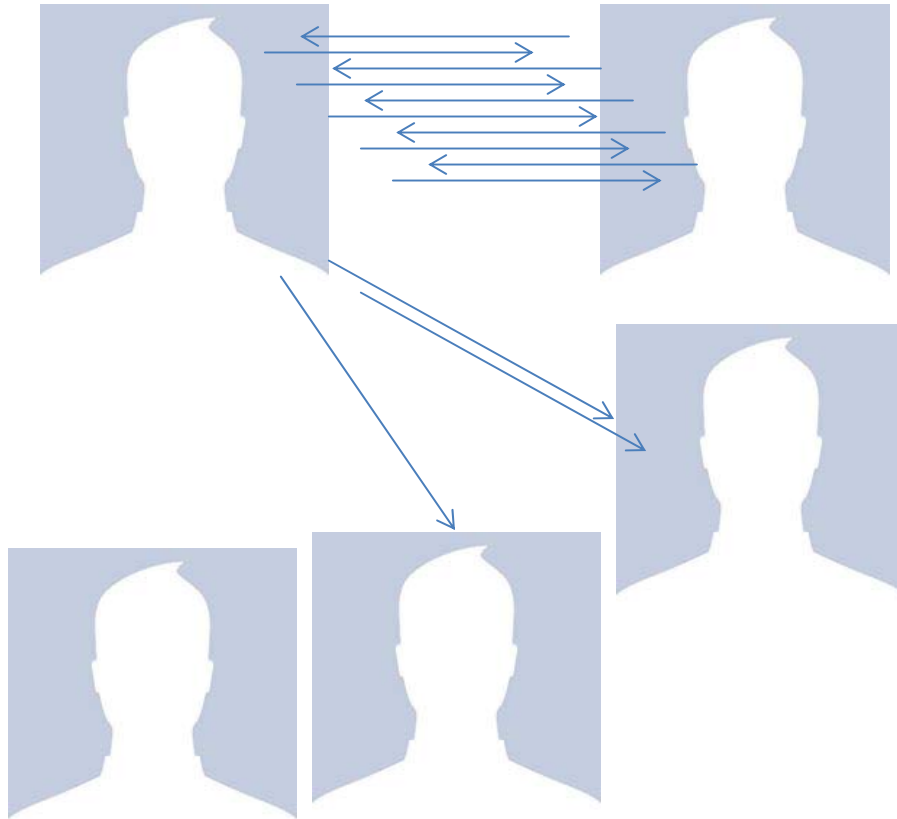
# Content Based Recommendation



$$\text{similarity}(d_a, u) = \frac{d_a \cdot u}{\|d_a\| \|u\|} = \frac{\sum_{i=1}^m d_{a,i} u_i}{\sqrt{\sum_{i=1}^m d_{a,i}^2} \sqrt{\sum_{i=1}^m u_i^2}} \quad (1)$$



# Trust Based Recommendation



- User activity/trust

$$trust_{ij} = \frac{\alpha \cdot like_{ij} + \beta \cdot comment_{ij} + \gamma \cdot share_{ij}}{published_j} + \mu \cdot \frac{activity_{ij}}{activity_j}$$

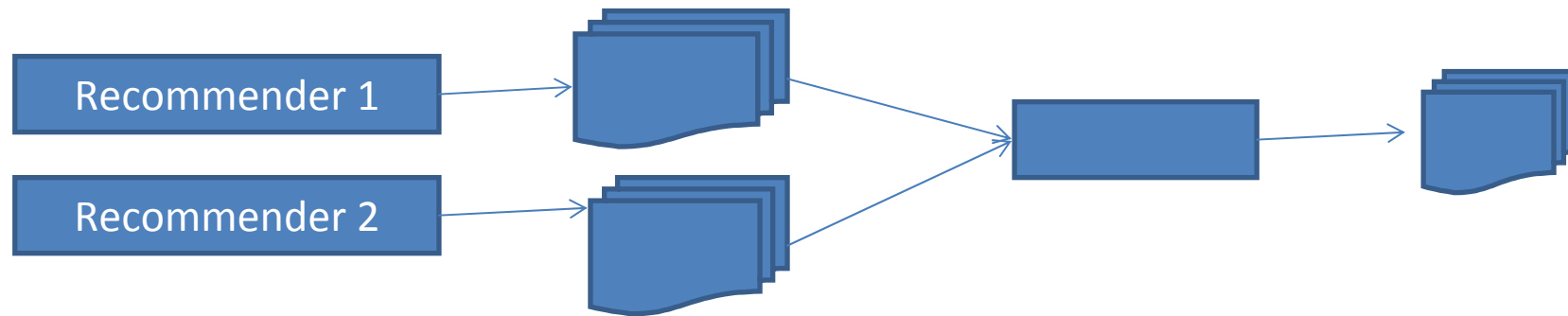
- News trust

$$trust_{ix} = \frac{trust_{awon_x} + \sum_{j \in \text{users interacted with } x} trust_{ij}}{maxtrust_i}$$

$$maxtrust_i = \sum_{j \in friends_i} trust_{ij}$$

# Hybrid Recommendation

- Parallel Approach



$$score_{ix} = \lambda trust_{ix} + (1 - \lambda) similarity_{ix}$$

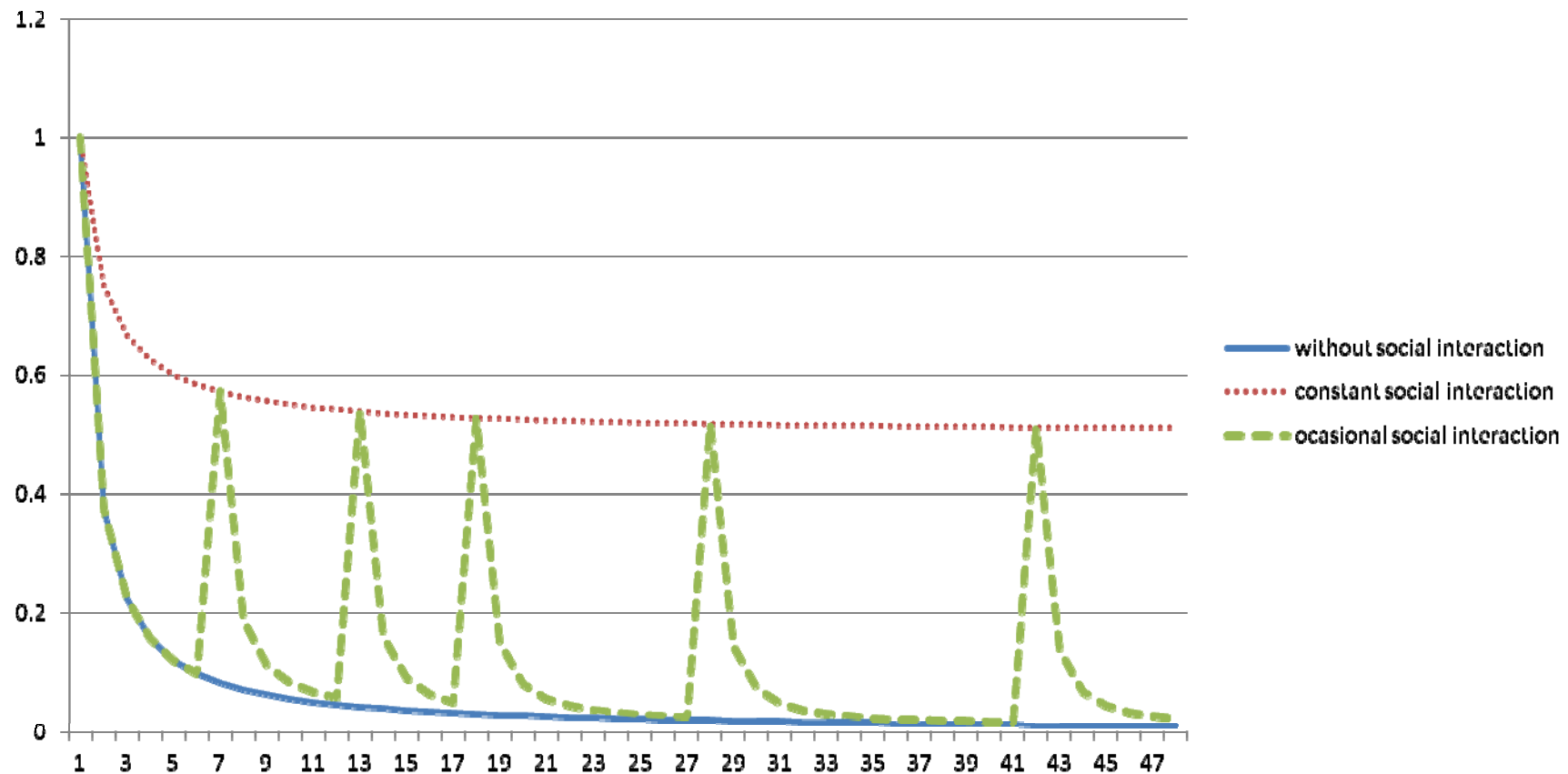
# Time Factor

- News have to decay in time.
- If there isn't social activity with the news it have to decay faster
- If after time social activity is assigned to the news its score have to be increased in order to get better rank at the list of news.



# Time Factor

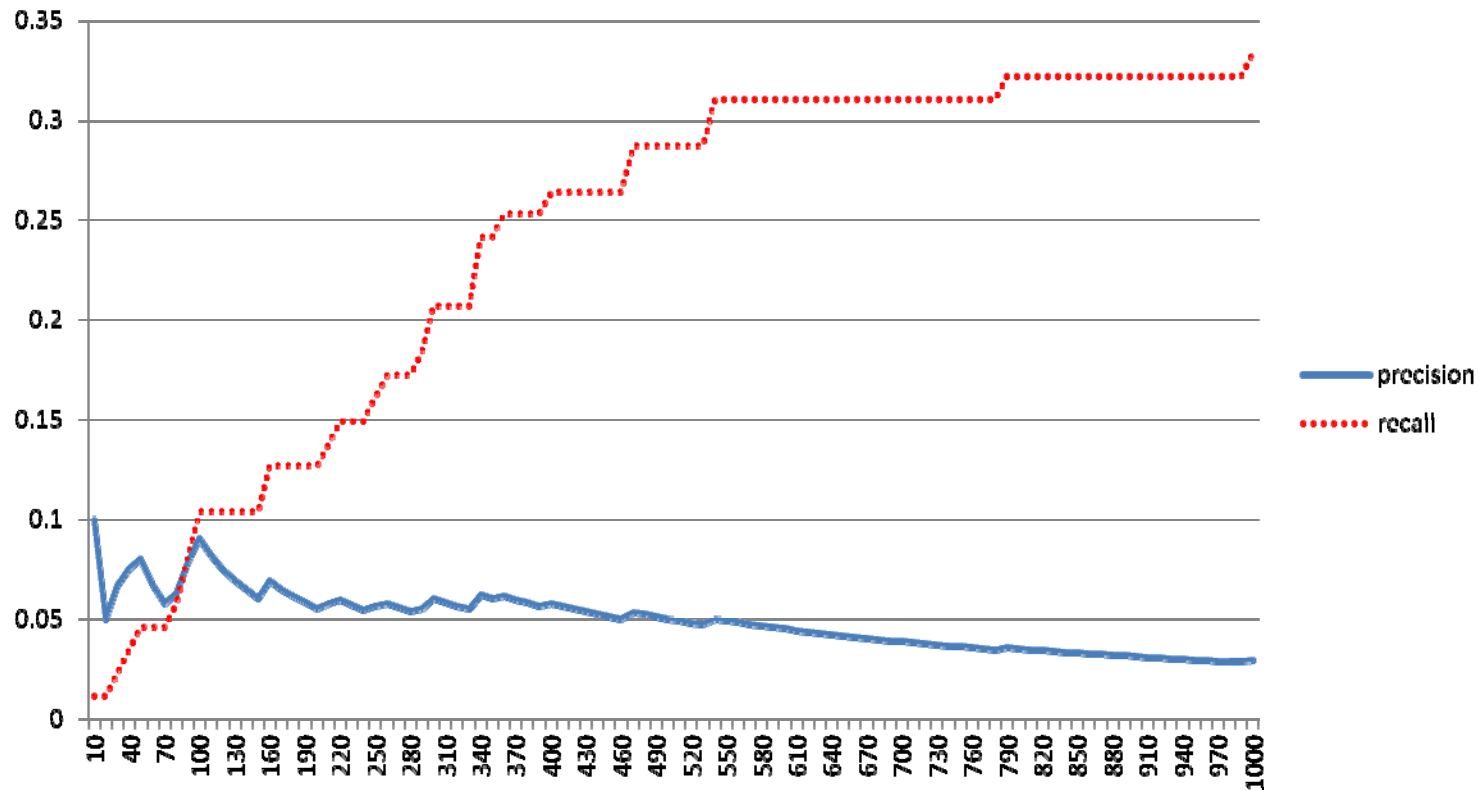
$$\text{score} \left( \frac{1}{2(t_{\text{now}} - t_{\text{post}} + 1)} + \frac{1}{2(t_{\text{now}} - t_{\text{updated}} + 1)^2} \right)$$



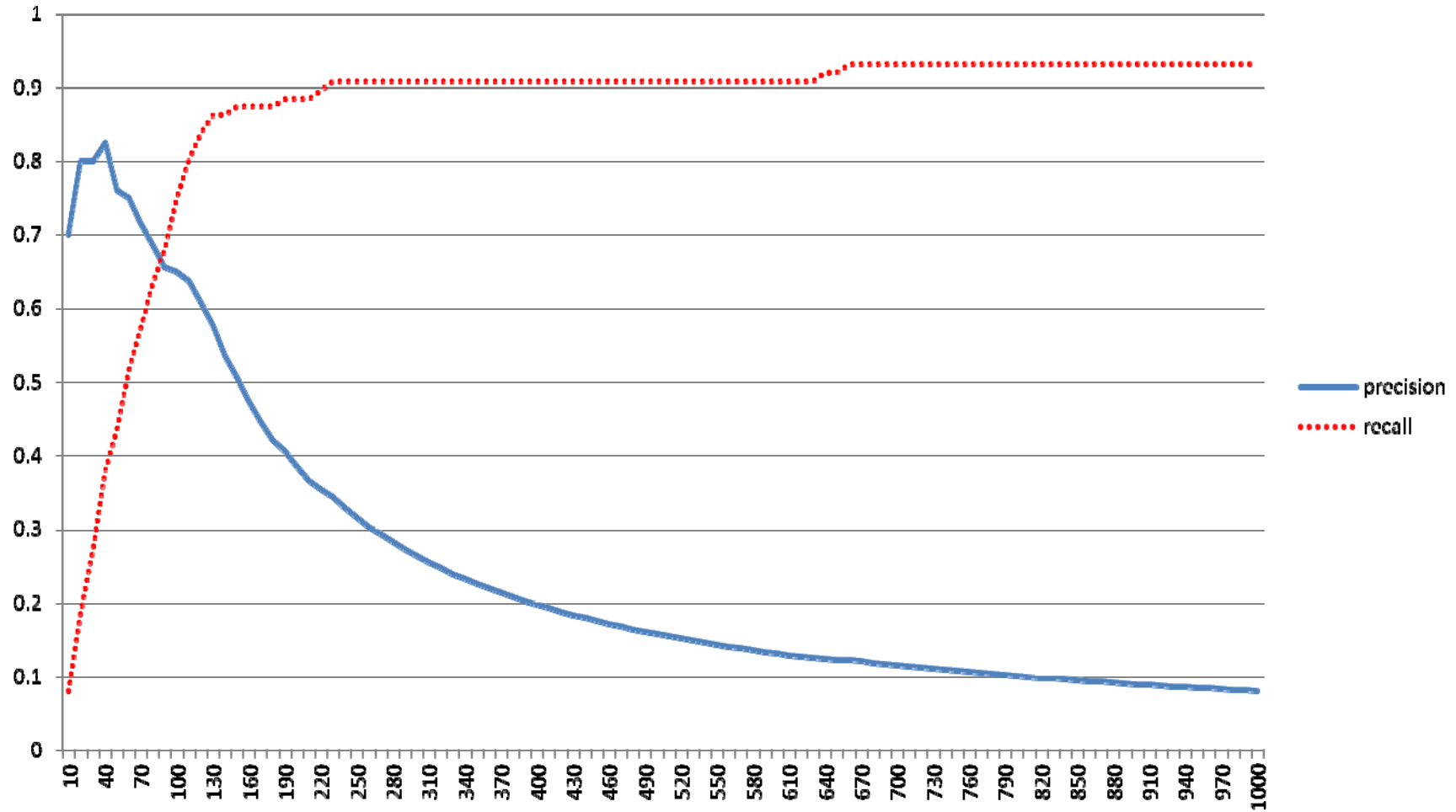
# Evaluation

- Offline Evaluation
  - Precision
  - Recall
- Online Evaluation
  - Experiments with real users and servey

# Evaluation - Content Based Approach

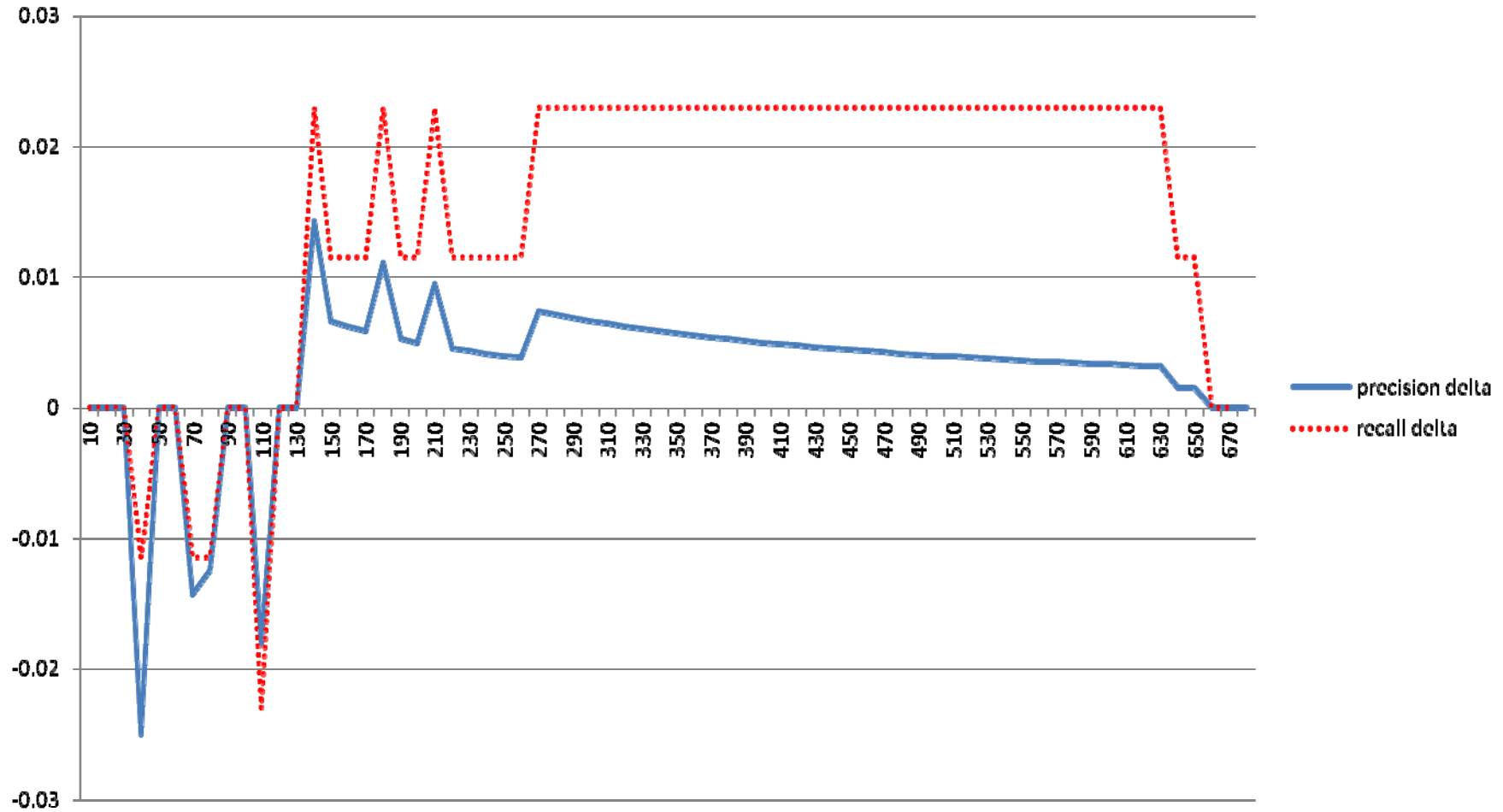


# Evaluation – Trust Based Approach



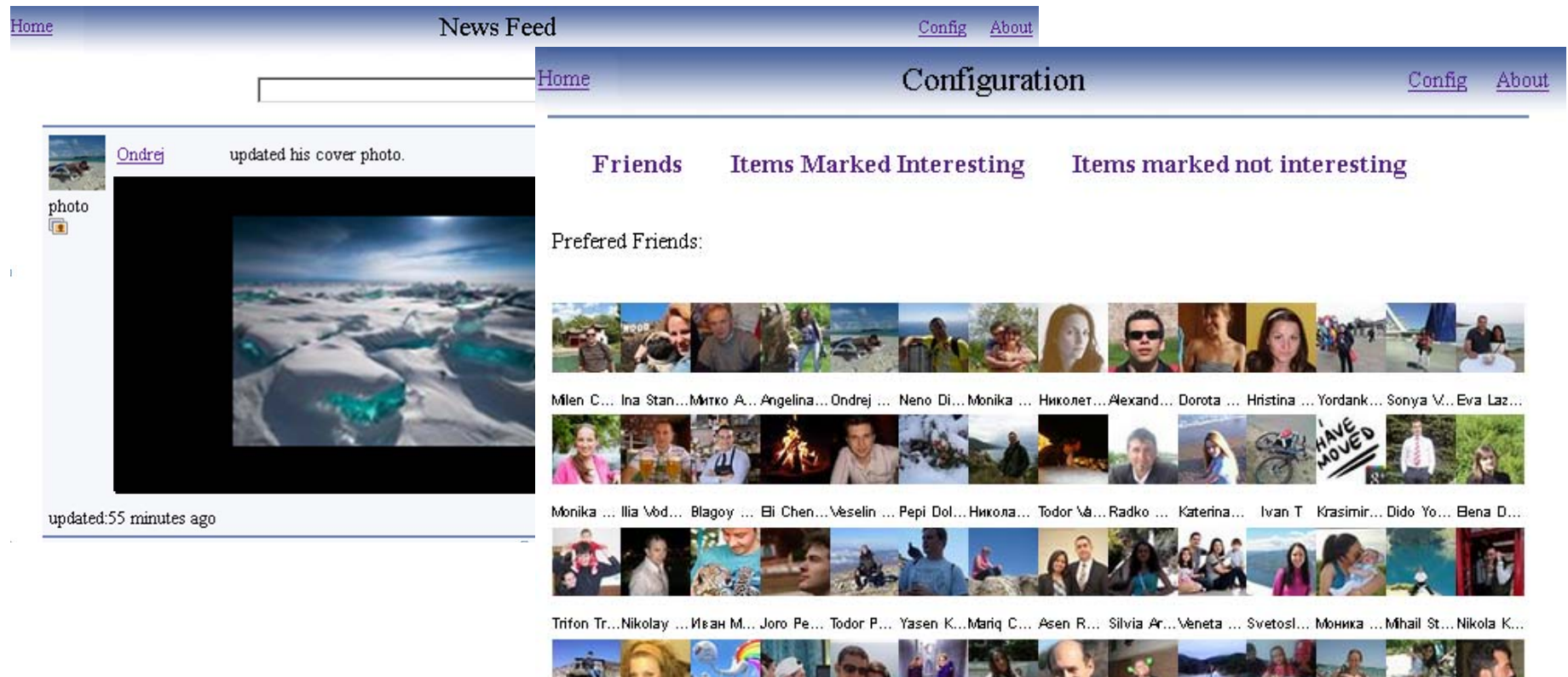
AIMSA 2014

# Evaluation: Hybrid Approach



# Online Evaluation

- Prototype:  
[http://apps.facebook.com/recommended\\_stream/](http://apps.facebook.com/recommended_stream/)



# Online Evaluation

- 32 participants
- Survey with 15+ questions
- Highlights:
  - 87% of the participants have trust at the recommendations they received
  - 93% - liked the decay of the news
  - 100% - liked the functionality for manual refinement of the user profile

# Conclusions

- Trust Based Recommendations have the best performance for the social network
- Users trust the recommendation of the prototype
- News Decay at Facebook can be simulated with the authors formula
- Users like the functionality of manual refinement of the user profile



Thank you!

*AIMSA 2014*

# Prototype demo

The image shows a browser window displaying a Facebook News Feed prototype. The browser's address bar shows the URL `https://apps.facebook.com/recommended_stream_d/`. The page title is "Recommended Stream Dev".

The News Feed is titled "News Feed" and includes a search bar. The first post is from "Ina Stanisheva" sharing a photo of "Hugh Laurie". The photo shows a man in a dark suit leaning over a dark wooden upright piano. To the right of the photo is a "Timeline Photos" section with the text: "Next stop on the tour... tonight in Riverside, CA at the Fox Performing Arts Center - <http://bit.ly/1gz7N4h>". Below this text is a list of 8 comments, each with a small profile picture and a timestamp: "house :)" (17 Jan. 1970 7:19:13), "..." (17 Jan. 1970 7:19:14), "..." (17 Jan. 1970 7:19:14), "test" (17 Jan. 1970 7:19:14), "test2" (17 Jan. 1970 7:19:14), "test3" (17 Jan. 1970 7:19:15), "test 4" (17 Jan. 1970 7:29:7), and "test 5" (17 Jan. 1970 7:29:9). The post has "1 likes" and is from "Milen Chechev". Interaction buttons for "unlike", "share", and "add comment" are visible.

The second post is also from "Ina Stanisheva" sharing a photo of "PETS&U". The photo shows a person's legs and a dog. To the right is another "Timeline Photos" section with the text: "Ако все още нямате планова за неделя, включете се в Шестият в поддръра на Осиговителския уикенд на Animal Rescue Sofa и PETS&U, заедно с Милена Славова и Никол Станкулова! Повече информация: <http://on.fb.me/1hyNcYD>". Below this text is a list of 1 comment with a timestamp: "..." (17 Jan. 1970 7:29:9).

The right sidebar contains several sections: "Your Apps" with icons for various games; "Recommended Games" with more game icons; "Recommended Pages" featuring "bettingtips7.com - 100% Winning Tips" and "Peter Stankulov likes this."; "Sponsored" with an advertisement for "Start Your Facebook Store" from shopify.com; "Red Army" with a 4-star rating and the text "Feel the real war!"; "Нова игра на табла" (New board game) for "PlayGem Social Backgammon" with a 4-star rating and "100,000 people played"; and "AECC Greece" with a link to `http://www.aecc.gr/index.php/aecc-event-СОФИЯ-ВЪЛГАРИЯ-Събота 7 Юни 2014...`.

At the bottom of the page, there is a status bar showing "97%" battery and "1 Chat (off)".