

# A Fuzzy-based Inference Mechanism of Trust for Improved Social Recommenders

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# Outline

- Introduction
- Recommender Methodology
- Fuzzy-Trust modeling
- Experiment and results

# Introduction

- Definition: Information filtering technique that attempts to present information items (movies, books, music, webpages, etc.) that are likely of interest to the user
- Early Applications:
  - Grouplens (Resnick, 1994)
  - Tapestry (Goldberg, 1996)
- Anatomy of Recommender Systems

# Recommender Methodology

	3	2		2		2	
	3	2	1		2		
	3	3		2		3	
	2	1	2	2	3	2	
		3	2	2		2	3
		1		2			3

Similarity Coefficient:

- Pearson correlation
- Cosine similarity

Input Data Representation

- Implicit / Explicit
- Normalization, categorization

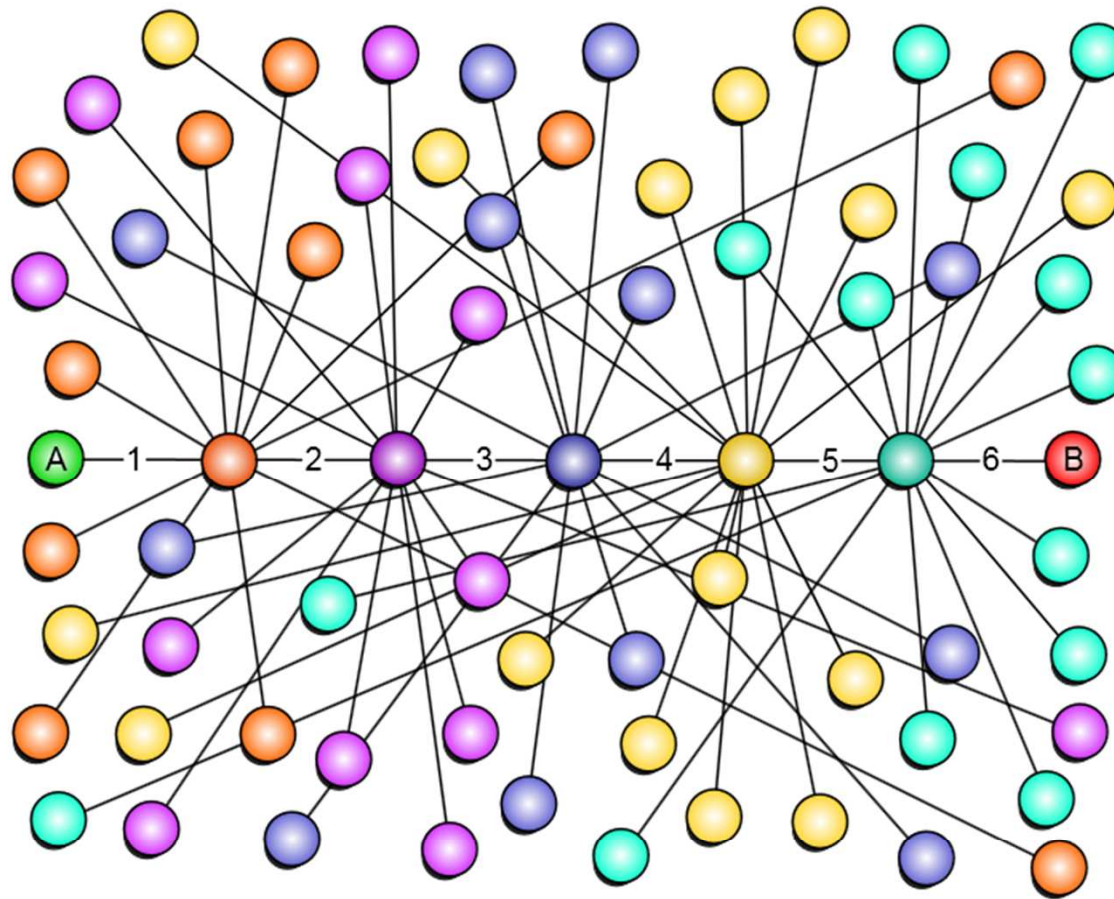
Neighborhood Formation

- Collaborative Filtering:
- item-to-item
  - user-to-user

Predictive Computation

Prediction Output

*"... Users like you are also interested in #1, #2, and #3 ..."*

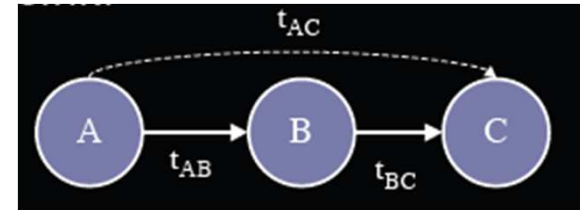


dw 2010

Social Networks complicate Recommenders

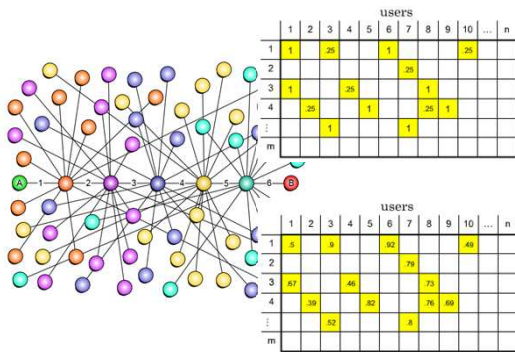
# Social Recommenders

- Trust Inference
- Sample Algorithms
  - Advogato (Levien, 2003)
  - Appleseed (Ziegler and Lausen, 2004)
  - TidalTrust (Golbeck, 2006)
  - MoleTrust (Massa and Avesani, 2007)
- Sociological Dimensions
  - Homophily (Lazarsfeld and Merton, 1954) and (McPherson, Smith-Lovin and Cook, 2001)
  - “Chain-links” (Karinthy, 1929), “Small World” problem (Milgram, 1967), and “Six Degrees of Separation” (John Guare, 1990)



# Fuzzy-Trust Modeling

Inputs

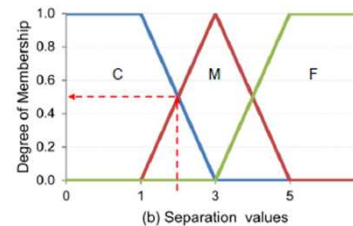
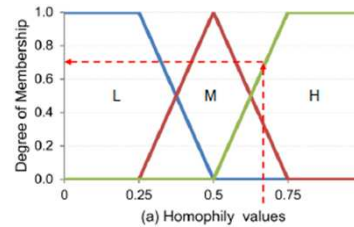


$$1. Homophily(u_m, u_n) = \frac{\{F_m = F_n\}}{\{F_m\} + \{F_n\} - \{F_m = F_n\}}$$

$$2. Separation(u_m, u_n) = ShortestPath_{m \rightarrow n}$$

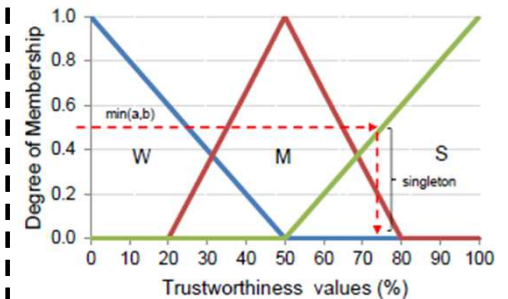
Inference Engine

Trustworthiness [0 - 100%]		Separation [1 - 6]		
		CLOSE	MEDIUM	FAR
Homophily [0 - 1]	LOW	Mild (#1)	Weak (#2)	Weak (#3)
	MEDIUM	Strong (#4)	Mild (#5)	Weak (#6)
	HIGH	Strong (#7)	Strong (#8)	Mild (#9)



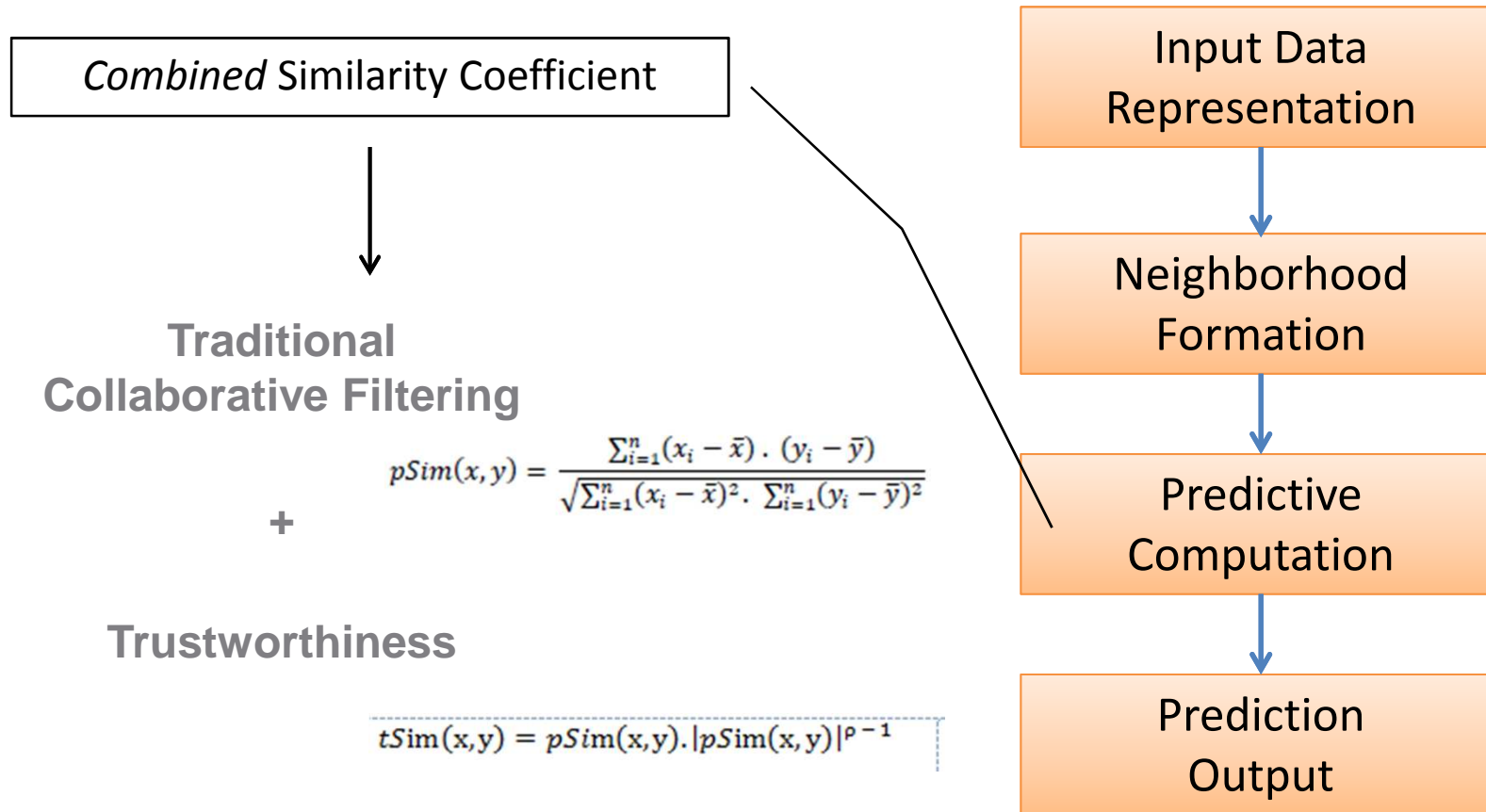
Output

Trustworthiness



	users											
	1	2	3	4	5	6	7	8	9	10	...	n
1	.5		1			1				1		
2		1				.5				1		
3	1			1				1	1			
4		1			.5		1		1			
...			.5				1					
m				1					.5			

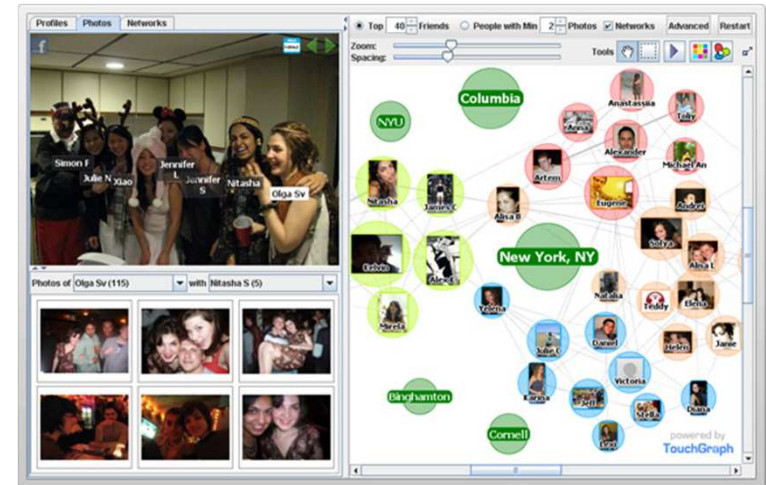
# Fuzzy-Trust Social Recommender





# Experimental Results

- Dataset
  - MovieLens, etc. → not adequate
  - [www.facebook.com/rate-a-movie/experiment](http://www.facebook.com/rate-a-movie/experiment)
  - TouchGraph Facebook Browser
  - 27 people, 7 movies, 26 ratings



- Evaluation metrics and results

$$MAE = \frac{1}{n} \sum_{i=1}^n |y_i - \hat{y}_i|$$
$$RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2}$$

Strategy	MAE	RMSE
Traditional	0.7819	0.9706
Proposed	0.7503	0.9302
<b>Improvement</b>	<b>4.04%</b>	<b>4.16%</b>

# Conclusions

- Social trust can be an effective way of recommending user-generated content
- Requires methods for inferring Trust
- Proposed Fuzzy Prediction
  - Relevant Social Phenomena metrics
  - Improves current techniques
- Future Work / Challenges
  - extend the recommender strategy to very large social networks (“Too Far”, “Too Close” linguistic variables)

# Merci

- Any questions or comments ?