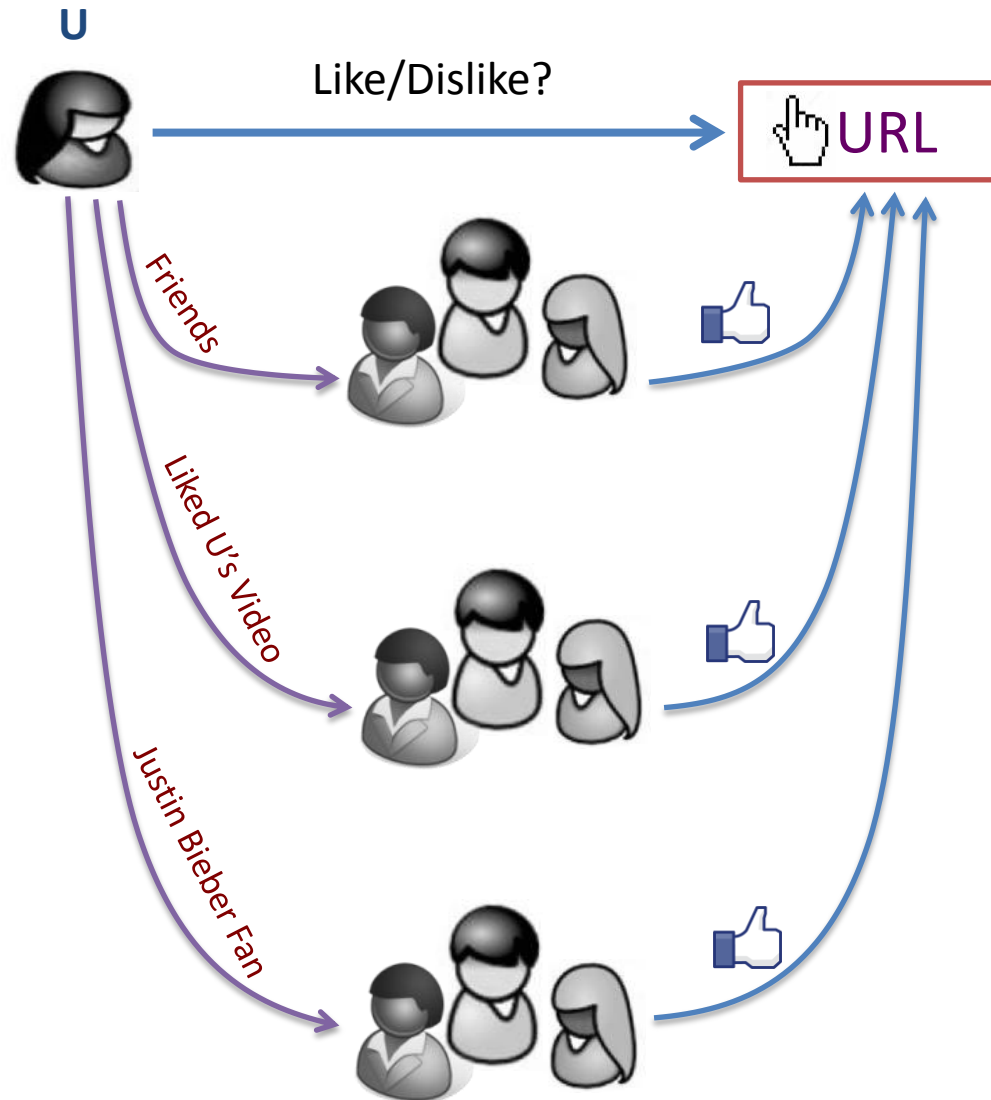


Social Affinity Filtering: Recommendation through Fine-grained Analysis of User Interactions and Activities

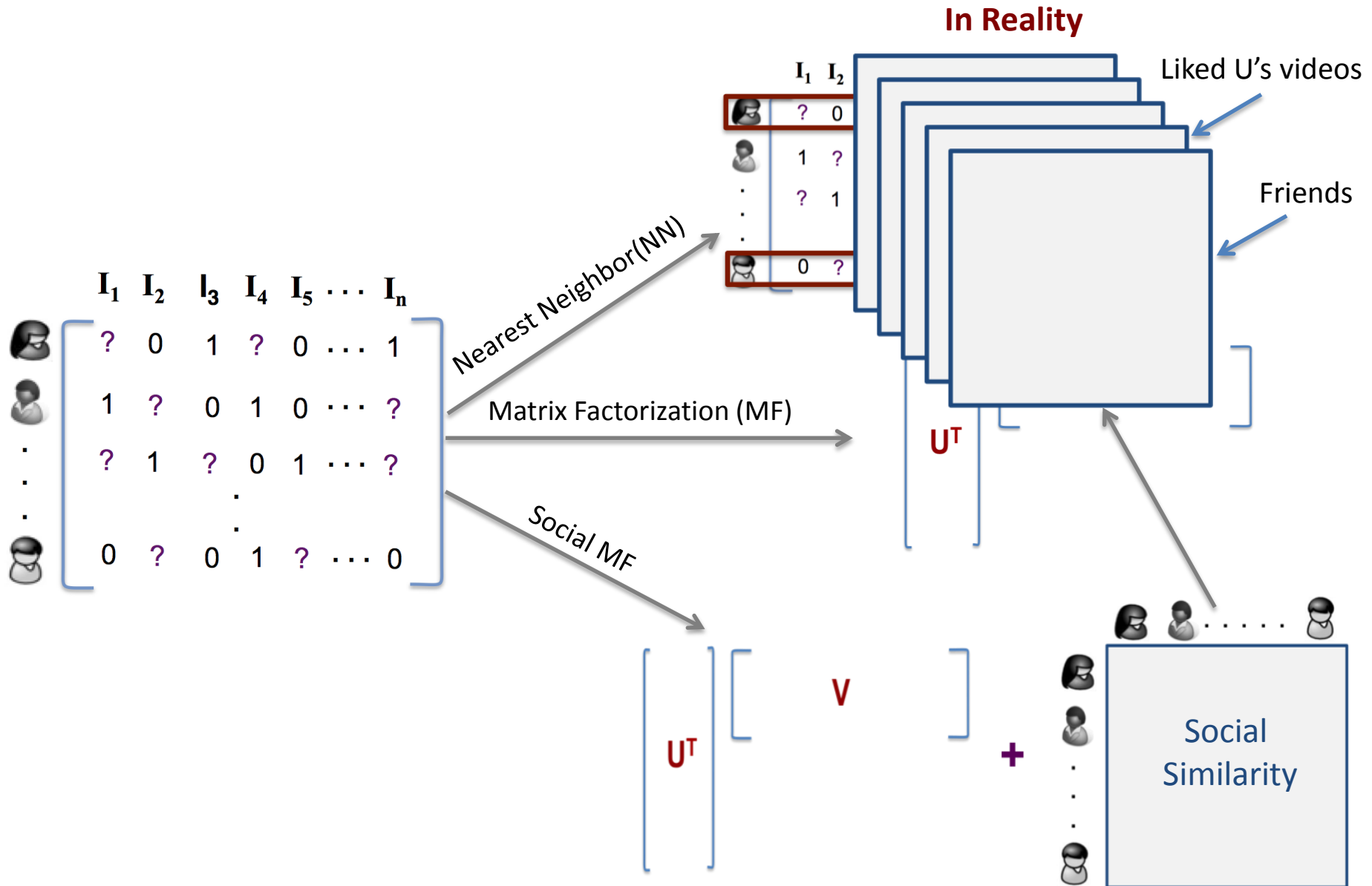
Suvash Sedhain, Scott Sanner, Lexing Xie,
Riley Kidd, Khoi-Nguyen Tran, Peter Christen

Australian National University
NICTA

Social Recommendation: Problem Setting



Motivation



Key Question

- Can we do better social recommendation via fine-grained analysis of different interactions?



YES !!

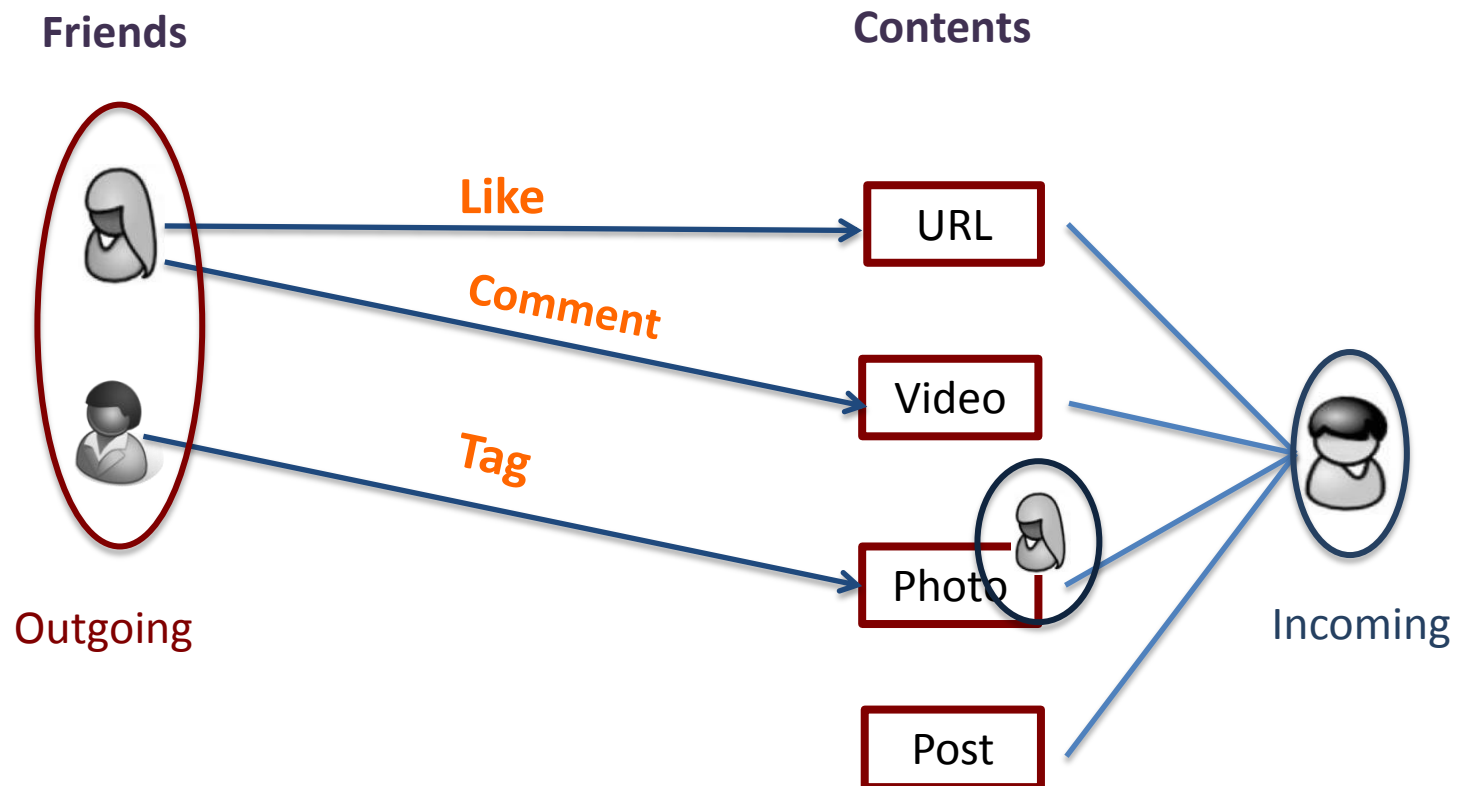
Outline

- Motivation
- Rich social features
 - Facebook interactions and activities
 - Social affinity features
- Experiment
- Results and discussion
- Summary

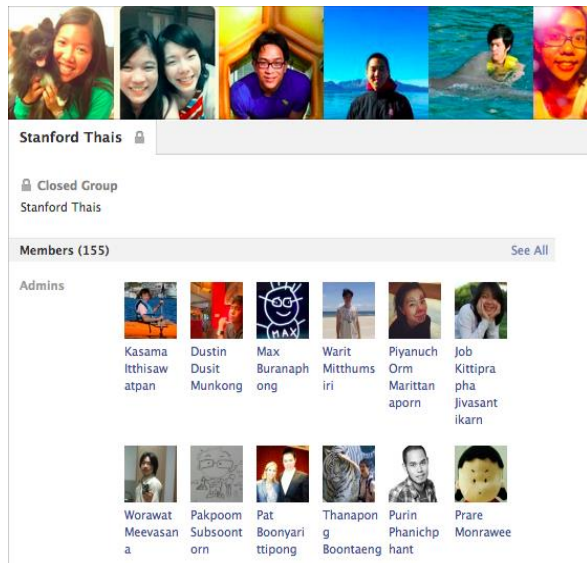
Facebook Interactions

$\{\text{link, post, photo, video}\} \times \{\text{like, tag, comment}\} \times \{\text{incoming, outgoing}\}$

23 interactions



Facebook Activities



Groups
3,469



Pages
10,771



Favourites
4,284

Social Affinity Features

		Interactions		Activities			Social Affinity Filtering(SAF)		
		LINK-LIKE-INCOMING	LINK-LIKE-OUTGOING		BIG BANG THEORY	FACEBOOK	SHAKIRA		Like / Dislike ?
User-Item	u_1, i_5	1	0		0	0	1		1
	u_1, i_8	0	0		0	0	0		0
	u_2, i_5	1	1	...	0	1	0	...	1
	u_2, i_7	0	1		1	0	0		1
				
	<hr style="border-top: 1px dashed #800000;"/>								
	u_1, i_7	0	1		1	0	1		?
	u_2, i_9	0	0	...	0	0	1	...	?
	u_2, i_8	1	0		1	1	0		?
				

Social Affinity Filtering(SAF)

- Naïve Bayes
- Logistic Regression
- SVM

Data Description

<http://www.youtube.com/watch?v=rtOvBOTyX00>

Christina Perri - A Thousand Years (Official Music Video)
 © 2011 WMG "a thousand years" on itunes:
<http://atlr.ec/npHAdW> directed by: jay martin "a thousand years"
 is a brand new song me + my best friend david hodge...

Rate this Recommendation: ☒ Not Rated ☐ Like ☐ Dislike

Comment: [Save Comment](#)

[Post Link to Your Wall](#)
 Recommended on Mon, 30 Jan 2012 at 09:39

 **Original Post from Khoi-Nguyen Tran** on Wed, 18 Jan 2012 at 05:00
 Message: Religion for Atheists

http://www.ted.com/talks/alain_de_botton_atheism_2_0.html?awesm=on.ted.com_deBotton&utm_campaign=&utm_medium=on.ted.com-static&utm_source=direct-on.ted.com&utm_content=awesm-publisher

Alain de Botton: Atheism 2.0 | Video on TED.com
 What aspects of religion should atheists (respectfully) adopt?
 Alain de Botton suggests a "religion for atheists" -- call it
 Atheism 2.0 -- that incorporates religious forms and traditions
 to satisfy our human need for connection, ritual and
 transcendence.

LinkR: Link Recommender App

119 users and 37,872 friends

Ego network of App Users	Tags	Comments	Likes
Post	1,215,382	3,122,019	1,887,497
Link	—	891,986	995,214
Photo	9,620,708	3,431,321	2,469,859
Video	904,604	486,677	332,619

	App Users	Ego Network of App Users
Groups	3,469	373,608
Page Likes	10,771	825,452
Favourites	4,284	892,820

Experiment Setup

- **Baselines**

- Non- Social Methods

- Nearest Neighbors(NN)
 - Matchbox (MF)

- Social Methods

- Social Matchbox (SMB)
- [Noel et al. WWW 2012]

- **Social Affinity Filtering**

- Interactions

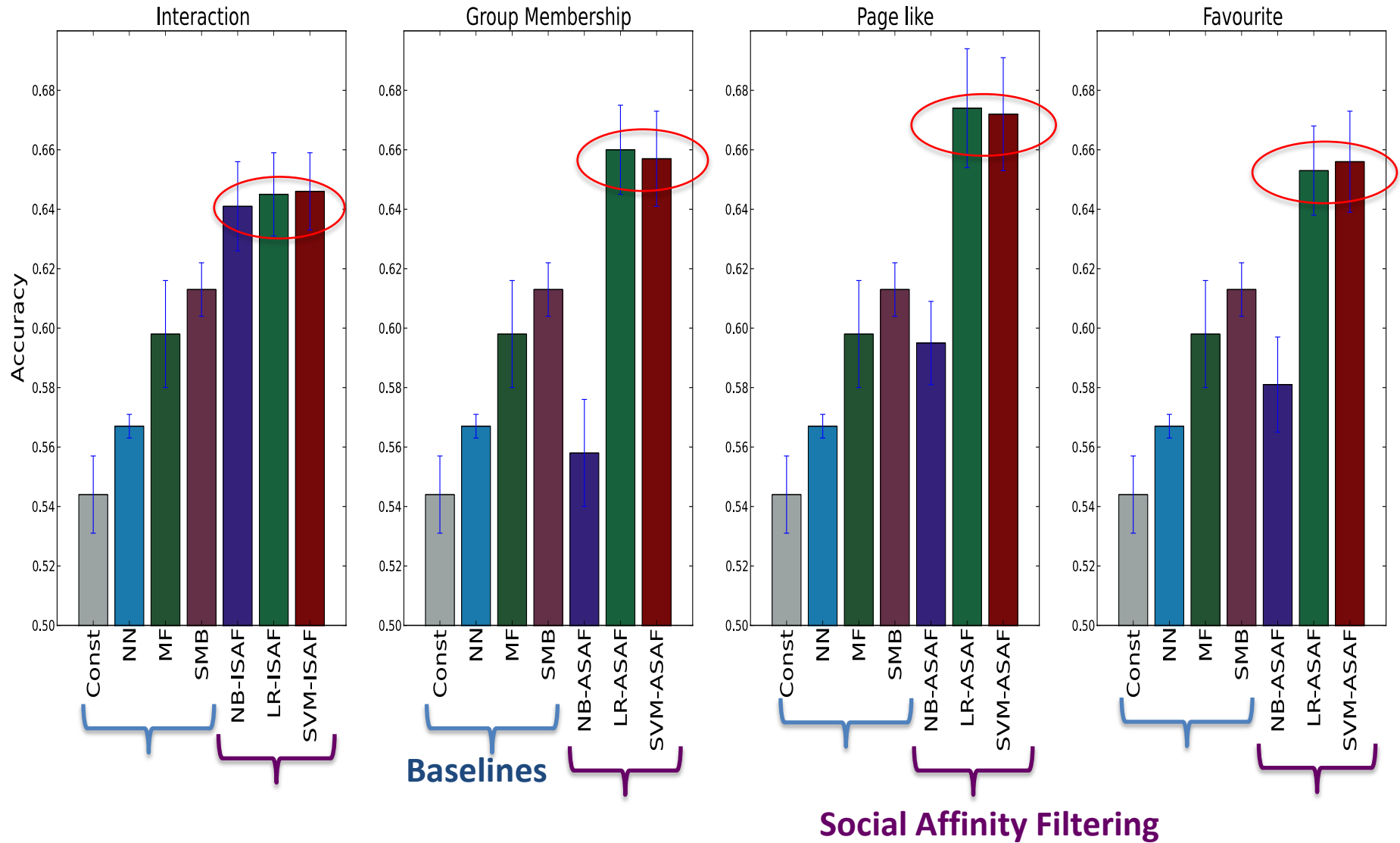
- Naïve Bayes (NB-ISAF)
 - Logistic Regression (LR-ISAF)
 - SVM (SVM-ISAF)

- Activities

- Naïve Bayes (NB-ASAF)
 - Logistic Regression (LR-ASAF)
 - SVM (SVM-ASAF)

Reported results are based on 10 fold cross-validation

SAF Accuracy



Outline

- Motivation
- Rich social features
- Experiment
- Discussion
 - Interaction Analysis
 - Activity Analysis
- Summary

Are all Interactions Equally Informative?

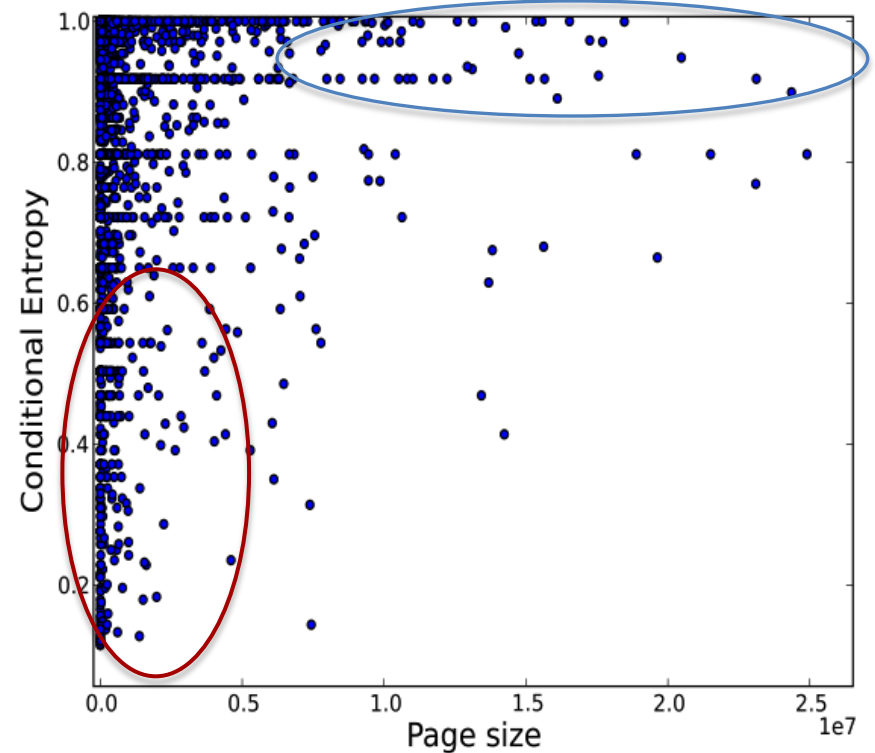
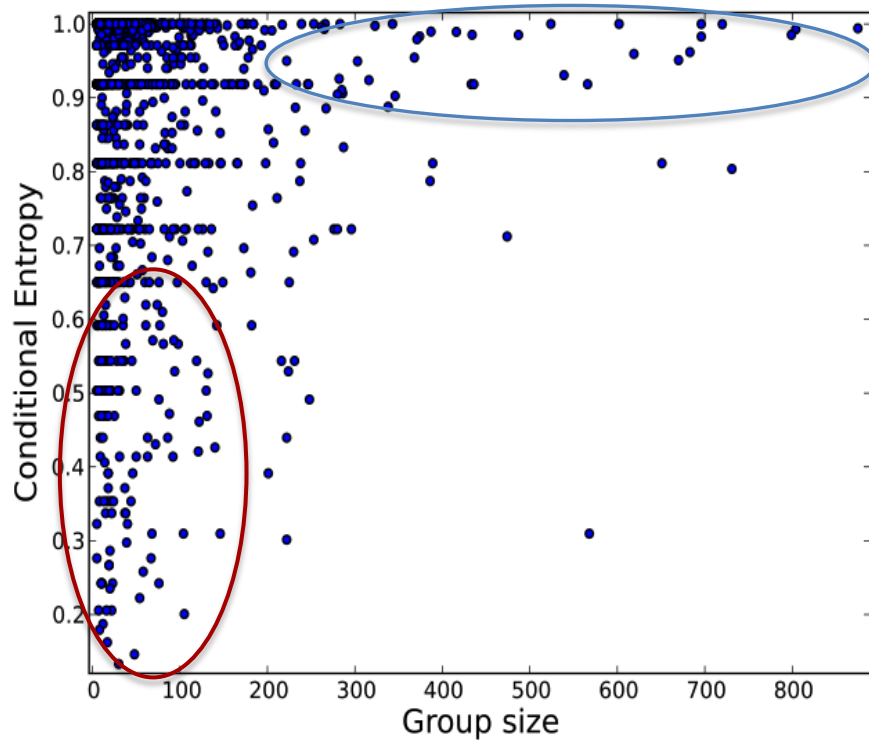
Conditional Entropy as a measure of informativeness

Modality (X)	$H(Y X = \text{true})$
video	0.850
link	0.915
post	0.918
photo	0.926

Action-Direction (X)	$H(Y X = \text{true})$
photo-outgoing	0.857
video-outgoing	0.863
link-outgoing	0.895
link-incoming	0.896
post-incoming	0.902
post-outgoing	0.906
video-incoming	0.915
photo-incoming	0.921

Are large groups more informative than small groups?

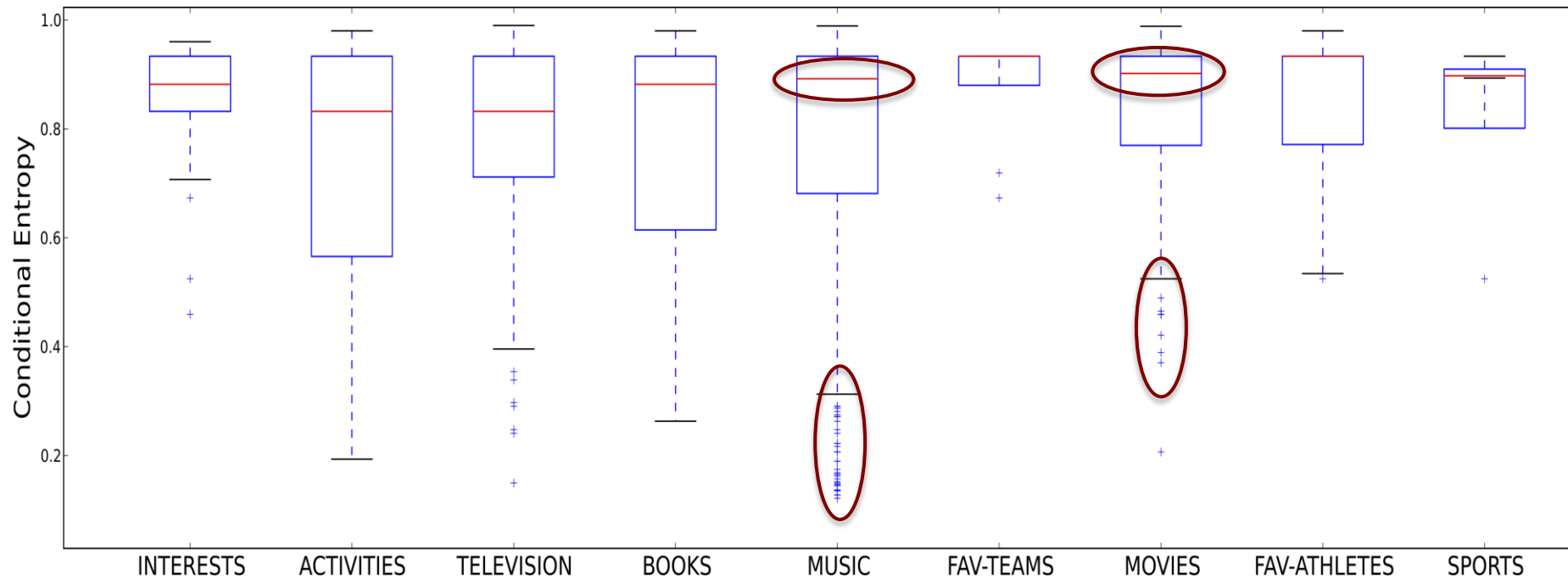
Large group tend not to be predictive



Most predictive group were small in size

Are all favourites equally informative?

- Majority of them are less informative
- Very Informative outliers



Most and Median Informative Favourites

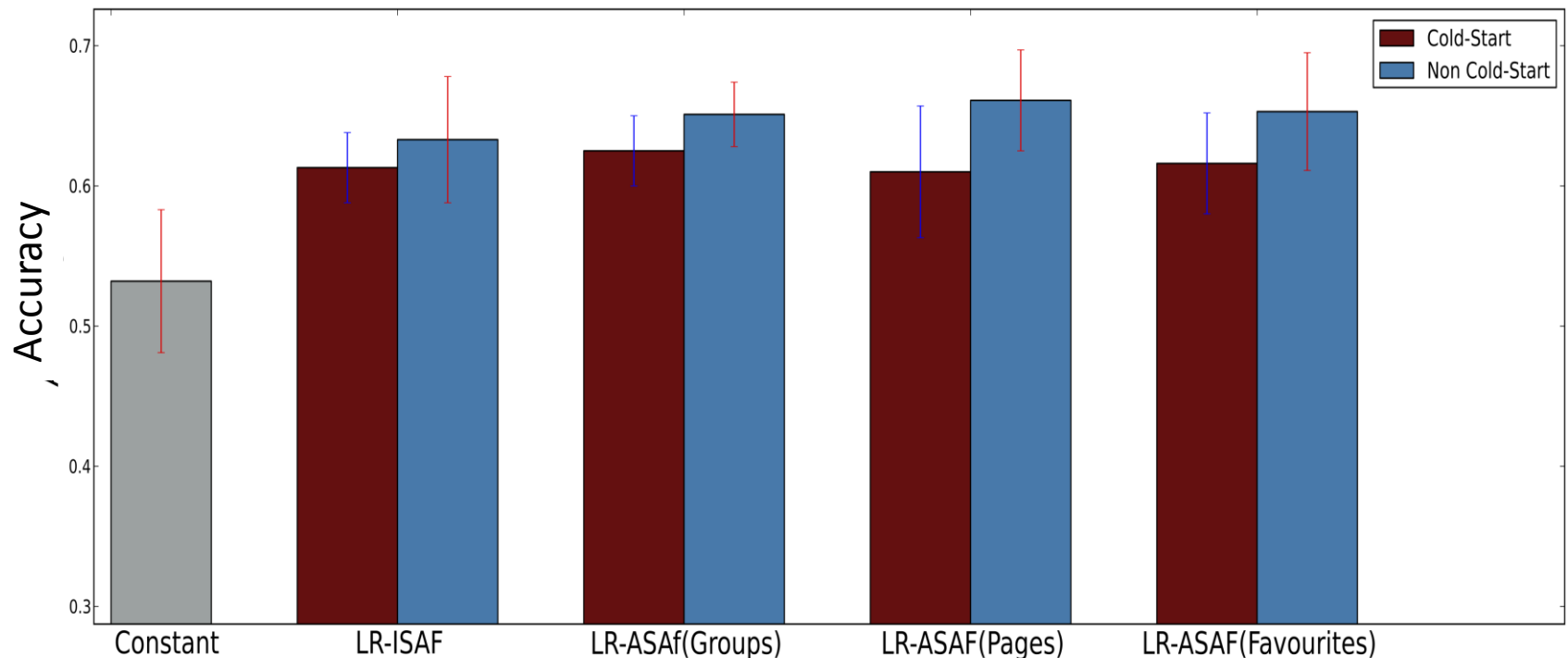
Median Informative Favourites by Category		
Movies	Music	Television
Forrest Gump	John Lennon	Futurama
Pretty Woman	U2	Star Trek
Napoleon Dynamite	AC/DC	The Trap Door
Harry Potter	The Smashing Pumpkins	Drawn Together
Toy Story 3	Gotye	Sherlock(Official)
The Godfather	The Rolling Stones	Hitchhiker's Guide to the Galaxy
Mulan	All Axess	Buffy The Vampire Slayer
How to Train Your Dragon	Steve Aoki	South Park

Most Informative Favourites by Category		
Movies	Music	Television
Billy Madison	Avascular Necrosis	Metalocalypse
Team America: World Police	Tortured	Beast Wars
Pan's Labyrinth	Elysian	Hey Arnold!
Pirates of the Caribbean	Anno Domini	Sherlock
Aladdin	Darker Half	Hey Hey It's Saturday
Starship Troopers	Hellbringer	Neil Buchanan and Art Attack!
Happy Gilmore	Johnny Roadkill	Breaking Bad
Timon and Pumbaa	Aeon of Horus	Red vs. Blue

- Median favorites were generic
- Most informative were specialized

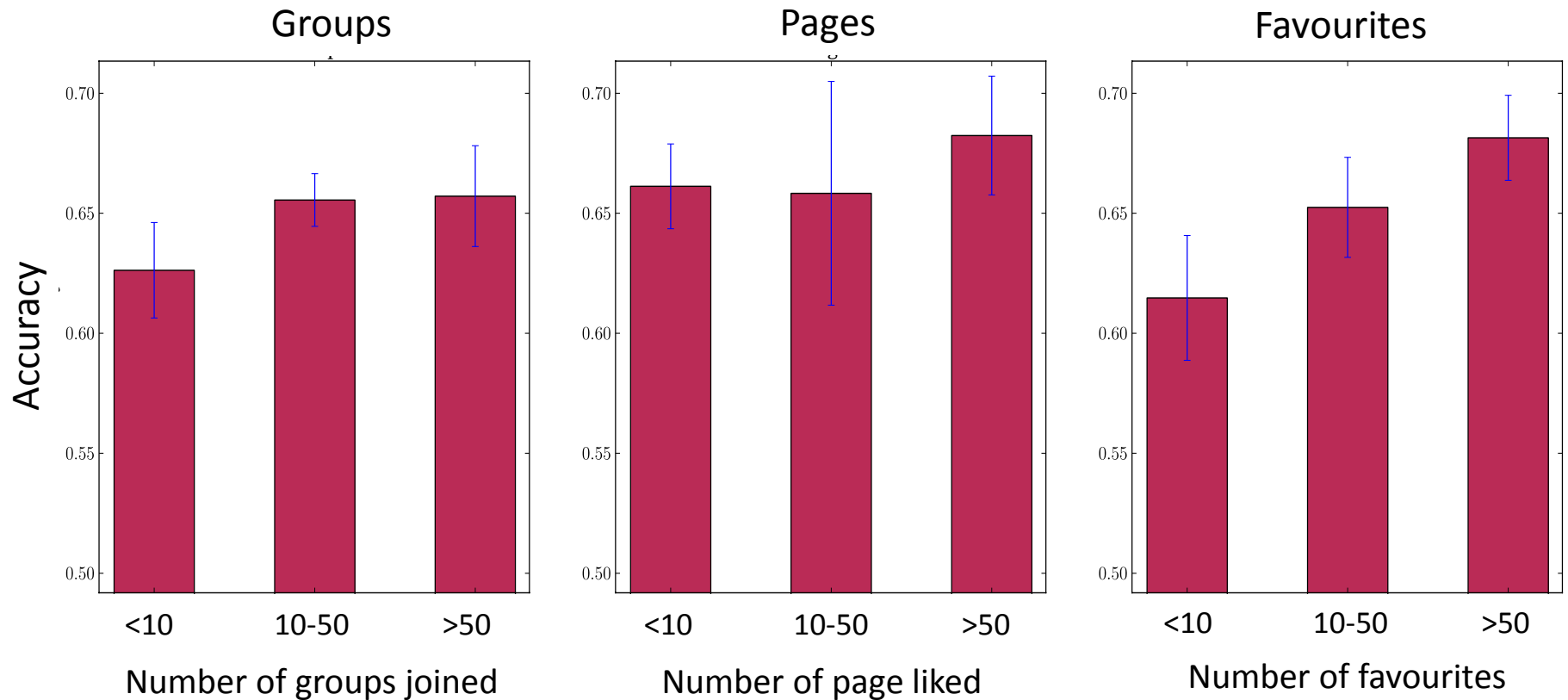
SAF for User Cold start

- User cold start : new user problem
- Cold-Start Predictor: Held out test users from training dataset
- Non Cold-Start : Train on full training dataset



Is having more social activity better?

- More activity is better for Social Affinity Filtering



Power of page likes

- Relates to the recent work
 - Page likes help to predict gender, relationship status, religion etc.
 - Michal Kosinska, David Stillwella, and Thore Graepel, Private traits and attributes are predictable from digital records of human behavior, PNAS 2013
 - Page likes help to predict user purchase behavior in ebay
 - Yongzheng Zhang and Marco Pennacchiotti, Predicting purchase behaviors from social media, WWW '13

Summary

- Social Affinity Filtering (SAF)
 - Novel social recommendation
 - scalable
- All Interactions and activities are not equally predictive
 - Interactions in videos are more predictive than other modalities
 - Small sized activities tends to be more predictive
- Future work
 - Predict with only likes (no dislikes)
 - SAF + MF/NN
- If you are building social recommender
 - Ask for Facebook page likes
 - Use SAF to build scalable state-of-the-art recommender system

Thanks!!!