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New Objective Functions for Social Collaborative Filtering

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Abstract Insert your abstract here. Include keywords, PACS and mathematical subject classification numbers as needed.

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1 Introduction

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2 Experiments

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2.1 Experiment 1

For the first experiment, we evaluated each algorithm using 10-fold cross validation by training and testing on only ACTIVE data. Objectives for each

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	Accuracy	Precision	Recall	F1
FIW	0.7507	0.8208	0.5335	0.6467
FUW	0.4274	0.4274	1.0	0.5989
Global	0.4274	0.4274	1.0	0.5989
Hybrid	0.7140	0.6722	0.6607	0.6615
Logistic Regression	0.7196	0.6869	0.6335	0.6590
Matchbox	0.6243	0.6103	0.3367	0.4338
NN	0.4274	0.4274	1.0	0.5989
Soc. Hybrid	0.7228	0.6969	0.6307	0.6597
Soc. Matchbox	0.6253	0.6151	0.3339	0.4325
Spec. Copreference	0.6297	0.6240	0.3392	0.4392
SVM	0.6779	0.6093	0.7897	0.6811
Spec. Matchbox	0.6338	0.6310	0.3466	0.4471

	Accuracy	Precision	Recall	F1
FUW	0.4274	0.4274	1.0000	0.5989
FIW	0.4206	0.4235	0.9840	0.5922
Global	0.4274	0.4274	1.0000	0.5989
Hybrid	0.6989	0.6213	0.7590	0.6831
LogisticRegression	0.7030	0.6244	0.7674	0.6883
Matchbox	0.6225	0.5932	0.3787	0.4612
NN	0.4274	0.4274	1.0000	0.5989
Soc. Hybrid	0.7055	0.6239	0.7855	0.6952
Soc. Matchbox	0.6243	0.6204	0.3148	0.4171
Spec. Copreference	0.62598	0.6117	0.3448	0.4408
Spec. Matchbox	0.6238	0.6043	0.3508	0.4437
SVM	0.6912	0.6145	0.7586	0.6772

algorithm were optimized via gradient descent. λ's for the matrix factorization based algorithms were tuned prior to the start of the trial by a systematic line (grid) search over 10^n for $n \in \{-10, -9, ..., 10\}$ to maximize accretion on 10% held-out data, training on the other 90%. This was repeated for $K \in \{3, 5, 7, 10, 15, 20, 30\}$ to find the best K. N and C were tuned similarly via line search over $N \in \{1, 2, ..., 250\}$ and $C \in [2^{-15}, 2^{15}]$.

2.2 Experiment 2

For the 2nd experiment, we wanted to see whether including PASSIVE data improves on the results over using solely ACTIVE data. To test this, we evaluated the algorithms by training them on UNION data and testing on ACTIVE data. The train/test split over the ACTIVE data is exactly the same as in Experiment 1, but this time we supplement each training with additional PASSIVE data. The PASSIVE data used are all the links that were "liked" by the users on Facebook. The hyper parameters were tuned as in Experiment 1.

Again, Soc. Hybrid was the best performing accuracy. However, most algorithms performed worse with the addition of PASSIVE data during training than with just using ACTIVE data. This suggests that the "likes" on the

	Accuracy	Precision	Recall	F1
Matchbox	0.6243	0.6103	0.3367	0.4338
Matchbox (No Features)	0.6175	0.6366	0.2512	0.3582
Soc. Matchbox	0.6238	0.6235	0.3024	0.4070
Social Matchbox (No Features)	**0.6149**	**0.6391**	**0.2272**	**0.3344**

	Accuracy	Precision	Recall	F1
Global	0.4396	0.4396	1.0000	0.5840
FUW	0.4396	0.4396	1.0000	0.5840
FIW	0.7911	0.5737	0.6382	0.5970
Hybrid	0.7059	0.5252	0.5505	0.5112
Matchbox	0.6145	0.4735	0.3104	0.3523
SocialHybrid	0.7134	0.4773	0.4902	0.4545
SocialMatchbox	0.6157	0.4640	0.2896	0.3360
SpectralCopreference	0.6248	0.4865	0.3096	0.3568
SpectralMatchbox	0.62557	0.4994	0.3250	0.3686
LogisticRegression	0.7175	0.4916	0.4868	0.4527
NN	0.4396	0.4396	1.0000	0.5840
SVM	0.6702	0.5264	0.7347	0.5932

PASSIVE data aren't as informative of the user's preferences than the explicit "likes" and "dislikes" in the ACTIVE data.

2.3 Experiment 3

For Experiment 3, we wanted to check weather the addition of user ad item features actually helps with the performance of the algorithms, over just using the latent features in matrix factorization. We repeated the same experiments as in Experiment 1 for Matchbox and Soc. Matchbox, but removed the user and item features. Matchbox hence basically becomes the PMF algorithm described in Salakhutdinov and Mnih.

2.4 Experiment 4

For the next experiment, we wanted to reevaluate the algorithms again in the same manner as in Experiment 1, but using Macro Averaging when calculating the metric.

2.5 Experiment 5

For Experiment 5, we tested the Social Matchbox and Spectral Matchbox algorithms using different ways of normalizing the Social Interaction measure between the two users.

MaxNormalizationNoLog

	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6280	0.6346	0.3070	0.4137
SpectralMatchbox	0.6353	0.6342	0.3487	0.4497

	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6255	0.6169	0.3307	0.4301
SpectralMatchbox	0.6231	0.6101	0.3289	0.4270

	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6261	0.6186	0.3293	0.4294
SpectralMatchbox	0.6345	0.6321	0.3487	0.4492

Algorithm	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6274	0.6310	0.3120	0.4171
SpectralMatchbox	0.6373	0.6351	0.3565	0.4563

MaxNormalizationWithLog
MaxNormalizationWithLogPlus1
MeanNormalizationNoLog
MeanNormalizationWithLog
MeanNormalizationWithLogPlus1

2.6 Experiment 6

For the last experiment, we simulated the cold-start problem by giving each algorithm more 25% more training data for each user. We wanted to see if the additional training data helps improve the training. Aside from the additional training data, the experimental setup is the same as in Experiment 1.

Paragraph headings Use paragraph headings as needed.

$$a^2 + b^2 = c^2 \tag{1}$$

Algorithm	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6238	0.6235	0.3024	0.4070
SpectralMatchbox	0.6231	0.6103	0.3314	0.4293

Algorithm	Accuracy	Precision	Recall	F1
SocialMatchbox	0.6261	0.6198	0.3240	0.4252
SpectralMatchbox	0.6338	0.6310	0.3466	0.4471

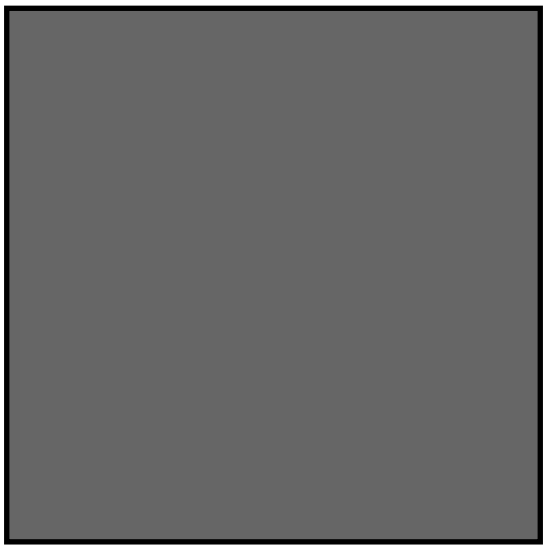

Fig. 1 Please write your figure caption here

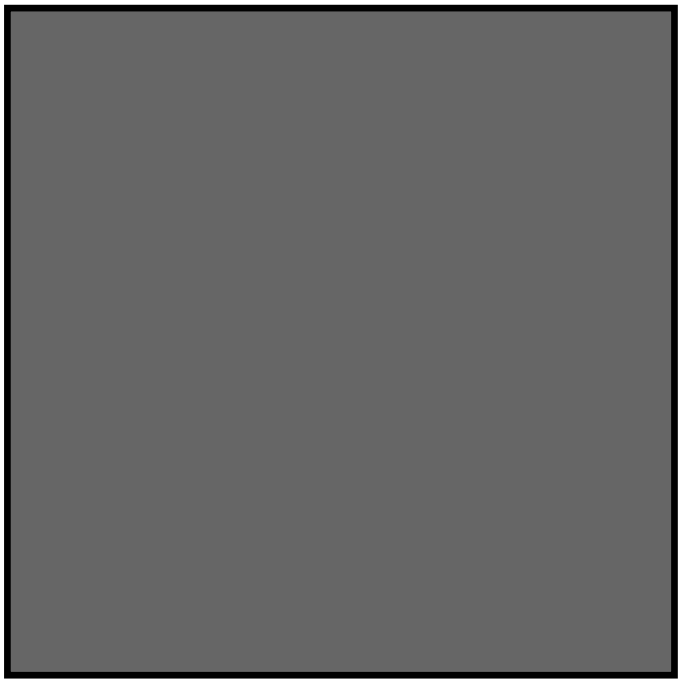

Fig. 2 Please write your figure caption here

Algorithm	Accuracy	Precision	Recall	F1
Global	0.4028	0.4028	1.0000	0.5724
FUW	0.4028	0.4028	1.0000	0.5724
FIW	0.8179	0.8330	0.0.6976	0.7502
Hybrid	0.7127	0.6647	0.5481	0.5992
LogisticRegression	0.7280	0.6694	0.6249	0.6448
Matchbox	0.6149	0.5323	0.2951	0.3778
NN	0.4028	0.4028	1.0000	0.5724
SocialHybrid	0.7317	0.6952	0.5615	0.6118
SocialMatchbox	0.6265	0.5594	0.3081	0.3958
SpectralCopreference	0.6265	0.5616	0.3051	0.3938
Spectral Matxhbox	0.6370	0.5917	0.3288	0.4194
SVM	0.7274	0.6490	0.7041	0.6705

Table 1 Please write your table caption here

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number	number	number
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References

1. Author, Article title, Journal, Volume, page numbers (year)
2. Author, Book title, page numbers. Publisher, place (year)