



BARTERING BOOKS TO BEERS



A RECOMMENDER SYSTEM FOR EXCHANGE PLATFORMS



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MAIN CONTRIBUTION

We propose a socially and temporally aware model for bartering-based recommendation, for which we introduce three novel datasets from online bartering platforms.

BARTERING

LIMITATIONS

- ❑ The need of a “double coincidence of wants”
- ❑ There is no common measure of value

PLATFORMS

| | Users | Items | Transactions |
|-------------|--------|-----------|--------------|
| Bookmooch | 84'989 | 2'098'699 | 148'755 |
| /r/gameswap | 9'888 | 3'470 | 2'008 |
| Ratebeer | 2'215 | 35'815 | 125'665 |

PROPOSED METHOD

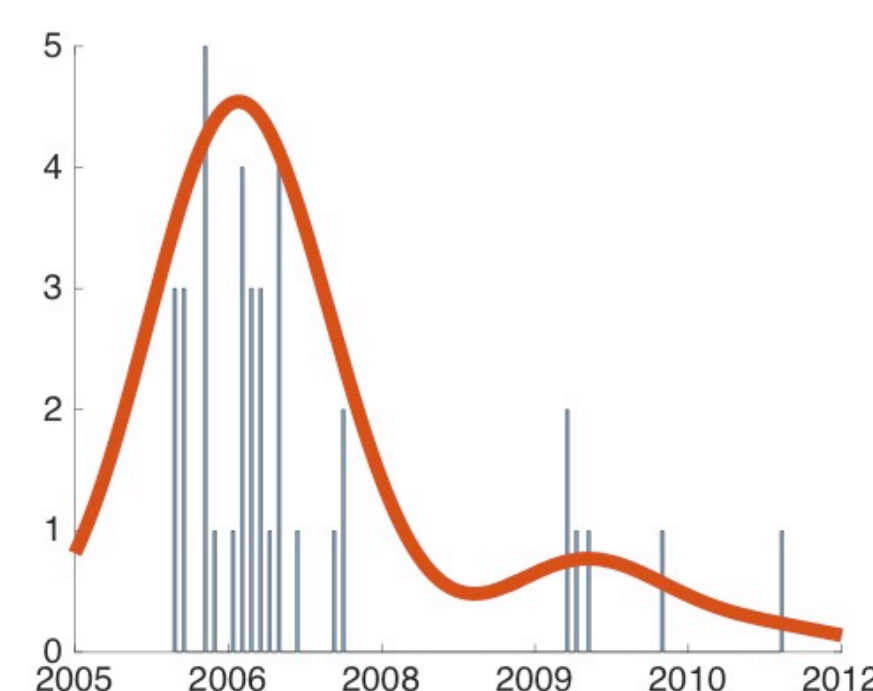
$$\hat{y}_{u_j, u_l, i_k} = p_{u_j}^T q_{i_k} + \underbrace{s_{u_j u_l}}_S + \underbrace{\tau_{u_j} \delta(t; \bar{t}_{u_j}) + \tau_{i_k} \delta(t; \bar{t}_{i_k})}_T$$

SOCIAL BIAS

$$S \in \mathbb{R}^{|U| \times |U|}$$

Directed bias from one user to another (asymmetric).

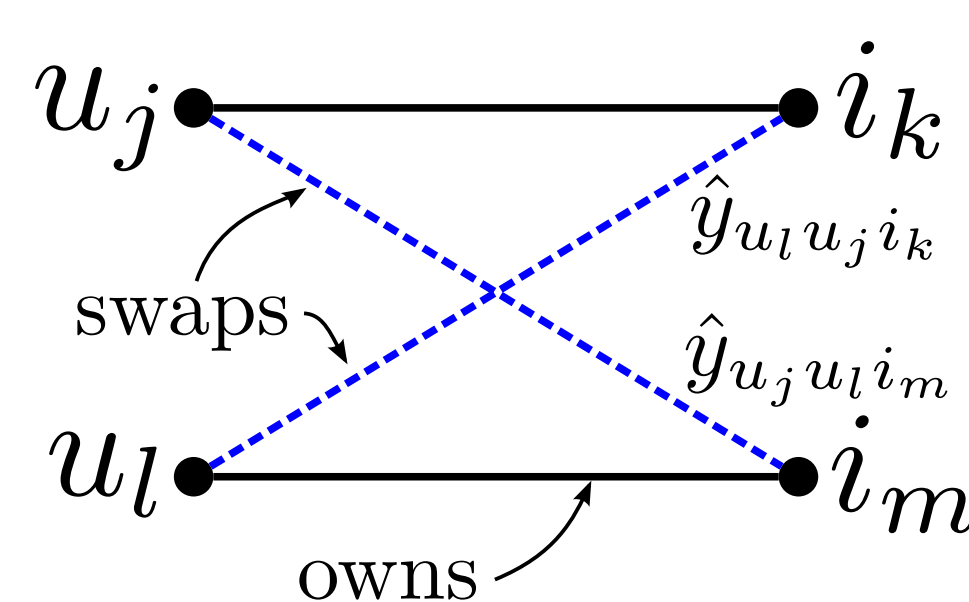
TEMPORAL DYNAMICS



$$\delta(x; \bar{x}) = \frac{1}{n} \sum_{i=1}^n K_h(x - x_i)$$

Discard users/items that have been inactive for a long period.

BIDIRECTIONALITY



$$\hat{y}_{u_j, i_m, u_l, i_k} = \frac{1}{2} (\hat{y}_{u_j u_l i_m} + \hat{y}_{u_l u_j i_k})$$

Re-rank recommendation vector according to the reciprocal interest: the arithmetic mean of both predicted scores.

SETTING

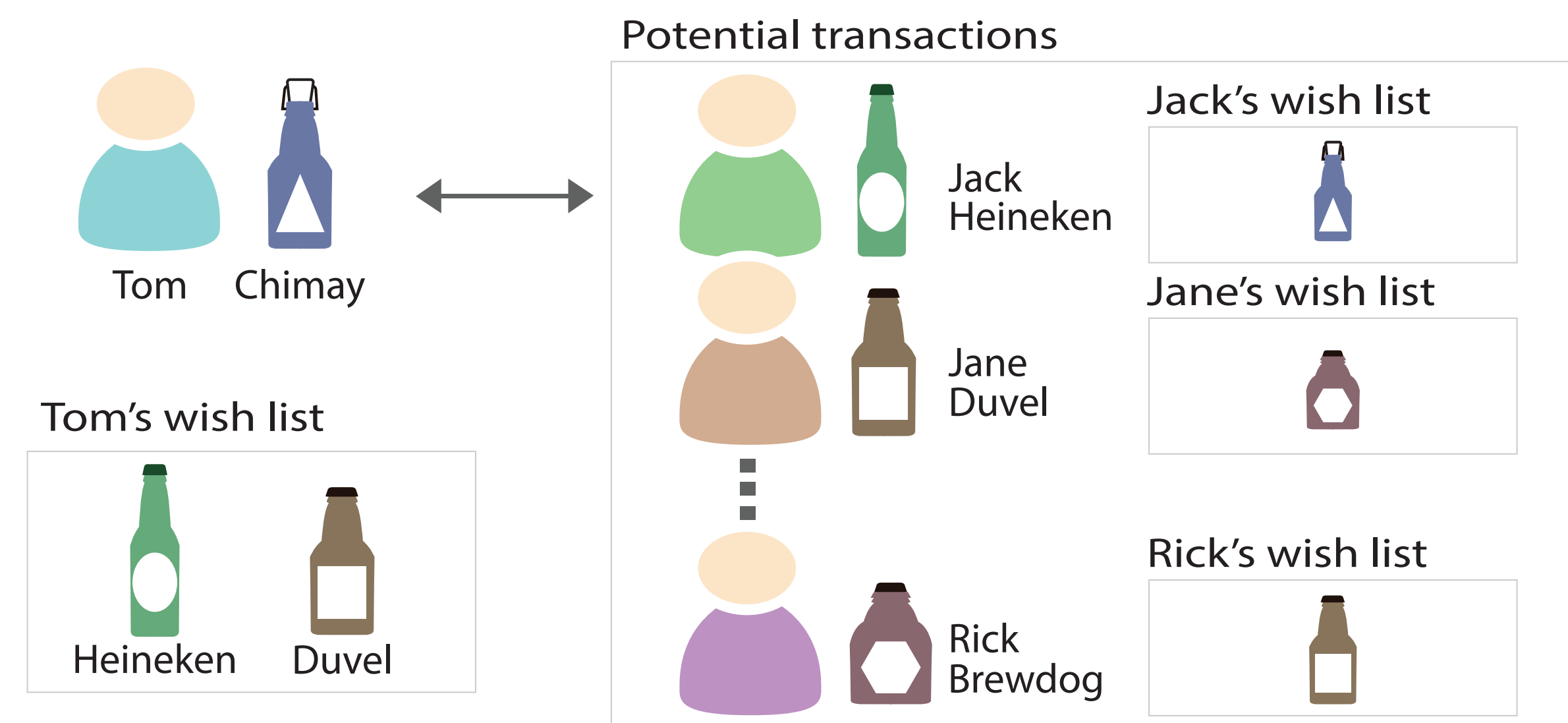
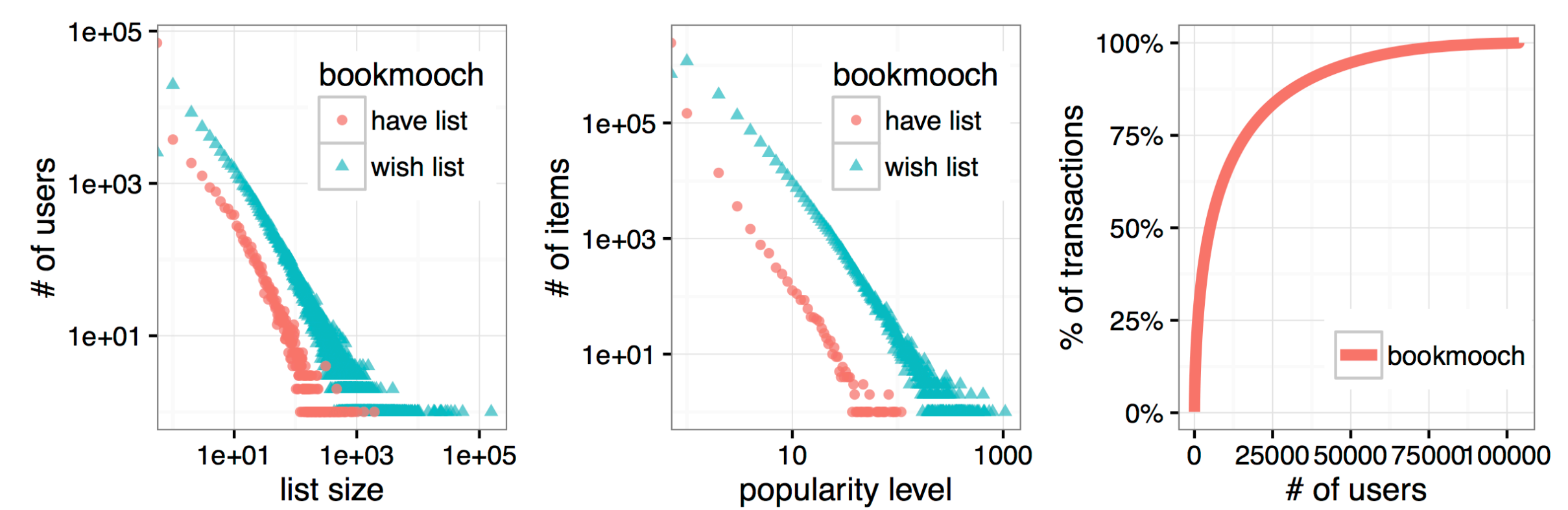


Illustration of the problem setting in which a user (Tom) can exchange an item with owners of other items available.

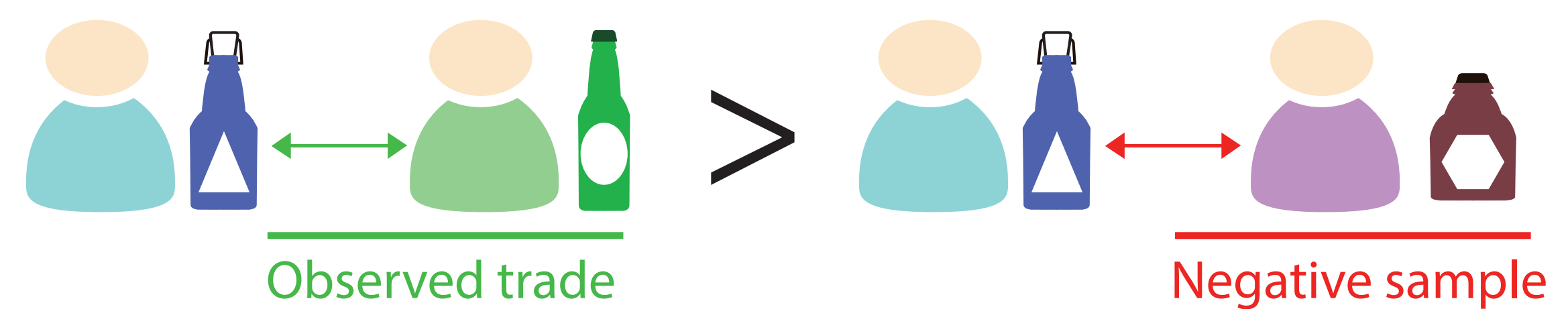
DATA DISTRIBUTION



Wish lists, give-away lists and transaction distributions unveil the existence of power users.

EXPERIMENTS

Goal: Rank higher an observed trade than a randomly sampled negative example \approx maximize AUC



Learning using Bayesian Personalized Ranking (BPR), Rendle 2009

RESULTS - AUC

| | MF | MF+B | MF+B+S | MF+B+T | MF+ALL |
|-------------|-------|-------|--------|--------|--------------|
| Bookmooch | 0.758 | 0.798 | 0.849 | 0.938 | 0.958 |
| /r/gameswap | 0.790 | 0.842 | 0.863 | 0.890 | 0.903 |
| Ratebeer | 0.824 | 0.892 | 0.962 | 0.969 | 0.983 |

CONCLUSION

- ❑ Successful trades require reciprocal user interest
- ❑ Users develop ‘trust’ and trade according to their social ties
- ❑ Activity density varies over time, for both items and users.