The *TagRec* Framework as a Toolkit for the Development of Tag-Based Recommender Systems

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Abstract

Recommender systems have become important tools to support users in identifying relevant content in an **overloaded information space**. To **ease the development of recommender systems**, a number of recommender frameworks have been proposed that serve a wide range of application domains. Our *TagRec* framework is one of the few examples of an **open-source framework** tailored towards developing and evaluating **tag-based recommender systems**. To date, *TagRec* served the development and/or evaluation process of tag-based recommender systems in **two large scale European research projects**, which have been described in **17 research papers**. Supported use cases:

- **Social tag recommendations**
- **Resource recommendations**
- **Recommendation evaluation**
- **Hashtag recommendations**

Features

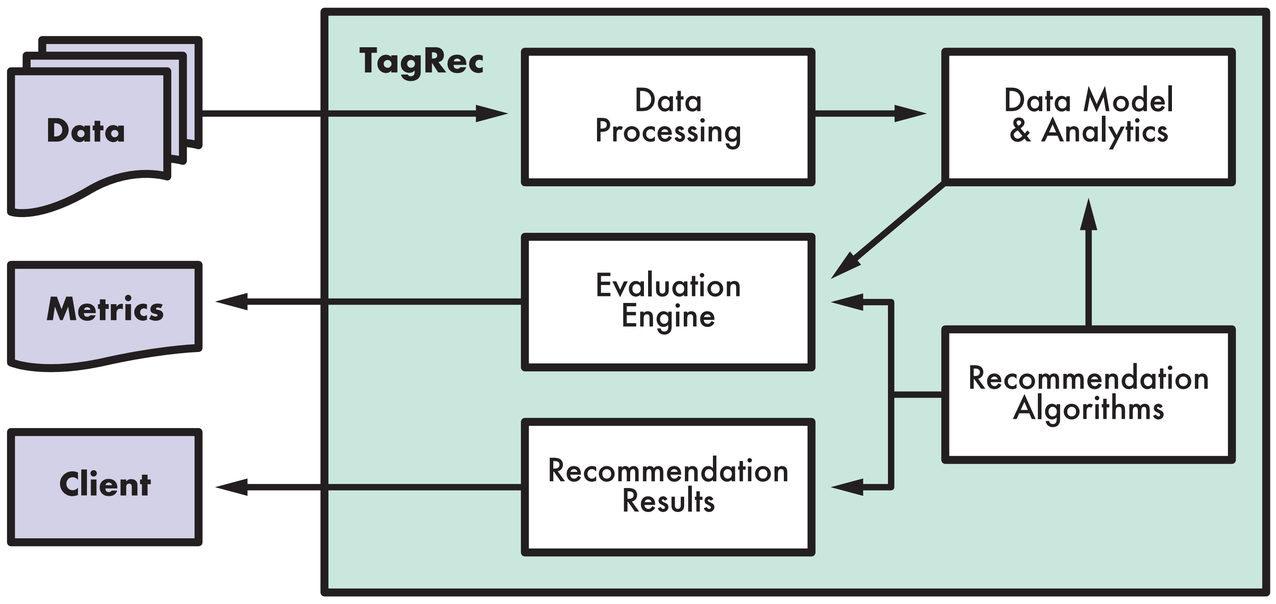
Dataset	Description
Flickr	Image sharing
CiteULike	Scientific references
BibSonomy	Publication sharing
Delicious	Social bookmarking
LastFM	Music sharing
MovieLens	Movie rating
Twitter	Microblogging
TravelWell	Learning resource exchange
Aposdle	Work-integrated learning
MACE	Informal learning
KDD15	KDD 2015 cup
Algorithm	**Description**
MostPopular	Frequency-based
CF	Collaborative Filtering
FolkRank / APR	Graph-based
FM / PITF	Factorization Machines
LDA	Topic modeling
MostRecent / GIRP	Time-based
3Layers	Human categorization theory
BLL / BLL_{AC}	Human memory theory
CIRTT	Tag- and time-based
SUSTAIN	Human category learning
SimRank	Content-based
$BLL_{I,S,C}$	Temporal hashtag patterns
Metric	**Description**
Recall	Accuracy
Precision	Accuracy
F1-score	Accuracy
MRR	Ranking
MAP	Accuracy & ranking
nDCG	Accuracy & ranking
AILD	Diversity
AIP	Novelty
Runtime	Computational costs
Memory	Computational costs

Reference

[1] D. Kowald, S. Kopeinik, and E. Lex. The TagRec Framework as a Toolkit for the Development of Tag-Based Recommender Systems. In *Proc. of UMAP'2017*. ACM.

https://github.com/learning-layers/TagRec/

The *TagRec* Framework: System Architecture

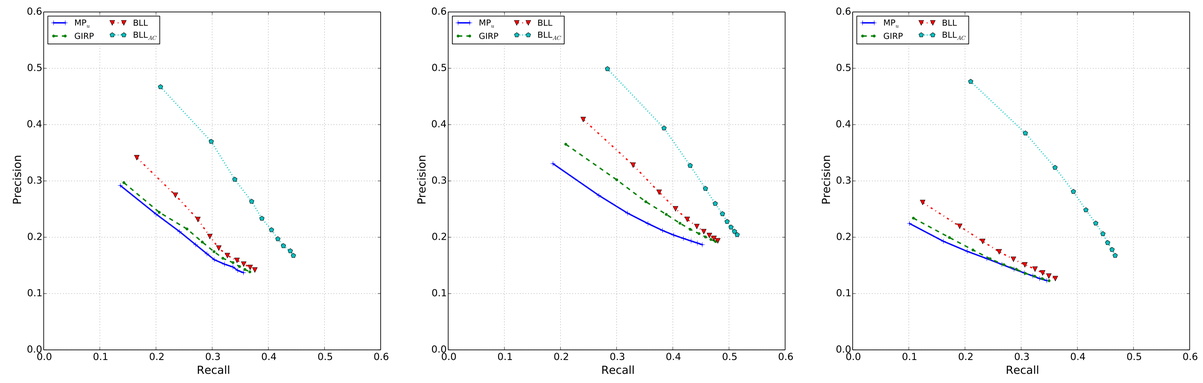


Example 1: Cognitive-Inspired Tag Recommendations

Can the activation equation of the cognitive model ACT-R, which accounts for the activation processes in human memory, be exploited to effectively predict a user's tag reuse?

$$A_i = B_i + \sum_j (W_j \cdot S_{j,i}) \qquad A(t,u,r) = B(t,u) + \sum_{c \in T_r} (|Y_{c,r}| \cdot S(c,t))$$

$$B_i = ln(\sum_{j=1}^{n} t_j^{-d}) \qquad B(t,u) = \ln(\sum_{j=1}^{n} (time_{u,ref} - time_{t,u,j})^{-d})$$

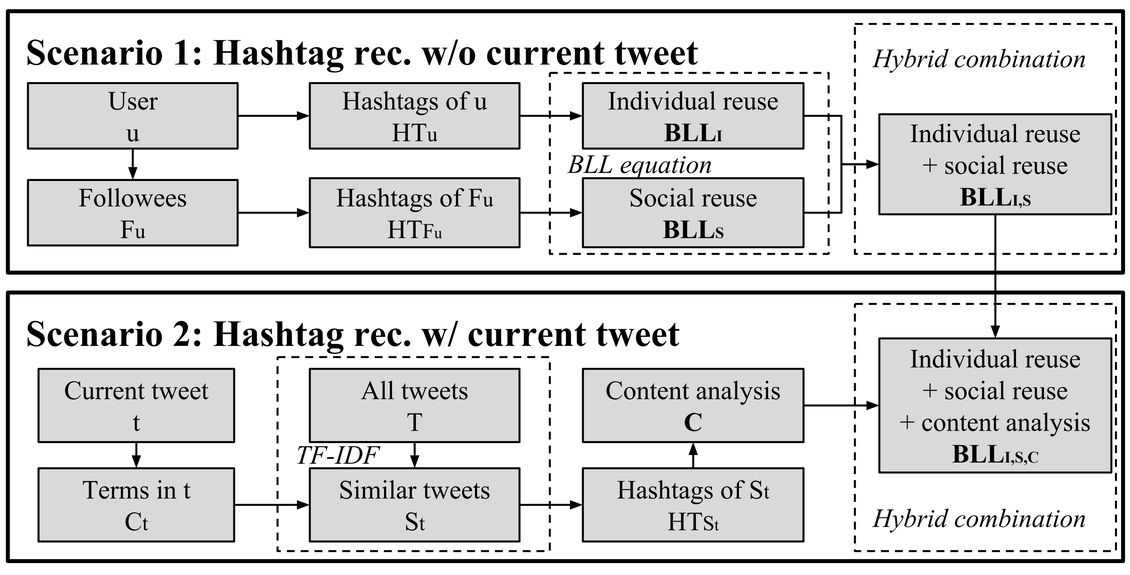


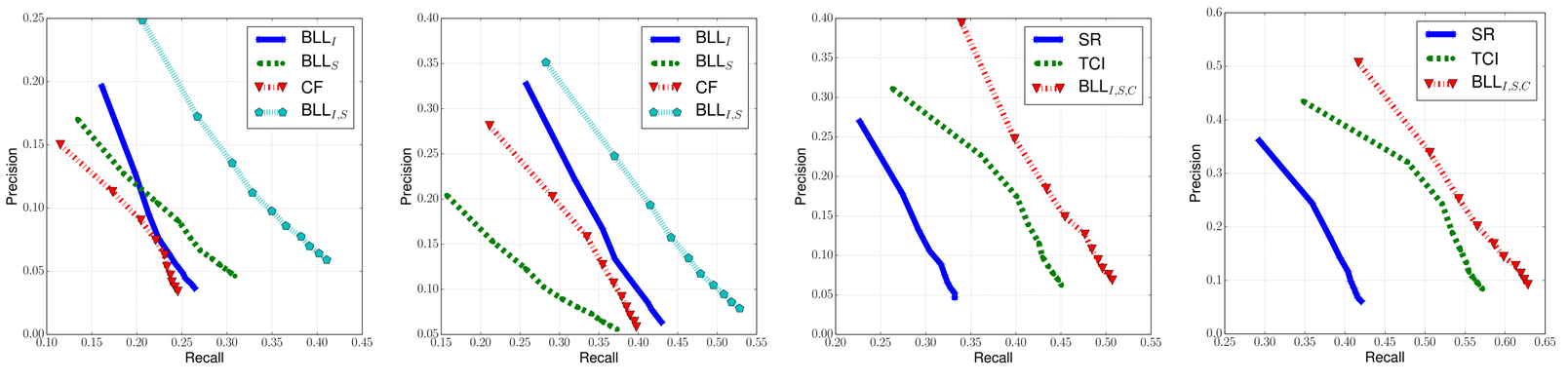
(a) BibSonomy (b) CiteULike (c) Delicious

[Kowald, D. and Lex, E. (2016). The influence of frequency, recency and semantic context on the reuse of tags in social tagging systems. In *Proc. of Hypertext'2016*. ACM.]

Example 2: Hashtag Recommendations in Twitter

Can BLL_{AC} be generalized for related use cases in the research area of tag-based recommender systems, such as hashtag recommendations in Twitter?





(d) *Scenario 1*: *CompSci* (e) *Scenario 1*: *Random* (f) *Scenario 2*: *CompSci* (g) *Scenario 2*: *Random*

[Kowald, D., Pujari, S., and Lex, E. (2017). Temporal effects on hashtag reuse in Twitter: A cognitive-inspired hashtag recommendation approach. In *Proc. of WWW'2017*. ACM.]