In this paper:

- Goal: improving user engagement evaluation using various data sources
- Motivation: application of user engagement evaluation in recommender systems
- Problem: detecting tweets with positive engagements
- Engagement: total number of users’ interactions, i.e., # of retweets + # of favorites

Research Questions:
- Do tweets of various web applications differ from each other in terms of being engaging?
- Is there any commonality among tweets of different web applications, which could be used to improve engagement evaluation? How to benefit from this commonality?

An Adaptive Model for User Engagement Evaluation

- Extract features from each tweet
- User-based features: # of followers, # of tweets, ...
- Item-based features: # of tweets about the item
- Tweet-based features: tweet age, mention count, ...
- Learn a generalized model via multi-task learning (MTL):
  - MTL-Trace: all tasks are related.
  - MTL-CASO: tasks have group structure.

Modify the loss function of MTL methods to overcome imbalanced data:
\[
\mathcal{L}(W, X, Y) = \sum_{i=1}^{n} \sum_{j=1}^{n} \lambda_{ij} \ln (1 + \exp (-y_i (W^T X_{ij} + c_i)))
\]

where
\[
\lambda_{ij} = \frac{1/n_i}{\sum_{k=1}^{n} 1/n_k}
\]

MTL-Trace: all tasks are related.
MTL-CASO: tasks have group structure.

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