



Activity Ranking in LinkedIn Feed

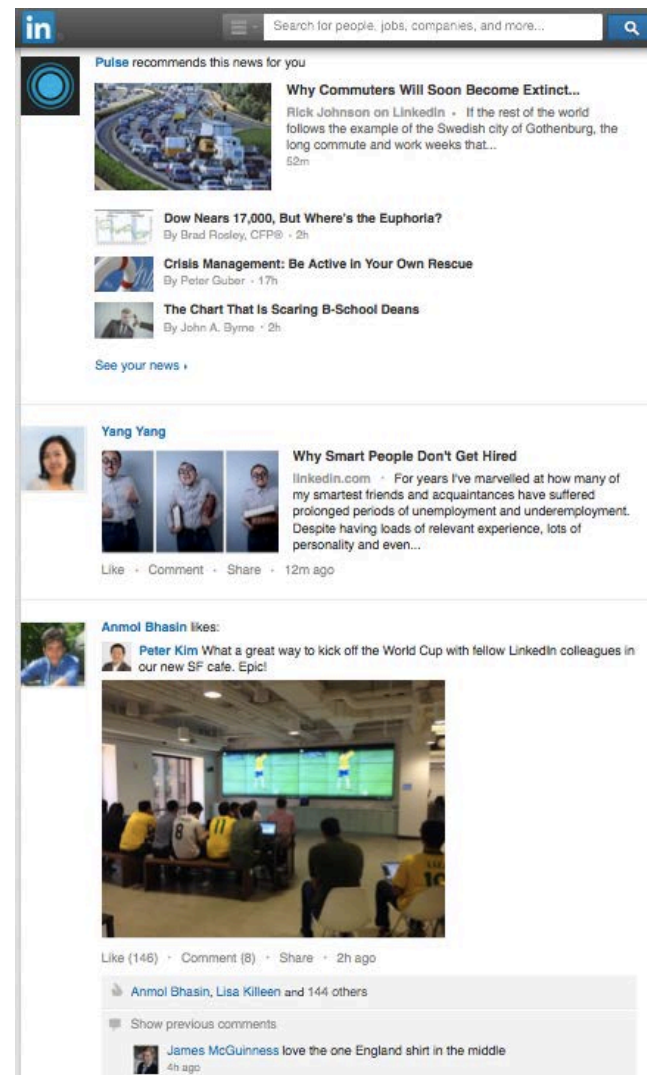
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LinkedIn Feed



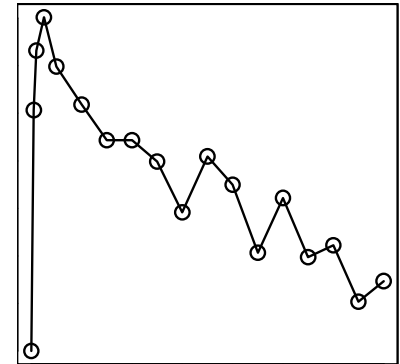
- Professional network
- Heterogeneous updates
 - More than 40 types
 - Shared articles, job changes, connection updates etc.
- Challenges
 - Large scale (313M+ members)
 - Relevance & Personalization
 - Freshness, diversity, user fatigue
- How do we rank activities?



Straw man approaches



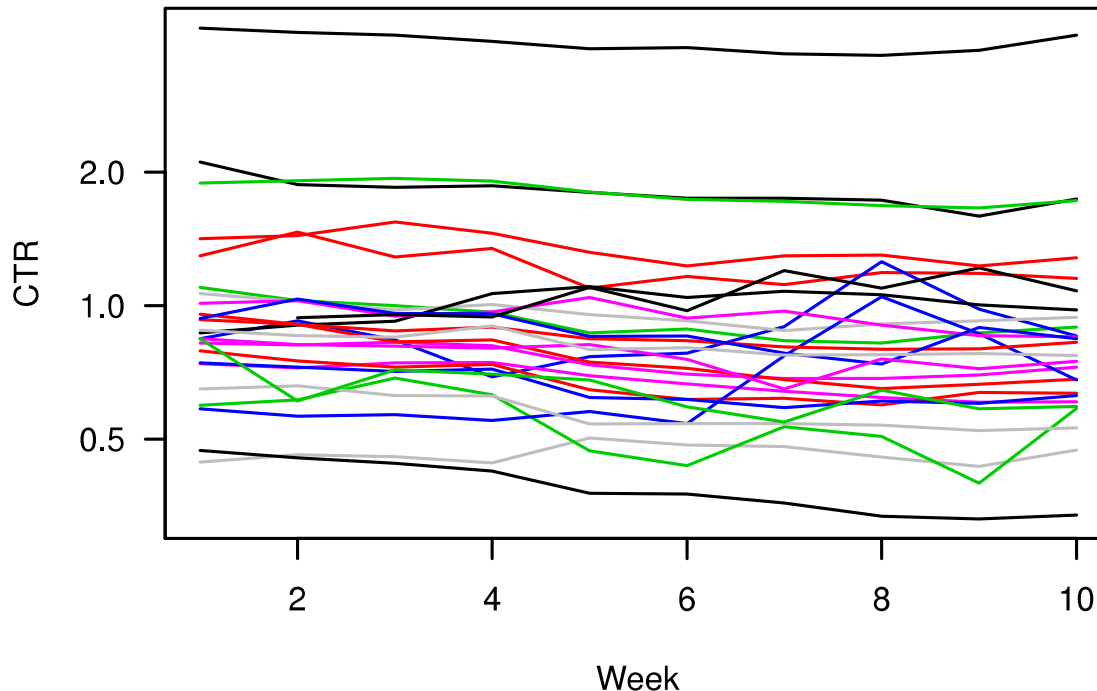
- Reverse chronological ranking
 - Fresh but not relevant
- Ranking by social popularity
 - Likes, a useful signal
 - CTR not monotonically related
 - Not all activities have likes



Activities on LinkedIn Feed



- Taxonomy (actor type, verb type, object type)
 - Connection : (member, connect, member)
 - Opinion: (member, like, article)
- What happens if we simply rank by CTR?



Relevance via CTR prediction

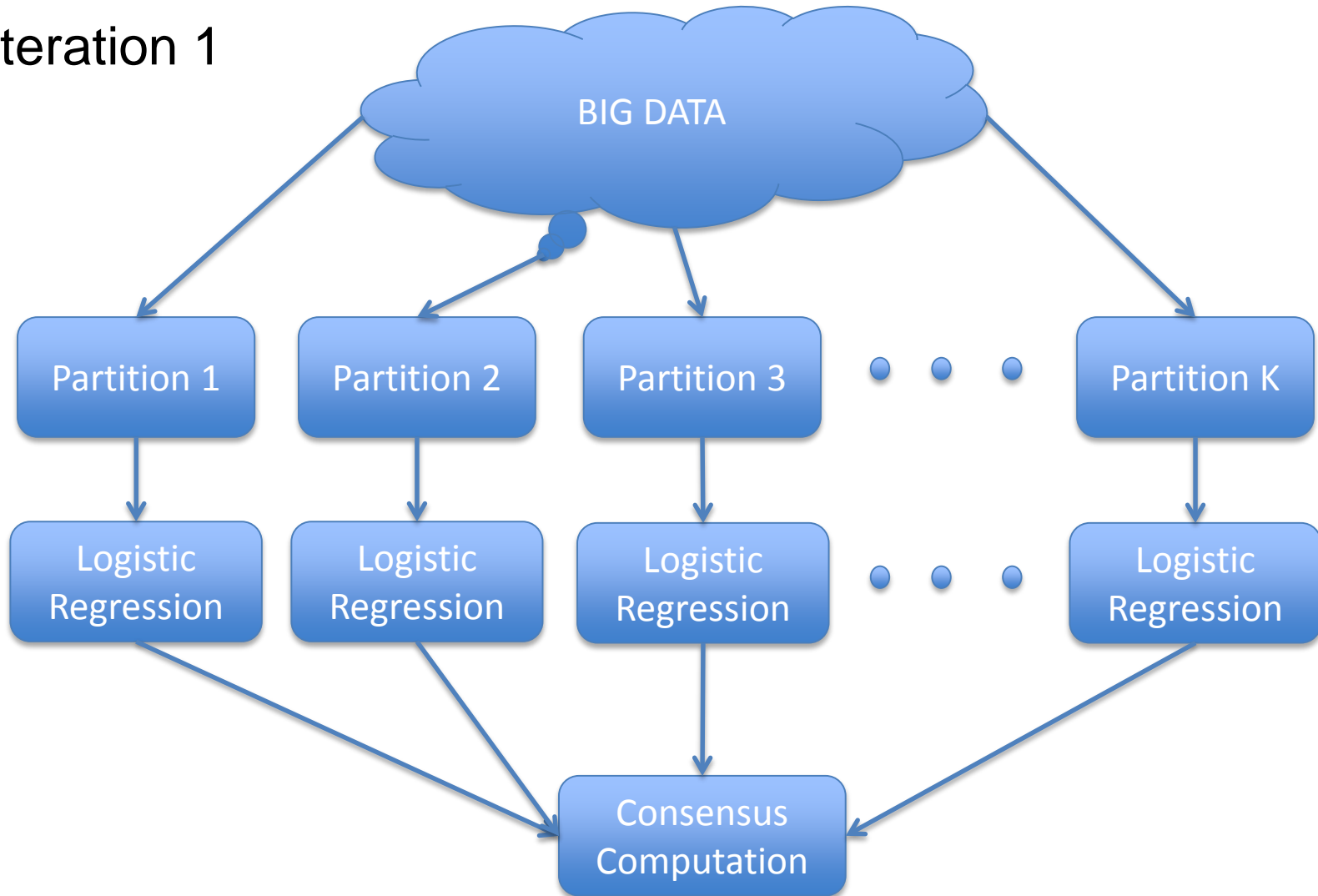


- Training data collection
 - Requires randomization
- Personalization features
 - E.g., viewer type affinity, viewer actor affinity
- Large scale logistic regression via ADMM
 - Scalable, distributed algorithm
- Offline evaluation
 - Unbiased estimation via replay

Large Scale Logistic Regression via ADMM



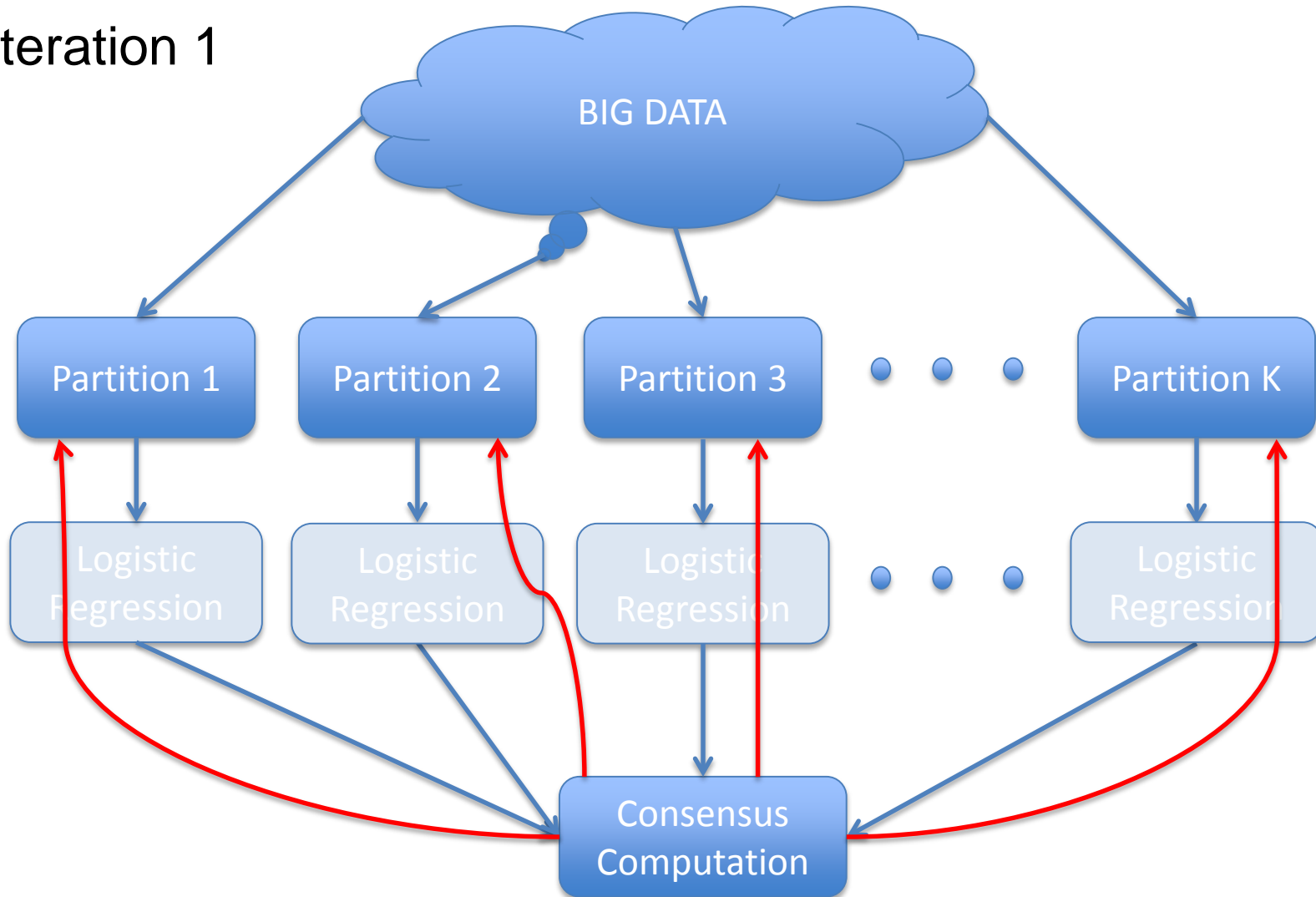
Iteration 1



Large Scale Logistic Regression via ADMM



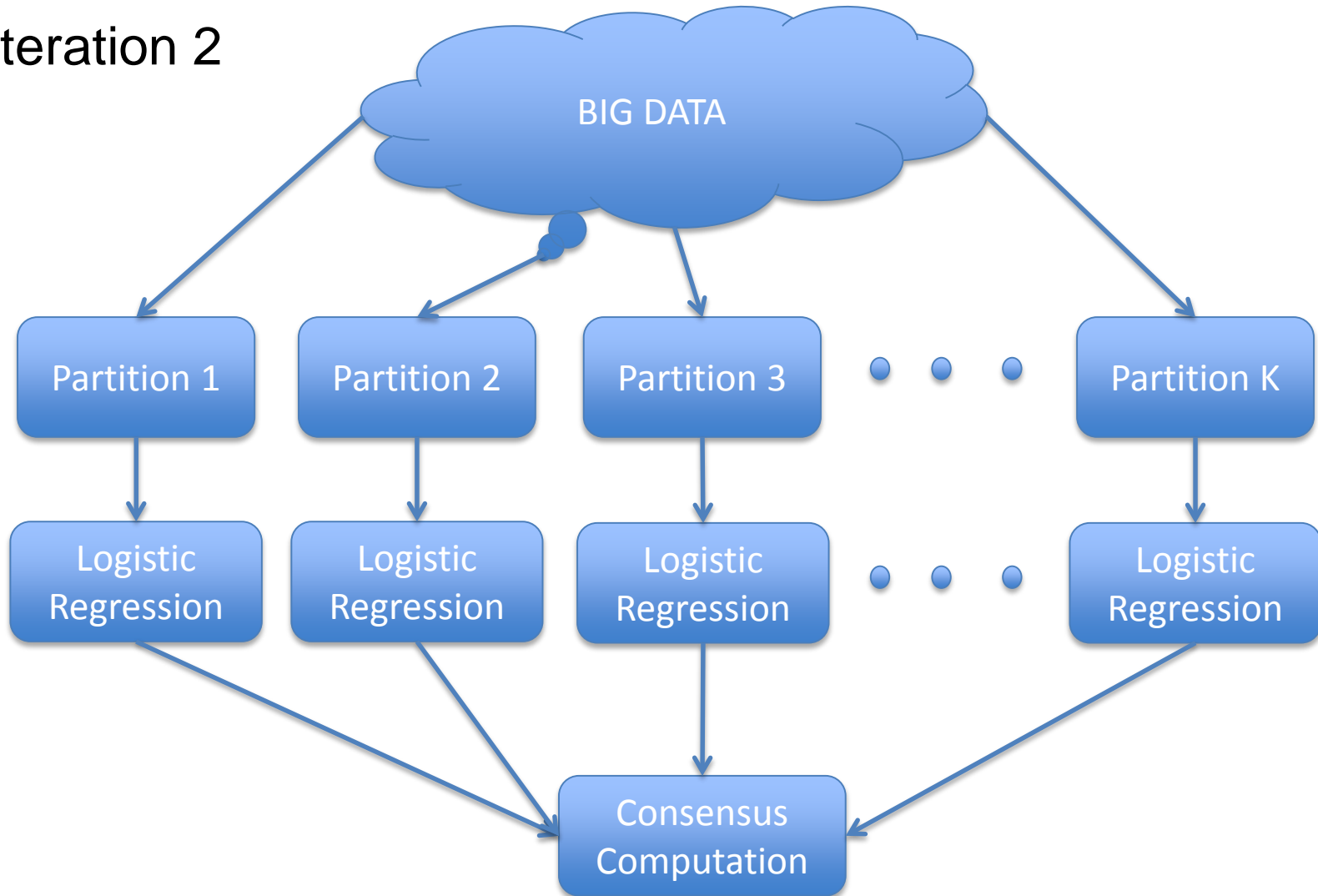
Iteration 1



Large Scale Logistic Regression via ADMM



Iteration 2



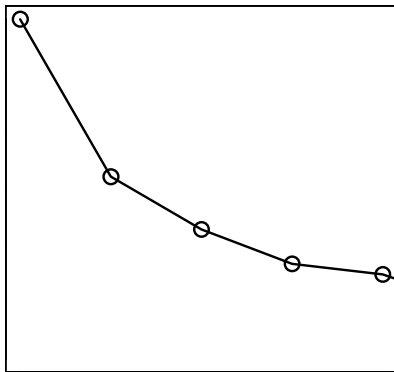
Logistic regression enough?



- Individual item ranking
- No diversity
 - Imagine seeing ten profile pictures one after the other
- Old relevant items versus new relevant items
 - Freshness
- User fatigue via repetition of the same item
 - Impression discounting

Effect of diversity

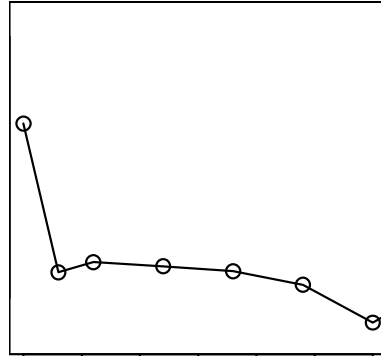
- Users prefer a more diverse feed
 - Repetition of actorId or verbType causes lower CTR



- Diversity reranker to ensure the feed is diverse

Effect of freshness

- By age

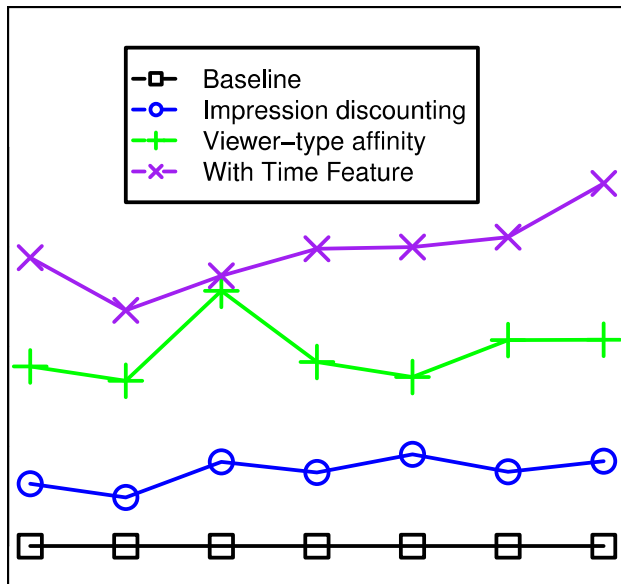


- User fatigue by repeated impressions

Desktop A/B Test Results



- Personalization
 - Viewer, type affinity
 - Time feature
- Exponential Impression discounting



Conclusions



- Multiple challenges for good user experience
 - Large scale learning problem
 - Heterogeneous updates
 - Relevance, personalization
 - Freshness
 - Fatigue reduction
 - Diversity