

# Remembering The Stars?

## Effect of time on preference retrieval from memory

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### Introduction

#### Memory Effects

Human memory effects may influence ratings submitted to recommender systems. As the time between watching and rating an item increases, recollection of how experience changes. These effects were investigated through two studies.

### Study

#### Offline Study

The offline analysis was performed on the Movielens 10M dataset, similar to a study performed by Koren on the Netflix dataset [1], looking at the time difference between moment of release and moment of rating.

Movies were split in popular and non-popular movies, based on a median split on the number of ratings. Popular movies will remain more vividly in memory, as they are aired and discussed more often.

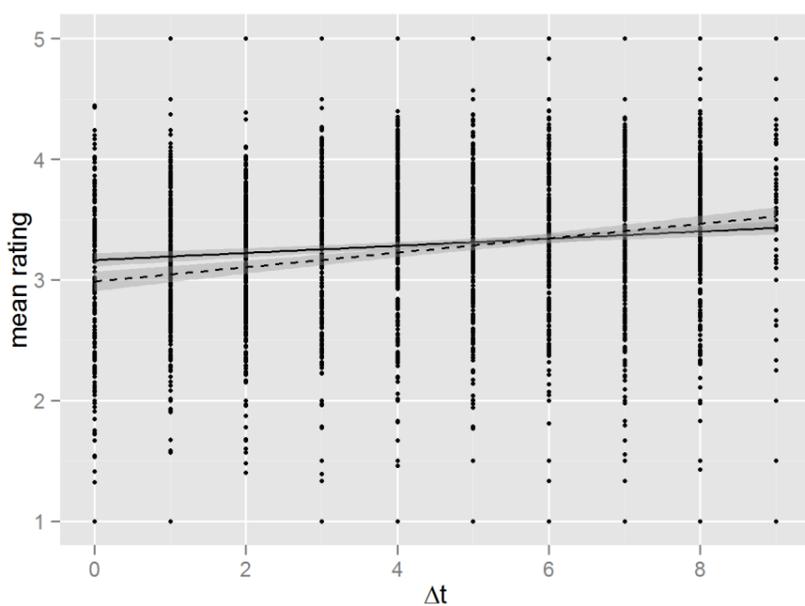


Fig 1.: Results of offline analysis. Time difference between moment of release and moment of rating (in years) on horizontal axis, rating on vertical axis. Solid line for popular movies, dashed line for non-popular movies.

This effect looks similar to the positivity effect [2]. Human memory works more efficiently for positive experiences, which results in experiences being looked at more favorably as time passes. This effect may be found because movies that are in the system longer are recommended more accurately and thus receive higher ratings.

#### User Study

A user study was performed to investigate the effect of (self-reported) time passing between moment of watching and moment of rating. This time information is not readily available in public datasets. 100 participants (40 male, 60 female) provided the following information on 156 movies that were aired in the month before the study:

- Rating (1 – 5 stars)
- Time since movie was watched (last week – over 3 years ago)
- Motivations for rating a movie (one watched recently and one longer ago)

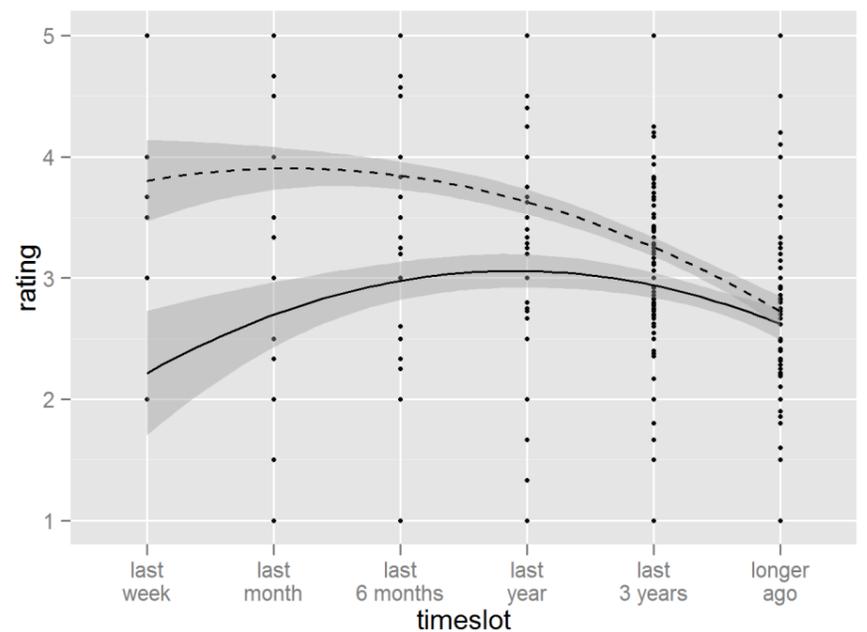


Figure 2: Results of the user study. Dashed line for initially high rated movies, solid line for initially low rated movies.

The movies were split based on the average rating in the first three timeslots to see if ratings for good and bad movies change differently with time. Figure 2 shows that over time ratings regress to the middle of the scale, different from the positivity effect found in the offline study. However, for movies seen longer ago participants were more inclined to provide motivation for high than low ratings, indicating that they indeed better remember positive experiences.

### Conclusions

The second study suggests that ratings for movies that have been seen longer ago might not be reliable. E.g., a three star rating after three years could have been either a two or four star rating right after seeing the movie. Future studies should investigate these memory effects in more detail and find ways to take them into account in recommender algorithms.

[1] Koren, Y. 2009. Collaborative filtering with temporal dynamics. In *Proceedings of the 15th international conference on Knowledge discovery and data mining (KDD '09)*. ACM, New York, NY, USA, 447-456

[2] Walker, W.R., Skowronski, J.J., & Thompson, C.P. 2003. Life Is Pleasant — and Memory Helps to Keep It That Way! *Review of General Psychology*, 7(2), 203-210