

Sequential Group Recommendation with Diversity

Ujunwa Edum
Ashkan Khademian

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Proposed Method

Sequential Group Recommendation

$$sat(u_s, G_r) = \frac{\sum_{i_z \in G_r} pr(u_s, i_z)}{\sum_{i_z \in A_{u_s, r}} pr(u_s, i_z)}$$

Such that:

$$pr(u_s, i_z) = \begin{cases} rating(u_s, i_z), & u_s \in U(i_z), \\ pred(u_s, i_z), & u_s \notin U(i_z) \wedge |N(u_s)| > 2, \\ avg\{rating(u_s, i_y) \mid i_y \in I(u_s)\}, & o.w. \end{cases}$$

Sequential Hybrid Group Recommendation

$$\text{hybridScore}(G_r, i_z) = (1 - \alpha_r) \cdot \text{avgScore}(G_r, i_z) + \alpha \cdot \text{leastScore}(G_r, i_z)$$

Such that:

$$\alpha_r = \max_{u \in G} \text{sat}(u, G_{r-1}) - \min_{u \in G} \text{sat}(u, G_{r-1})$$

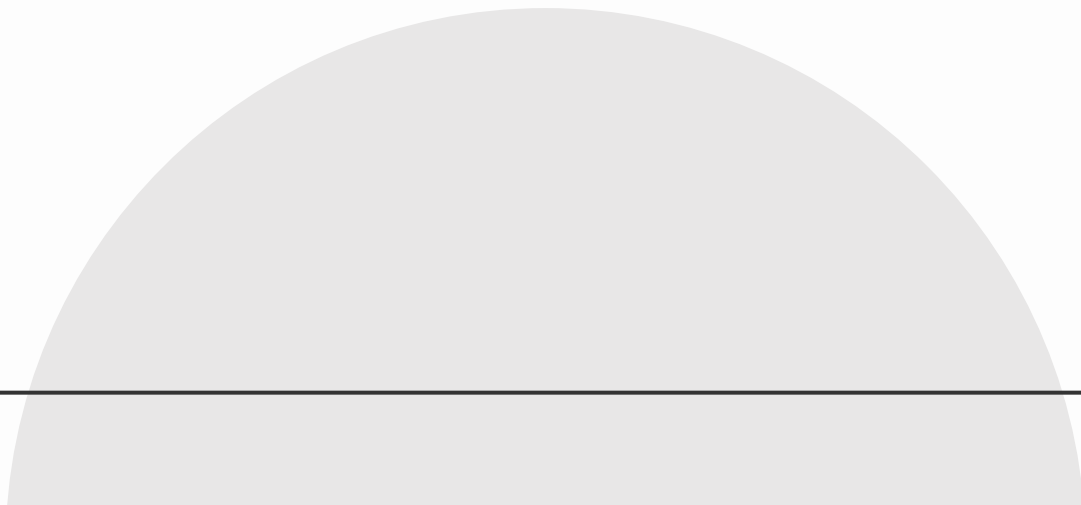


Diversity

Item Diversity. Provides a varied selection of items to avoid redundancy and keep recommendations fresh.

- **Inter-Round Diversity.** Maintains variety across recommendation rounds, preventing repetitive suggestions over time.
- **Intra-Round Diversity.** Ensures a diverse range of items within a single recommendation round for broader appeal.

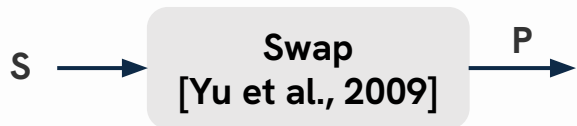
**We use both inter-round and
intra-round diversity**



Diversification

Inter-Round

1. Produce the most relevant elements based on a query q , as the candidate set P .
2. Produce the set $S \subseteq P$, containing elements relevant to the query, as diverse as possible to other elements of S .



Intra-Round

1. Consider the diversity measure when scoring every movie in a round.
2. Sort the recommended movies and select the top- k for the new round based on this new scoring criteria.

$$\begin{aligned} \text{Score}^*(G_r, i_z) = \\ (1 - \beta) \cdot \text{hybridScore}(G_r, i_z) + \beta \cdot \text{Div}(i_z, G_{r-1}) \end{aligned}$$

Diversification (Cont.)

Inter-Round

$$Div(G_r) = \sum_{i_y, i_z \in G_r} Div(i_y, i_z)$$

Intra-Round

$$Div(i_z, G_r) = \min\{Div(i_y, i_z) \mid i_y \in G_r\}$$

Such that:

$$Div(i_y, i_z) = 1 - CosineSim(embedding(i_y), embedding(i_z))$$

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Experiment

Setup



Dataset

MovieLens 100K dataset (ml-latest-small)



Chunks

from 1998 up to 2008



initial group recommendation

from 2009 up to 2018



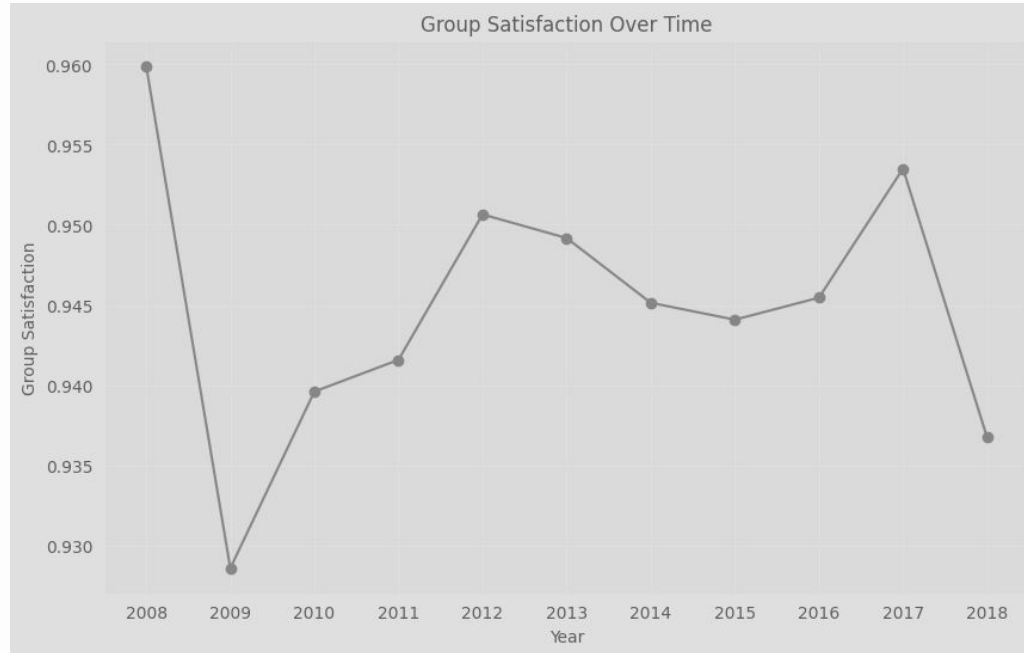
one year for each round



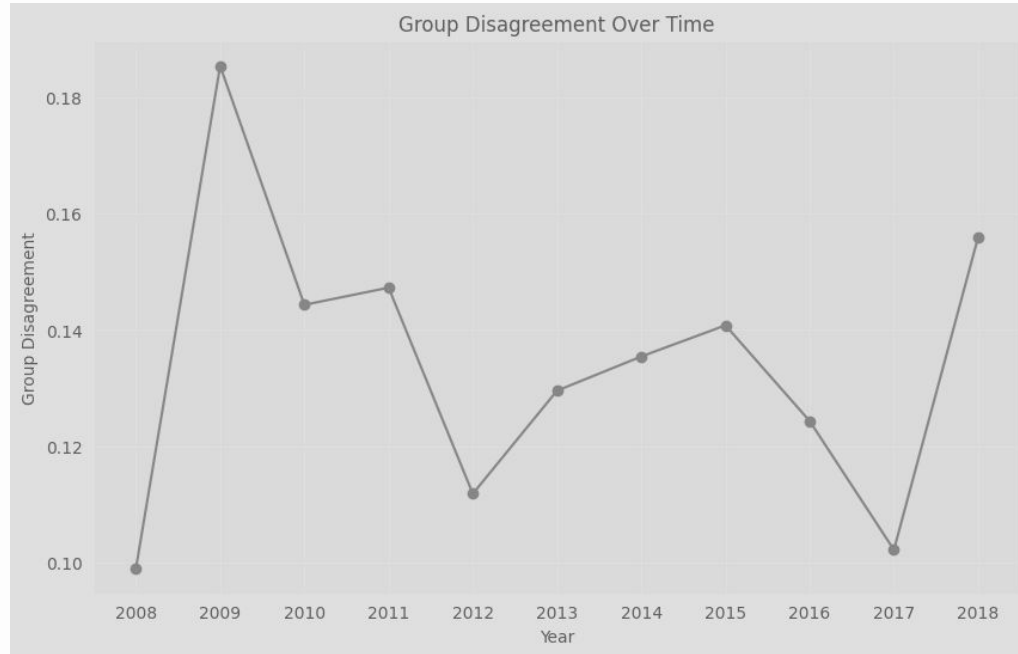
User Group

A group of 10 random users

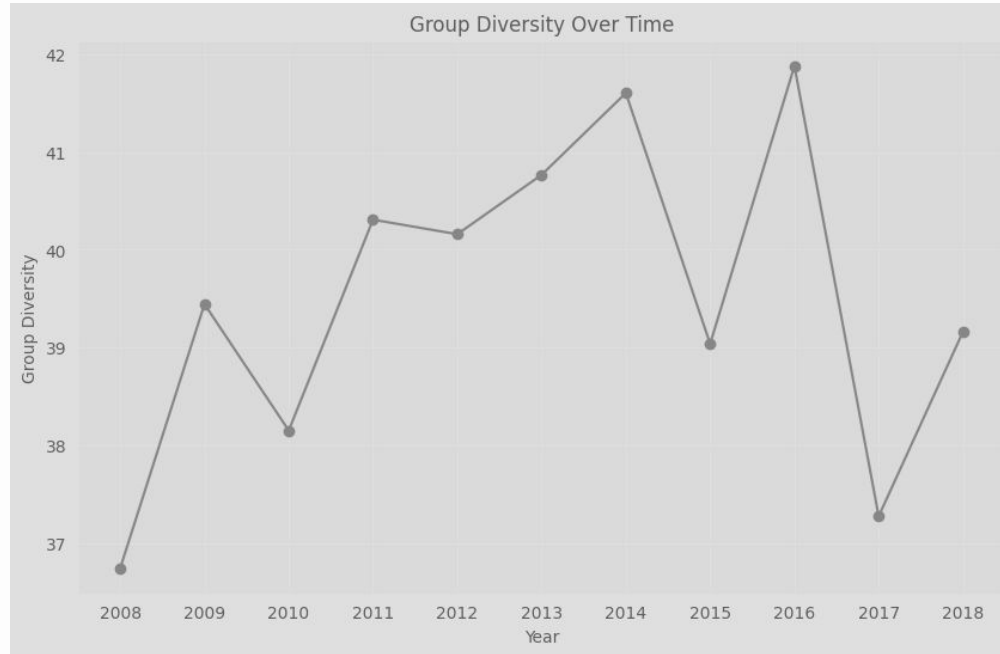
Results: Group Satisfaction



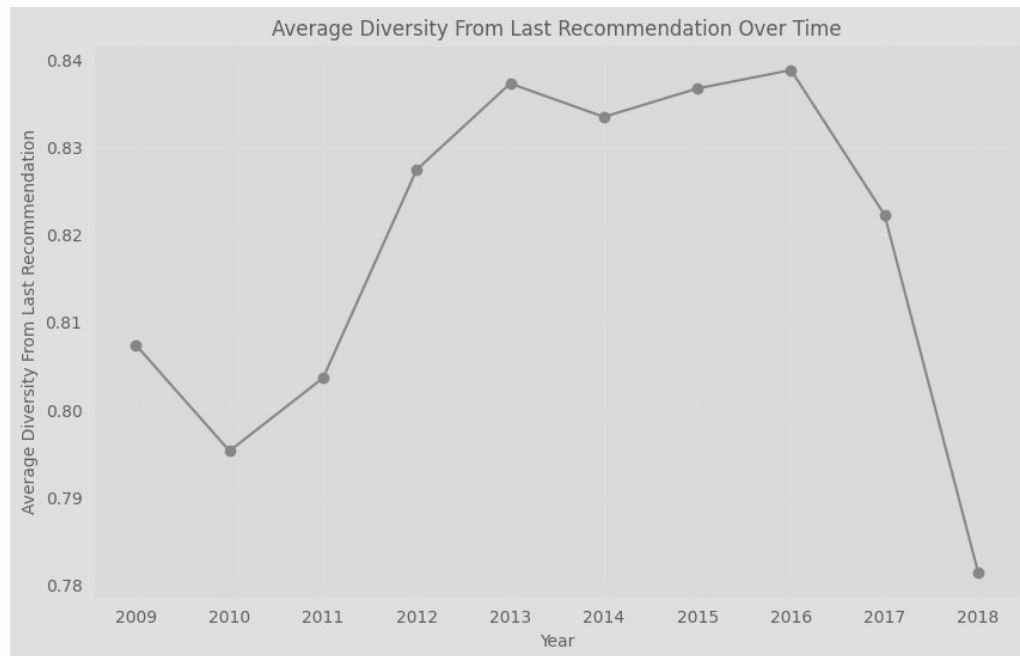
Results: Group Disagreement



Results: Inter-Round Diversity



Results: Intra-Round Diversity



Thanks!

Do you have any questions?

ashkan.khademian@tuni.fi

ujunwa.edum@tuni.fi

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