User’s statisfaction:

$$sat(u_i, Gr_j) = \frac{GroupListSat(u_i, Gr_j)}{UserListSat(u_i, A_{u_i,j})} \quad \text{(Equation 1)}$$

$$GroupListSat(u_i, Gr_j) = \sum_{dz \in Gr_j} p_j(u_i, d_z) \quad \text{(Equation 2)}$$

$$UserListSat(u_i, A_{u_i,j}) = \sum_{dz \in A_{u_i,j}} p_j(u_i, d_z) \quad \text{(Equation 3)}$$

Where

- Gr_j = Sequence of group recommendations in iteration j
- $A_{u_i,j}$ = Sequence of recommendations for individual user in iteration j
- $p_j(u_i, d_z)$ = Predicted score of item d_z for user u_i
- $|Gr_j| = |A_{u_i,j}|$

Problem definition

The Fair Sequential Group Recommendation Problem

How to calculate score for item d_z for group G in iteration j $score(G, d_z, j)$.

My solution:

Basic approach is to use the group average only (Naive solution):

$$score(G, d_z, j) \ = \frac{1}{|G|} \sum_{u_i \in G} p_j(u_i, d_z)$$

Instead of traditional mean, consider a weighted average:

$$score(G, d_z, j) \ = \sum_{u_i \in G} w_{u_i,j} * p_j(u_i, d_z)$$

Where

- $\sum_{u_i \in G} w_{u_i,j} = 1$
- $w_{u_i,j} = \frac{sat(u_i, Gr_{j-1})^{-1}}{\sum_{u_k \in G} sat(u_k, Gr_{j-1})^{-1}}$

Or alternatively

- $w_{u_i,j} = \frac{1 - sat(u_i, Gr_{j-1})}{\sum_{u_k \in G}(1 - sat(u_k, Gr_{j-1}))}$