Contents

1 Annex I - Mathematical Notations

- Let $U = \{u_1, \ldots, u_n\}$ be a set of *users*, where u_i represents the ith user and n the number of users, $|U| = n$.
- Let $P = \{p_1, \ldots, p_m\}$ be a set of *products* or *items* for recommendation, where p_j is the jth product and m the number of items, $|P| = m$. Depending on the recommender algorithm, P will be the whole set of products or a subset of them.
- Let R be the *Utility* or *Rating Matrix*; defined as an $n \times m$ matrix of *ratings* or *degrees of preference* $r_{i,j}$, with $i \in \{1, \ldots, n\}$ and $j \in \{1, \ldots, m\}$. Values come from the ordered set RV (e.g., integers 1–5, representing the number of stars that the user gave as a rating for that item). We assume that the matrix is **sparse**, meaning that most entries are "unknown." An unknown rating $r_{i,j}$ implies that the user i has no explicit information about preference for the item j.
- Let $V = \{v_1, \ldots, v_s\}$ be an ordered set of *values* representing the possible ratings given by a user for any item, where s the number of items, $|V| = s$.
- *Sparsity Problem*: In any recommender system, the number of ratings already obtained is usually very small compared to the number of ratings that need to be predicted.
- *Cold-Start Problem*: problem that occurs in content-based filtering and in social filtering due to no information about a new user.