Movie Recommender Systems

['movieId',

'genres',

'userId',

'rating',

'Title',

'Year',

'Rated',

'Runtime',

'Genre',

'Director',

'Actors',

'Plot',

'Language',

'Country',

'Poster',

'imdbRating',

'Type']

Rating:

Motion Picture Association

**G — General Audiences**: All Ages Admitted. A G-rated motion picture contains nothing in theme, language, nudity, sex, violence or other matters that, in the view of the Rating Board, would offend parents whose younger children view the motion picture. The G rating is not a “certificate of approval,” nor does it signify a “children’s” motion picture. Some snippets of language may go beyond polite conversation but they are common everyday expressions. No stronger words are present in G-rated motion pictures. Depictions of violence are minimal. No nudity, sex scenes or drug use are present in the motion picture.

**PG — Parental Guidance Suggested**. Some Material May Not Be Suitable For Children. A PG-rated motion picture should be investigated by parents before they let their younger children attend. The PG rating indicates, in the view of the Rating Board, that parents may consider some material unsuitable for their children, and parents should make that decision. The more mature themes in some PG-rated motion pictures may call for parental guidance. There may be some profanity and some depictions of violence or brief nudity. But these elements are not deemed so intense as to require that parents be strongly cautioned beyond the suggestion of parental guidance. There is no drug use content in a PG-rated motion picture.

**PG-13 — Parents Strongly Cautioned**. Some Material May Be Inappropriate For Children Under 13. A PG-13 rating is a sterner warning by the Rating Board to parents to determine whether their children under age 13 should view the motion picture, as some material might not be suited for them. A PG-13 motion picture may go beyond the PG rating in theme, violence, nudity, sensuality, language, adult activities or other elements, but does not reach the restricted R category. The theme of the motion picture by itself will not result in a rating greater than PG-13, although depictions of activities related to a mature theme may result in a restricted rating for the motion picture. Any drug use will initially require at least a PG-13 rating. More than brief nudity will require at least a PG-13 rating, but such nudity in a PG-13 rated motion picture generally will not be sexually oriented. There may be depictions of violence in a PG-13 movie, but generally not both realistic and extreme or persistent violence. A motion picture’s single use of one of the harsher sexually-derived words, though only as an expletive, initially requires at least a PG-13 rating. More than one such expletive requires an R rating, as must even one of those words used in a sexual context. The Rating Board nevertheless may rate such a motion picture PG-13 if, based on a special vote by a two-thirds majority, the Raters feel that most American parents would believe that a PG-13 rating is appropriate because of the context or manner in which the words are used or because the use of those words in the motion picture is inconspicuous.

**R — Restricted**. Children Under 17 Require Accompanying Parent or Adult Guardian. An R-rated motion picture, in the view of the Rating Board, contains some adult material. An R-rated motion picture may include adult themes, adult activity, hard language, intense or persistent violence, sexually-oriented nudity, drug abuse or other elements, so that parents are counseled to take this rating very seriously. Children under 17 are not allowed to attend R-rated motion pictures unaccompanied by a parent or adult guardian. Parents are strongly urged to find out more about R-rated motion pictures in determining their suitability for their children. Generally, it is not appropriate for parents to bring their young children with them to R-rated motion pictures.

**NC-17 — No One 17 and Under Admitted**. An NC-17 rated motion picture is one that, in the view of the Rating Board, most parents would consider patently too adult for their children 17 and under. No children will be admitted. NC-17 does not mean “obscene” or “pornographic” in the common or legal meaning of those words, and should not be construed as a negative judgment in any sense. The rating simply signals that the content is appropriate only for an adult audience. An NC-17 rating can be based on violence, sex, aberrational behavior, drug abuse or any other element that most parents would consider too strong and therefore off-limits for viewing by their children. Originally called X, In 1990, the X rating was retired and replaced with the NC-17 rating. The X rating had become closely associated with pornography, and filmmakers objected to their films being classified in the same category. The MPAA did not

**NR and UR labels**

If a film doesn’t fit any of the previous labels, it may wind up labeled NR or UR, which stand for “Not Rated” and “Unrated” respectively. At first glance, the NR and UR labels might look like they mean the same thing, and they are sometimes used interchangeably, but there is also an important distinction.

The Not Rated label is usually applied to films that are not *yet*rated or that have chosen to remain “Not Rated” rather than accept the rating assigned by the MPAA. A film might be promoted in trailers and other advertisements ahead of receiving an official MPAA rating with the disclaimer “This Film is Not Yet Rated.”

On the other hand, the “Unrated” label is most commonly applied to alternate cuts of a film that differ from the initial theatrical release. An “Unrated” cut of a film often exists alongside a rated cut of the film. It commonly appears on home video releases or re-releases that contain additional footage or do not maintain the cuts initially made to ensure a lighter rating from the MPAA.

# **Cold Start Problems**

Cold start problems can be handled by recommendations based on meta-information, such as:

* For new users, we can use their location, age, gender, browser, and user device to predict recommendations.
* For new movies, we can use genre, cast, and crew to recommend it to target users.

# **Step 1: Matrix Factorization-based Algorithm**

[Matrix factorization](https://datajobs.com/data-science-repo/Recommender-Systems-%5bNetflix%5d.pdf) is a class of collaborative filtering algorithms used in recommender systems. This family of methods became widely known during the [Netflix prize challenge](https://netflixprize.com/index.html) due to how effective it was.

Matrix factorization algorithms work by decomposing the user-movie interaction matrix into the product of two lower dimensionality rectangular matrices, say U and M. The decomposition is done in such a way that the product results in almost similar values to the user-movie interaction matrix. Here, U represents the user matrix, M represents the movie matrix, n is the number of users, and m is the number of movies.

Each row of the user matrix represents a user and each column of the movie matrix represents a movie.

Recommending Items to User Based on Content:

Method 1:

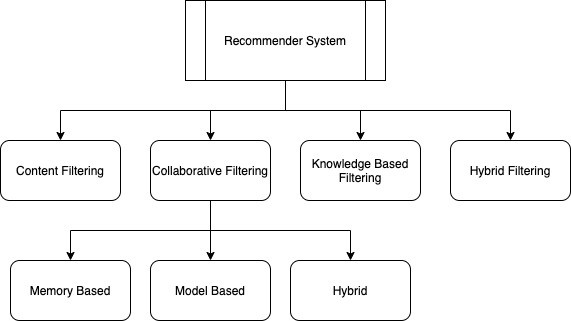
We can use the cosine distance between the vectors of the item and the user to determine its preference to the user. For explaining this, let us consider an example:

We observe that the vector for a user will have a positive number for actors that tend to appear in movies the user likes and negative numbers for actors user doesn’t like, Consider a movie with actors which user likes and only a few actors which user doesn’t like, then the cosine angle between the user’s and movie’s vectors will be a large positive fraction. Thus, the angle will be close to 0, therefore a small cosine distance between the vectors.

It represents that the user tends to like the movie, if the cosine distance is large, then we tend to avoid the item from the recommendation.

Method 2:

We can use a classification approach in the recommendation systems too, like we can use the Decision Tree for finding out whether a user wants to watch a movie or not, like at each level we can apply a certain condition to refine our recommendation. For example



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