3. K-Nearest Neighbor Method
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Our goal in the movie recommender system problem is to predict the movie ranking that a user would give on a movie that (s)he has not seen.

Let m be the number of movies and n the number of users. The ranking Y_{ai} of a movie $i \in \{1, \ldots, m\}$ by a user $a \in \{1, \ldots, n\}$ may already exist or not. Our goal is to predict Y_{ai} in the case when Y_{ai} does not exist.

K-Nearest Neighbour

The K-Nearest Neighbor method makes use of ratings by K other "similar" users when predicting Y_{ai}.

Let $\mathrm{KNN}(a)$ be the set of K users "similar to" user a, and let $\mathrm{sim}(a, b)$ be a **similarity measure** between users a and $b \in \mathrm{KNN}(a)$. The K-Nearest Neighbor method predicts a ranking Y_{ai} to be :

$$\widehat{Y}_{ai} = \frac{\sum_{b \in \mathrm{KNN}(a)} \mathrm{sim}(a, b)\, Y_{bi}}{\sum_{b \in \mathrm{KNN}(a)} \mathrm{sim}(a, b)}.$$

The similarity measure $\mathrm{sim}(a, b)$ could be any distance function between the feature vectors x_a and x_b of users a and b, e.g. the euclidean distance $\|x_a - x_b\|$ and the cosine similarity $\cos\theta = \frac{x_a \cdot x_b}{\|x_a\|\,\|x_b\|}$. We will use these similarity measures again in *Unit 4 Unsupervised Learning*.

A drawback of this method is that the success of the K-Nearest Neighbor method depends heavily on the choice of the similarity measure. In the next section, we will discuss collaborative filtering, which will free us from the need to define a good

similarity measure.

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	very clear thoughts Wanna say a big thanks to the prof. for her clear and structured way of explanation.	1
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