Baseline predictors

Denote by μ the overall average rating. A baseline prediction for an unknown rating r_{ui} is denoted by b_{ui} and accounts for the user and item effects

$$b_{ui} = \mu + b_u + b_i$$

The parameters b_u and b_i indicate the observed deviations of user u and item i from the average. In order to estimate b_u and b_i one can solve the least squares problem

$$\min_{b^*} \sum \left(r_{ui} - \mu - b_u - b_i\right)^2 + \lambda_1 \left(\sum b_u^2 + \sum b_i^2\right)$$

Here, the first term $\sum \left(r_{ui} - \mu - b_u - b_i\right)^2$ strives to find b_u and b_i that fit the given ratings. The regularizing term $\lambda_1 \left(\sum b_u^2 + \sum b_i^2\right)$ avoids overfitting by penalizing the magnitudes of the parameters.