## Ordinal Logistic Regression

Key Idea: 
$$\forall i = 1, ..., M, \forall j = 3, ..., k, \beta_{ji} = \beta_{j-1i}$$

- → Share training data → Reduce # of parameters

$$\begin{array}{c|c} \text{Rating} & \log \frac{p(Y_j=1\,|\,X)}{p(Y_j=0\,|\,X)} = \log \frac{p(r\geq j\,|\,X)}{1-p(r\geq j\,|\,X)} = \alpha_j + \sum_{i=1}^M x_i \beta_i & \beta_i \in \Re \\ \hline \\ \frac{k}{k-1} & \text{Classifier 1} \\ \frac{k-2}{k-2} & \text{Classifier k-1} \end{array} \qquad p(r\geq j\,|\,X) = \frac{e^{\alpha_j + \sum_{i=1}^M x_i \beta_i}}{e^{\alpha_j + \sum_{i=1}^M x_i \beta_i} + 1} \\ \hline \\ \text{How many parameters are there in total?} \qquad \text{M+k-1} \end{array}$$