

$$\mathcal{L} = - \sum_{(i,j) \in \Omega} \frac{1}{2\sigma^2} ||M_{ij} - u_i^T v_j||^2 - \sum_{i=1}^{N_1} \frac{\lambda}{2} ||u_i^2|| - \sum_{j=1}^{N_2} \frac{\lambda}{2} ||v_j^2|| + \text{constant}$$