

$$f_1(\mathbf{Y}, \bar{\mathbf{D}}, \bar{\mathbf{X}}) = \sum_{c=1}^c \left(||\mathbf{Y}_c - \bar{\mathbf{D}} \bar{\mathbf{X}}_c||_F^2 + ||\mathbf{Y}_c - \mathbf{D}_0 \mathbf{X}_c^0 - \mathbf{D}_c \mathbf{X}_c^c||_F^2 + \sum_{j=1, j \neq c}^c ||\mathbf{X}_c^j||_F^2 \right)$$