1 Intro

2 Optimization Problem

2.1 Classical Two-View CCA

$$\begin{array}{ll} \textbf{minimize} & \|\mathbf{X}_1\mathbf{\Phi}_1 - \mathbf{X}_2\mathbf{\Phi}_2\|_F^2 \\ \textbf{subject to} & \mathbf{\Phi}_1^\top \mathbf{X}_1^\top \mathbf{X}_1 \mathbf{\Phi}_1 = \mathbf{I}_k \\ & \mathbf{\Phi}_2^\top \mathbf{X}_2^\top \mathbf{X}_2 \mathbf{\Phi}_2 = \mathbf{I}_k, \end{array}$$

where $\mathbf{\Phi}_1$ and $\mathbf{\Phi}_2$ are the optimization variables.

2.2 Fully Connected Multiview Graph

$$\begin{array}{ll} \textbf{minimize} & \sum_{i=1}^{m} \sum_{j=i+1}^{m} \|\mathbf{X}_i\mathbf{\Phi}_i - \mathbf{X}_j\mathbf{\Phi}_j\|_F^2 \\ \textbf{subject to} & \mathbf{\Phi}_i^\top \mathbf{X}_i^\top \mathbf{X}_i \mathbf{\Phi}_i = \mathbf{I}_k \;\; i = 1, \ldots, m, \end{array}$$

where $\mathbf{\Phi}_i$ are the optimization variables.

2.3 (Mean Field Variational?) Approximation of Fully Connected Graph

$$\begin{array}{ll} \textbf{minimize} & \sum_{i=1}^{m} \|\mathbf{X}_i\mathbf{\Phi}_i - \mathbf{\Psi}\|_F^2 \\ \textbf{subject to} & \mathbf{\Phi}_i^\top \mathbf{X}_i^\top \mathbf{X}_i \mathbf{\Phi}_i = \mathbf{I}_k \;\; i = 1, \ldots, m, \end{array}$$

where $\mathbf{\Phi}_i$ and $\mathbf{\Psi}$ are the optimization variables.

2.4 Arbitrary Dependency Graph

$$\begin{array}{ll} \textbf{minimize} & \sum_{(i,j)\in E} \|\mathbf{X}_i\mathbf{\Phi}_i - \mathbf{X}_j\mathbf{\Phi}_j\|_F^2 \\ \textbf{subject to} & \mathbf{\Phi}_i^\top \mathbf{X}_i^\top \mathbf{X}_i \mathbf{\Phi}_i = \mathbf{I}_k \;\; i = 1, \ldots, m, \end{array}$$

where E is the set of edges in the dependency graph between the views, and $\mathbf{\Phi}_i$ are the optimization variables.

3 Algorithms

3.1 AppGrad

3.2 GenELinK