

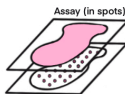
Sample Collection



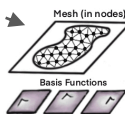
Gene Expression

gene

$$\mathbf{X} \begin{matrix} \text{Spot} \\ (m \times n) \end{matrix}$$



Finite Element Analysis



Penalty Matrix

$$\mathbf{P} \begin{matrix} (k \times k) \end{matrix} = \begin{matrix} \mathbf{R}_1 \\ (k \times k) \end{matrix} \begin{matrix} \mathbf{R}_0^{-1} \\ (k \times k) \end{matrix} \begin{matrix} \mathbf{R}_1 \\ (k \times k) \end{matrix}$$

Functional Mapping

$$\Psi \begin{matrix} (n \times k) \end{matrix}$$

$$\underset{h,w}{\operatorname{argmin}} \{ \|\mathbf{X} - h\mathbf{w}^T \Psi^T\|_F^2 + \lambda h^T h \mathbf{w}^T \mathbf{P} \mathbf{w} \}$$

$$\hat{\mathbf{X}}$$

Data
Reconstruction

Denosed Gene Expression

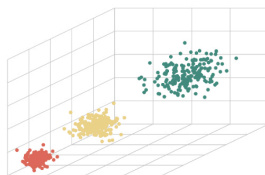


Scores

$$\mathbf{H} \begin{matrix} (m \times r) \end{matrix}$$

Clustering

Gene Co-Expression



Functional Components

$$\mathbf{W}^T \begin{matrix} (r \times k) \end{matrix}$$

Clustering

Spatial Domain Detection

