$$\min_{\boldsymbol{D}\in C,\boldsymbol{A}} \frac{1}{2}||\boldsymbol{Y}-\boldsymbol{D}\boldsymbol{A}||_F^2+\lambda f(\boldsymbol{A})$$

$\boldsymbol{Y} \in R^{n\times m}$: raw data matrix whose columns are signal.

$\boldsymbol{D} \in R^{n\times k}$: a dictionary whose columns $||d_i||_2 \leq 1$

$\boldsymbol{A} \in R^{k\times m}$: the matrix of sparse coefficients.

$f : R^{k\times m} \to R$: a sparsity-promoting function.

$$\begin{aligned}&\min_{\boldsymbol{U},\boldsymbol{S},\boldsymbol{m},\boldsymbol{O}} \tfrac{1}{2}||\boldsymbol{Y}-\boldsymbol{m}\boldsymbol{l}^T-\boldsymbol{U}\boldsymbol{S}-\boldsymbol{O}||_F^2+\lambda||\boldsymbol{O}||_{2,c}\\ &\boldsymbol{U}^T\boldsymbol{U}=\boldsymbol{I}_{q\times q}\end{aligned}$$

$\boldsymbol{Y} \in R^{n\times m}$: raw data matrix whose columns are signal.

$\boldsymbol{m} \in R^{n}$: mean vector.

$\boldsymbol{l} \in R^{m}$: a vector where each element is equal to one.

$\boldsymbol{U} \in R^{n\times q}$: an orthonormal matrix that spans the signal subspace.

$\boldsymbol{S} \in R^{q\times m}$: a matrix whose columns are the principal components.

$\boldsymbol{O} = [\boldsymbol{o}_1, \boldsymbol{o}_2, \ldots, \boldsymbol{o}_N]$: $\boldsymbol{o}_n \neq \boldsymbol{0}_p$ whenever datum n is an outlier, and $\boldsymbol{o}_n = \boldsymbol{0}_p$ otherwise.

$$\min_{\hat{\boldsymbol{P}},\{\boldsymbol{L}_i\}_{i=1}^N} \sum_{i=1}^{N} ||(\hat{\boldsymbol{P}}\boldsymbol{R}_i-\boldsymbol{L}_i)\Omega_i||_F^2+\tau||\hat{\boldsymbol{P}}-\boldsymbol{P}||_F^2$$

$\boldsymbol{N}$: number of points.

$\hat{\boldsymbol{P}}$:denoised point cloud.

$\boldsymbol{P}$: noisy point cloud.

$\boldsymbol{R}_i \in R^{N\times K}$: the operator that extracts the K-neighbourhood of $\boldsymbol{p}_i$.

$\boldsymbol{L}_i$: the approximation of the local data matrix.

$\boldsymbol{\Omega}_i \in R^{K\times K}$: A diagonal matrix whose elements are ω_{ij}.

τ: it is a regularization parameter that controls the trade-off between the denoising 'strenth' and data fidelity.