
Algorithm 2: Hyper-parameter selection

Input: *data train:* $\mathbf{P}^{\text{Train}} \in \mathbb{R}^d \otimes \mathbb{R}^{T^{\text{Train}}}$,

data test: $\mathbf{P}^{\text{Test}} \in \mathbb{R}^d \otimes \mathbb{R}^{T^{\text{Test}}}$,

number of atoms: $K \in \{1, 2, \dots\}$,

lambda: $\lambda > 0$

Output: *reconstruction error:* \mathcal{E}

1 $\mathbf{D}^{\text{Train}}, \mathbf{A}^{\text{Train}}, \mathbf{w}^{\text{Train}} \leftarrow \text{DL}(\mathbf{P}^{\text{Train}}, K, \lambda, 500)$,

where the function DL refers to Algorithm 1

2 $\mathbf{A}^{\text{Test}} \leftarrow \text{Proj}_{\mathbf{D}^{\text{Train}}}(\mathbf{P}^{\text{Test}})$

3 $A_{k,t}^{\text{Sim}} \leftarrow \hat{\mu}_k + A_{k,t}^{\text{Test}} w_k^{\text{Train}} + \varepsilon_k^t$ with

$$\hat{\mu}_k = \bar{\alpha}_k^{\text{Train}}(1 - w_k^{\text{Train}}),$$

$$\varepsilon_k^t \sim \mathcal{N}(0, \hat{\sigma}_k^2),$$

$$\hat{\sigma}_k^2 \leftarrow \widehat{\text{Var}}[\boldsymbol{\alpha}_k^{\text{Train}}] \left(1 - (w_k^{\text{Train}})^2\right),$$

for all $k \in [K]$ and $t \in [T^{\text{Test}} - 1]$

4 $\mathbf{P}^{\text{Reco}} \leftarrow \mathbf{D}^{\text{Train}} \mathbf{A}^{\text{Train}}$

5 $\mathbf{P}^{\text{Sim}} \leftarrow \mathbf{D}^{\text{Train}} \mathbf{A}^{\text{Sim}}$

6 $\mathcal{E} \leftarrow 0.8 \left\| \mathbf{P}_{:,1}^{\text{Test}} - \mathbf{P}^{\text{Sim}} \right\|_F^2 + 0.2 \left\| \mathbf{P}^{\text{Train}} - \mathbf{P}^{\text{Reco}} \right\|_F^2$

without the first test value
