1 Persudo Code of Superresolution

Algorithm 1 Approximate K-SVD

Input: Singal set $\mathbf{X}$, initial dictionary $\mathbf{D_0}$, target sparsity K, number of iterations k
Output: Dictionary $\mathbf{D}$ and sparse matrix $\mathbf{\Gamma}$ such that $\mathbf{X} \approx \mathbf{D\Gamma}$
Init Set $\mathbf{D} \leftarrow \mathbf{D_0}$
for $n = 1, \ldots, k$ **do**
  $\mathbf{\Gamma} = \mathrm{OMP}(\mathbf{X}, \mathbf{D})$
  for $j = 1, \ldots, L$ **do**
    $\mathbf{D}_j \leftarrow 0$
    $I \leftarrow \{$ *indices of the signals in* $\mathbf{\Gamma}_i$ *whose* i *element is non-zero* $\}$
    $g \leftarrow \mathbf{\Gamma}_{j,I}^T$
    $d \leftarrow \mathbf{X}_I g - \mathbf{D\Gamma}_I g$
    $d \leftarrow d / \|d\|_2$
    $g \leftarrow \mathbf{X}_I^T d - (\mathbf{D\Gamma_I}^T) d$
    $\mathbf{D}_j \leftarrow d$
    $\mathbf{\Gamma}_{j,I} \leftarrow g^T$
  end for
end for

Algorithm 2 Parallelized Orthogonal Matching Pursuit(OMP)

Input: Dictionary $\mathbf{D_0}$, batch of signals x_i, target sparsity T
Output: Sparse Representations γ
Init Set $I \leftarrow \{\}$, $r \leftarrow x, \Gamma \leftarrow 0$
for $i = 1, \ldots, T$ **do**
  $\mathbf{k} \leftarrow \mathbf{D}r$
  $k^* \leftarrow \max\{\mathbf{k}\}$
  $I \leftarrow (I, k^*)$
  $x_i = \mathbf{D}_I r_i$
  $r_i \leftarrow x_i - \mathbf{D}_I \gamma_I$
end for

Algorithm 3 Parallelized Orthogonal Matching Pursuit(OMP)

Input: Dictionary $\mathbf{D_0}$, batch of signals $X = \{x_i\}$, target sparsity T
Output: Sparse Representations Γ
Init Set $I \leftarrow \{\}$, $R \leftarrow X, \Gamma \leftarrow 0$
for $i = 1, \ldots, T$ **do**
  $\mathbf{K} \leftarrow \mathbf{D}r$
  $k^* \leftarrow \max\{\mathbf{K}\}$
  $I \leftarrow (I, k^*)$
  in batch solve $x_i = \mathbf{D}_I r_i$
  in batch compute $r_i \leftarrow x_i - \mathbf{D}_I \gamma_I$ where $R = r_i$
end for