
Algorithm 1 t-SVD for third order tensors

Input: $\mathcal{M} \in \mathbb{R}^{n_1 \times n_2 \times n_3}$.

Output: $\mathcal{U} \in \mathbb{R}^{n_1 \times n_1 \times n_3}$, $\mathcal{S} \in \mathbb{R}^{n_1 \times n_2 \times n_3}$, $\mathcal{V} \in \mathbb{R}^{n_2 \times n_2 \times n_3}$.

$\mathcal{D} \leftarrow \text{fft}(\mathcal{M}, [], 3)$

for $i = 1$ to n_3 **do**

$[\mathbf{U}, \mathbf{S}, \mathbf{V}] = \text{svd}(\mathcal{D}^{(i)})$

$\hat{\mathcal{U}}^{(i)} = \mathbf{U}$; $\hat{\mathcal{S}}^{(i)} = \mathbf{S}$; $\hat{\mathcal{V}}^{(i)} = \mathbf{V}$;

end for

$\mathcal{U} \leftarrow \text{ifft}(\hat{\mathcal{U}}, [], 3)$; $\mathcal{S} \leftarrow \text{ifft}(\hat{\mathcal{S}}, [], 3)$; $\mathcal{V} \leftarrow \text{ifft}(\hat{\mathcal{V}}, [], 3)$
