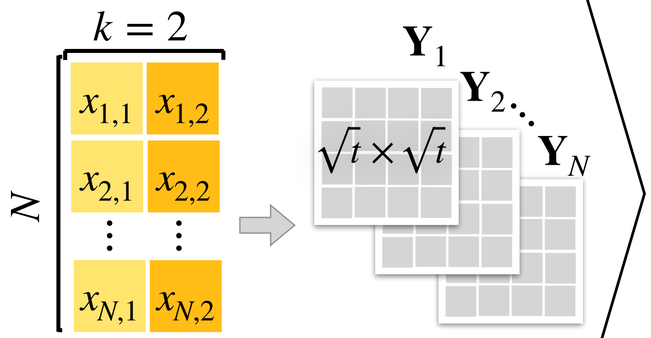
Manifold learning-based PCE

Data:

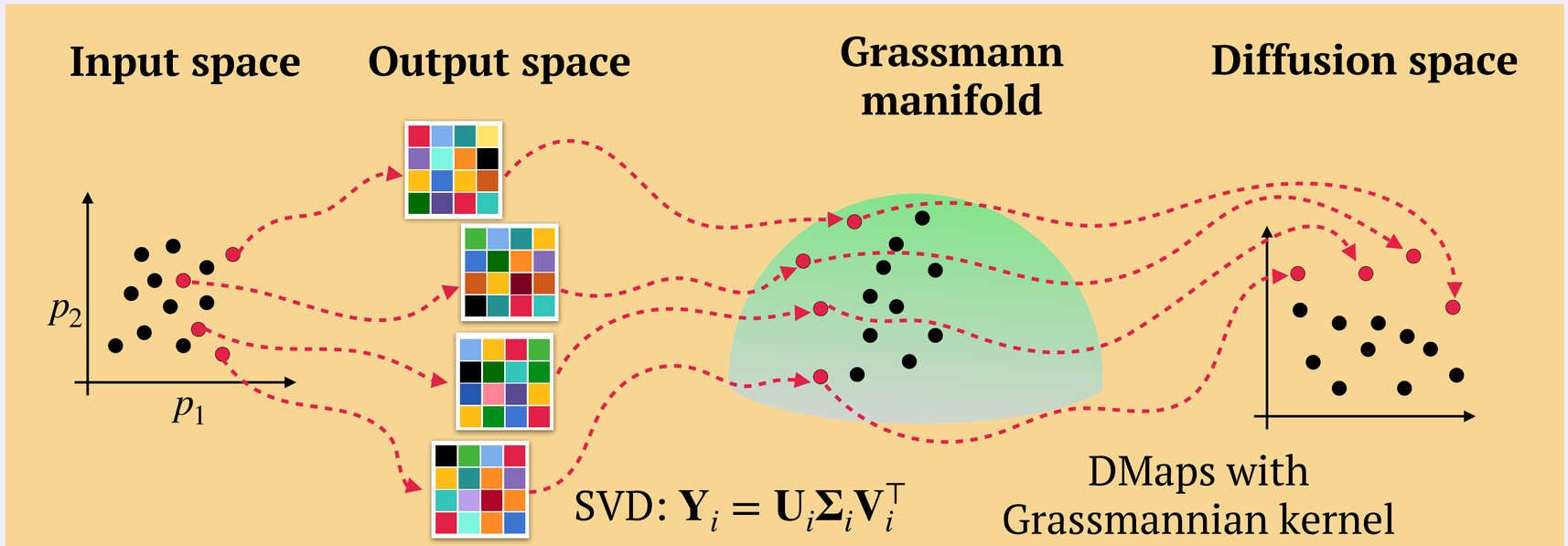


Parameters: $p, g, s_{\max}$

Sobol' indices on the manifold:

S_{α,θ_1}	S_{α,θ_2}	S_{α,θ_3}	$S_{T_{\alpha,\theta_1}}$	$S_{T_{\alpha,\theta_2}}$	$S_{T_{\alpha,\theta_3}}$
S_{β,θ_1}	S_{β,θ_2}	S_{β,θ_3}	$S_{T_{\beta,\theta_1}}$	$S_{T_{\beta,\theta_2}}$	$S_{T_{\beta,\theta_3}}$

GDMaps



PCE computed with data on the latent space

$$\widetilde{\mathscr{E}}(\mathbf{X}) = \sum_{\mathbf{s} \in \Lambda} c_{\mathbf{s}} \Psi_{\mathbf{s}}(\mathbf{X}), \quad \Psi_{\mathbf{s}}(\mathbf{X}) = \prod_{i=1}^{k} \psi_{s_i}^{(i)}(\mathbf{X}_i),$$

Λ: a total-degree multi-index set with all multi-indices satisfying $\|\mathbf{s}\|_1 \leq s_{\max}$

GSA using PCE

Obtain first-order Sobol' indices $(\mathbf{S}_i)_{i=1}^k, \mathbf{S}_i \in \mathbb{R}^g$ and total-order Sobol' indices $(\mathbf{S}_{T_i})_{i=1}^k, \mathbf{S}_{T_i} \in \mathbb{R}^g$