

# Dimensionality Reduction on Manifolds

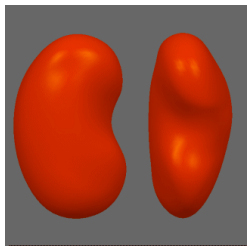
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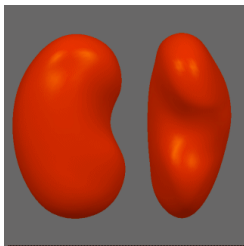
July 15, 2016



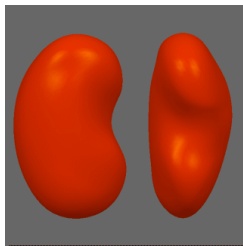
# PGA of Kidney



Mode 1

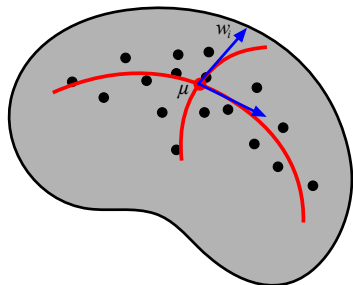


Mode 2



Mode 3

# Probabilistic Principal Geodesic Analysis



$$y|x \sim N_M(\text{Exp}(\mu, z), \tau^{-1})$$

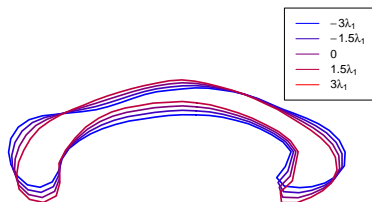
$$z = W\Lambda x$$

Zhang & Fletcher, NIPS 2013

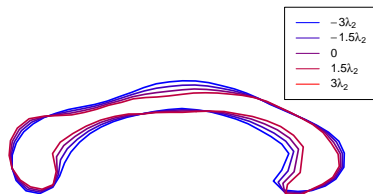
- ▶  $W$  is  $n \times k$  matrix = orthonormal  $k$ -frame in  $T_\mu M$
- ▶  $\Lambda$  is a  $k \times k$  diagonal matrix
- ▶  $x \sim N(0, I)$  are latent variables

Generalization of PPCA (Roweis, 1998; Tipping & Bishop, 1999)

# PPGA of Corpus Callosum



Principal Geodesic 1



Principal Geodesic 2