

# Tangent Space Alignment for Manifold Learning

**Hongyuan Zha**

*zha@cse.psu.edu*

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, PENNSYLVANIA STATE  
UNIVERSITY, USA

In this talk we present an algorithm for the manifold learning and parametrization recovery problems. Based on a set of scattered data points sampled with noise from a parameterized manifold, the local geometry of the manifold is learned by constructing an approximation for the tangent space at each data point, and those tangent spaces are then aligned to produce the global coordinates of the data points with respect to the underlying manifold. We relate the alignment process to biharmonic eigenvalue problems and discuss the spectral properties of the alignment operators. We also mention how those techniques can be applied to supervised manifold learning problems. Applications in scientific computing will be discussed as well.