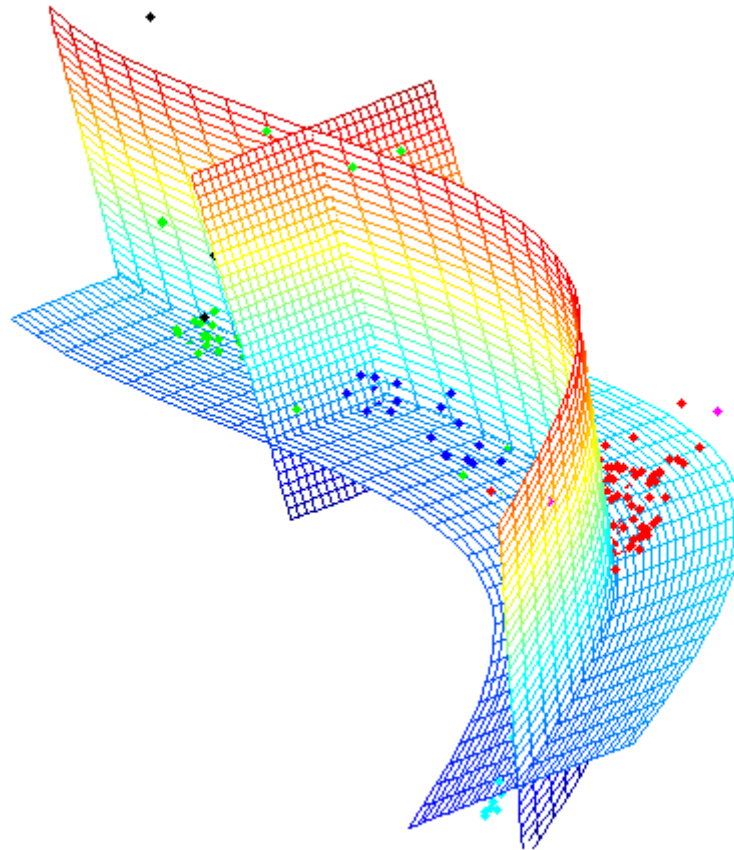


Manifold Learning



Manifold Learning

Learning (Training)



Features:
1. Color: **Radish/Red**
2. Type : **Fruit**
3. Shape
etc...



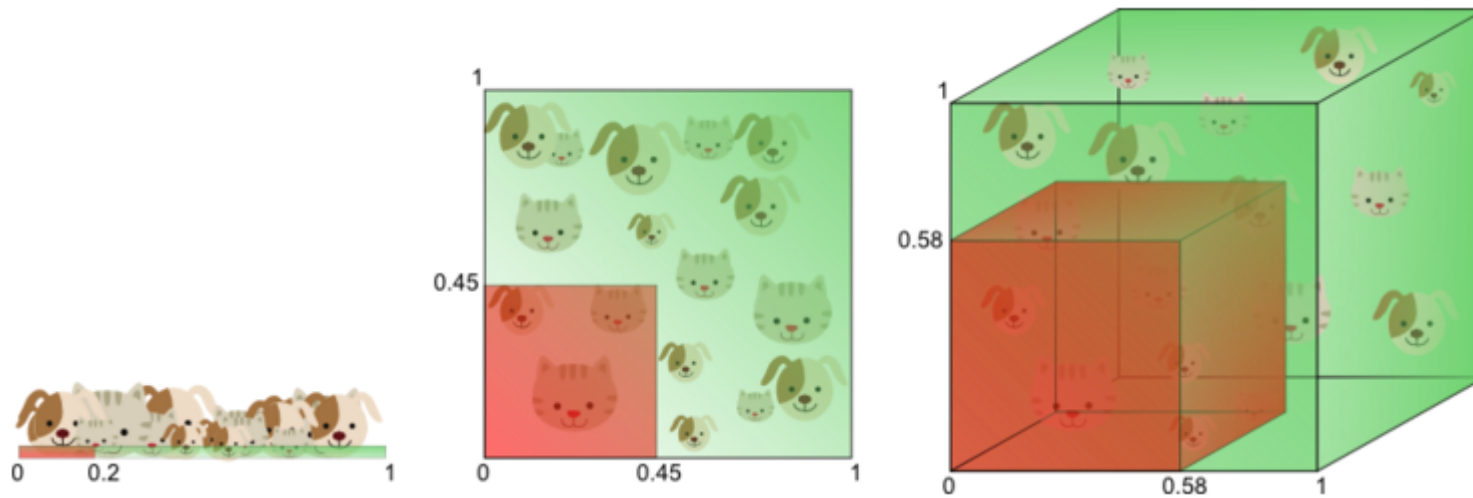
Features:
1. Sky Blue
2. **Logo**
3. Shape
etc...



Features:
1. **Yellow**
2. **Fruit**
3. Shape
etc...

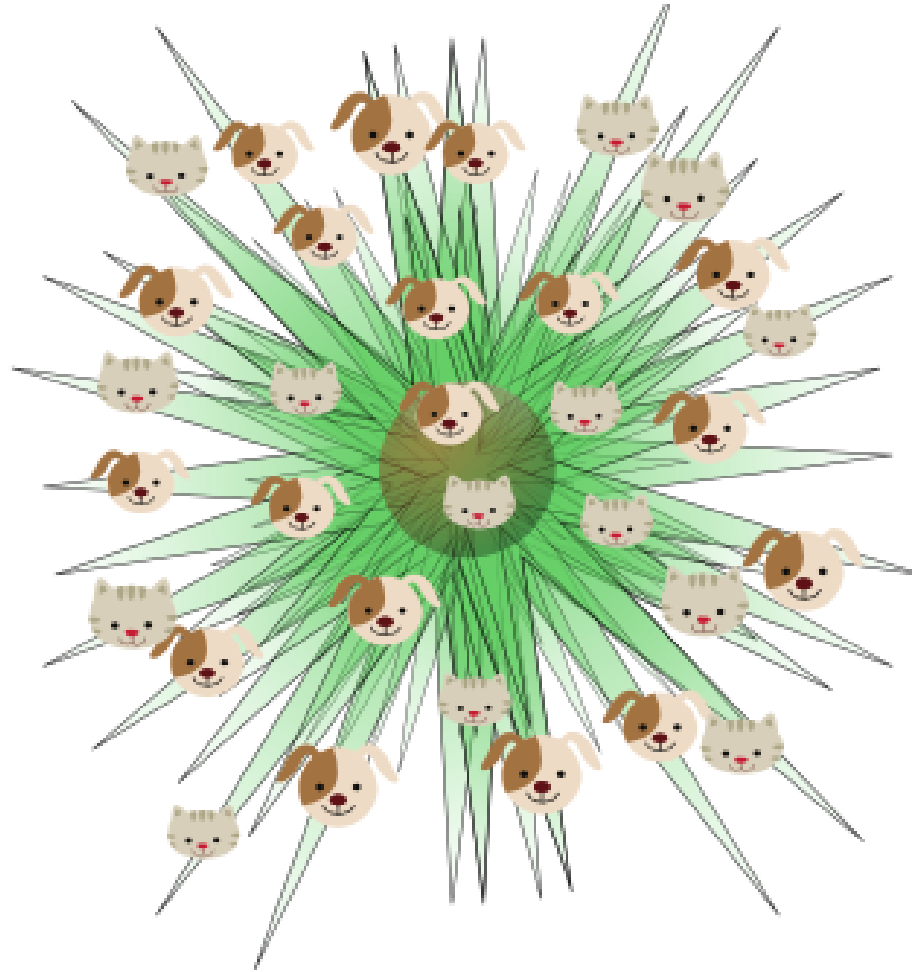
Feature Extraction

Manifold Learning



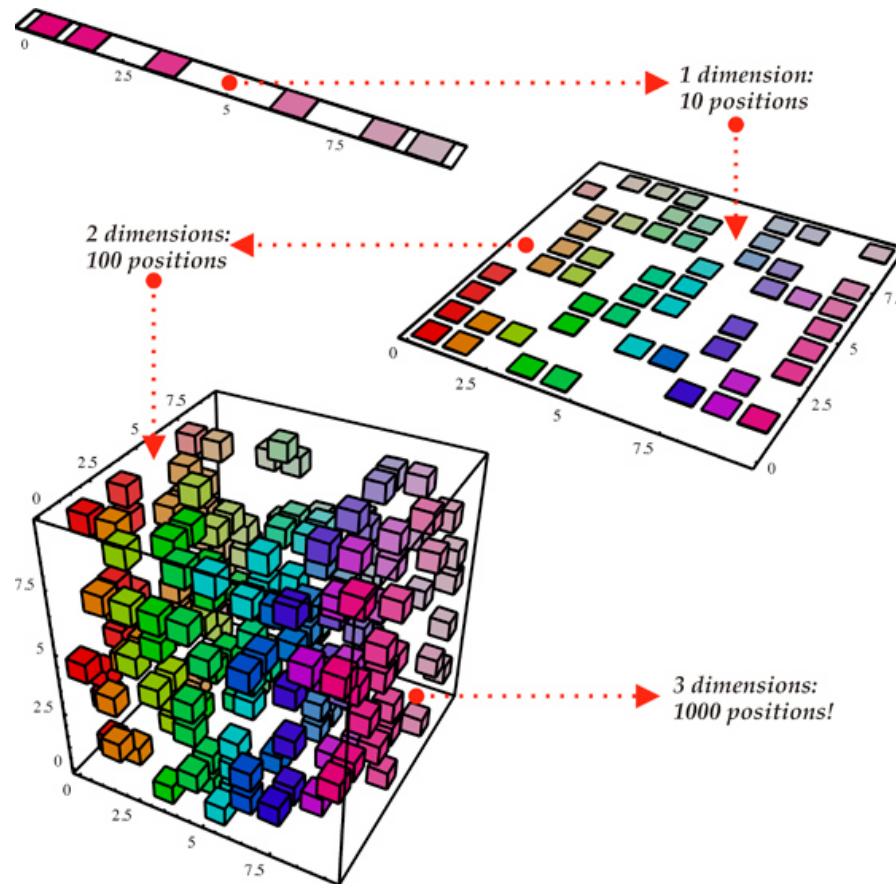
Feature Space

Manifold Learning



N – dimensional Feature Space

Manifold Learning

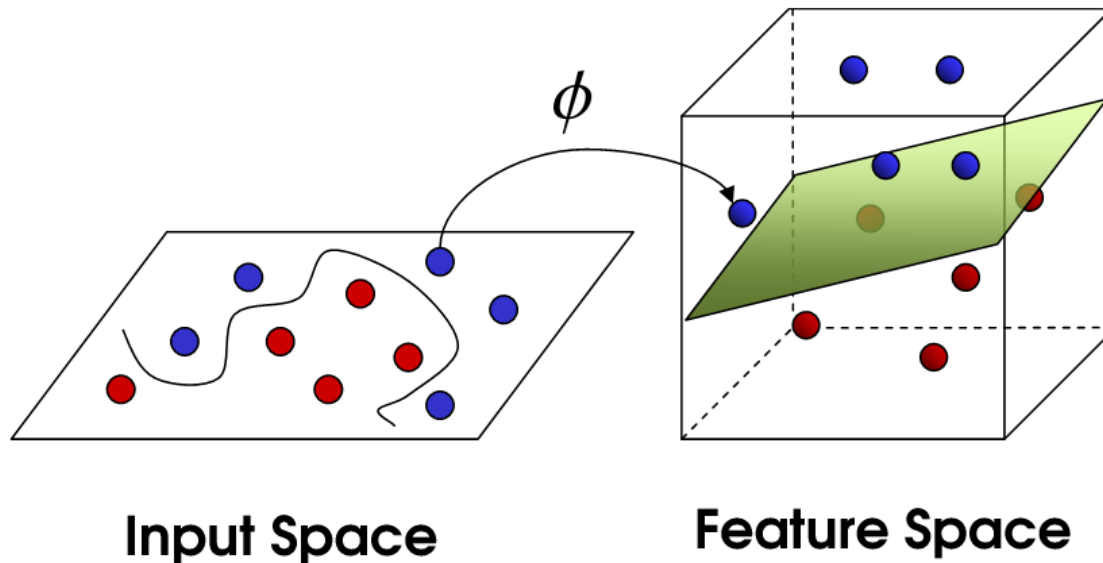


Curse of Dimensionality

Manifold Learning

Common Strategies

1. Dimensionality reduction methods
2. Feature Selection methods



Manifold Learning

Common Strategies

1. Dimensionality reduction methods
 - a. Principal Component Analysis (PCA)
 - b. Linear Discriminant Analysis (LDA)
2. Feature Selection methods

Principal Component Analysis (PCA)



(a) Angle 1



(b) Angle 2



(c) Angle 3

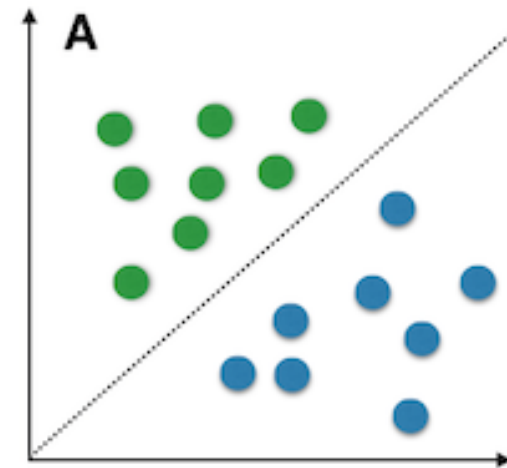
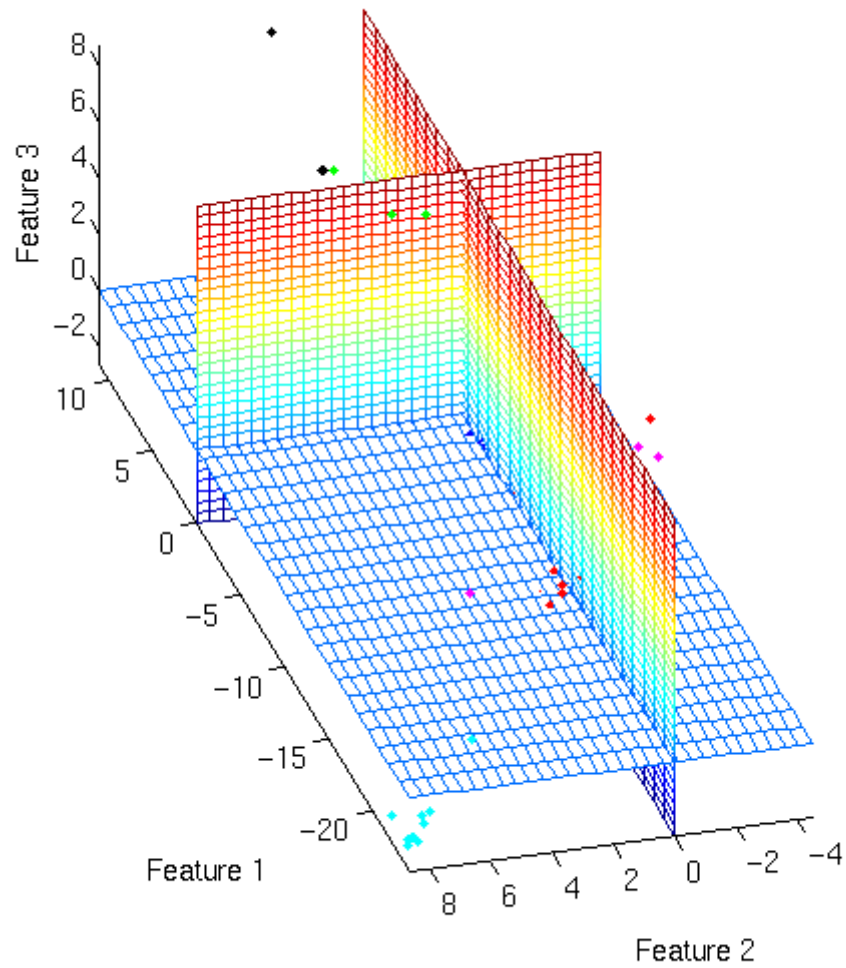


(d) Angle 4

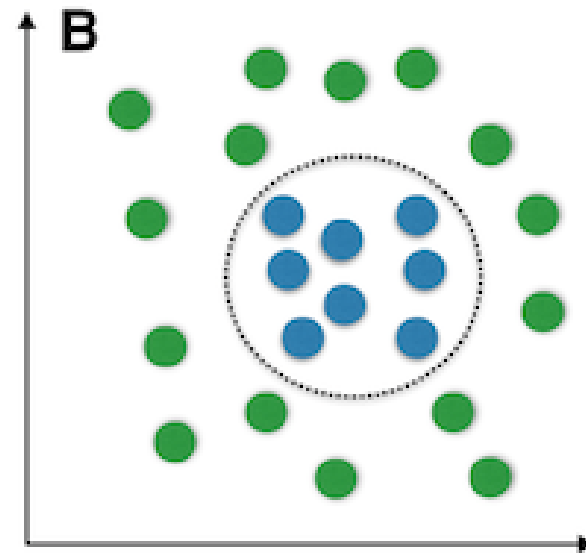
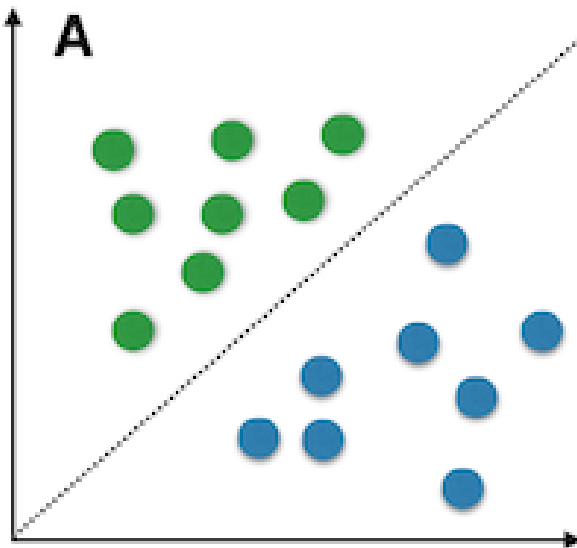


(e) Angle 5

Linear Dimensionality Reduction Methods



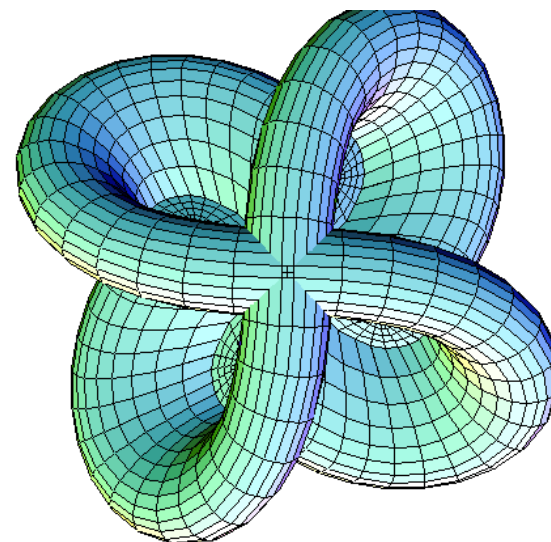
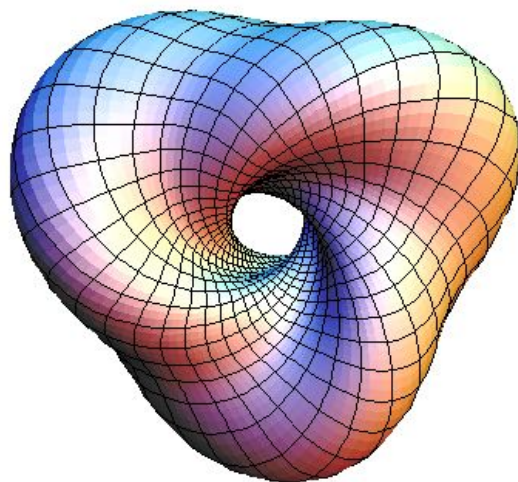
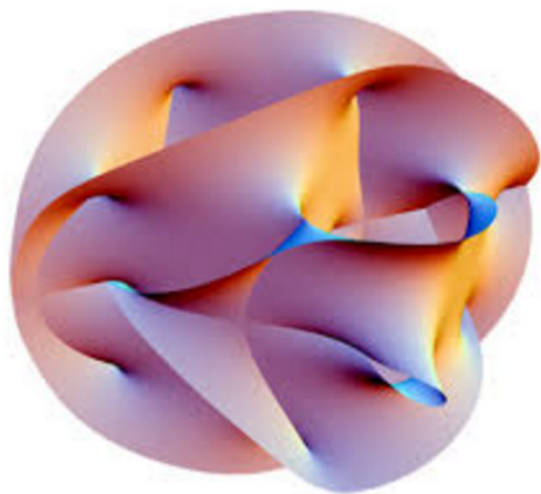
Linear Dimensionality Reduction Methods



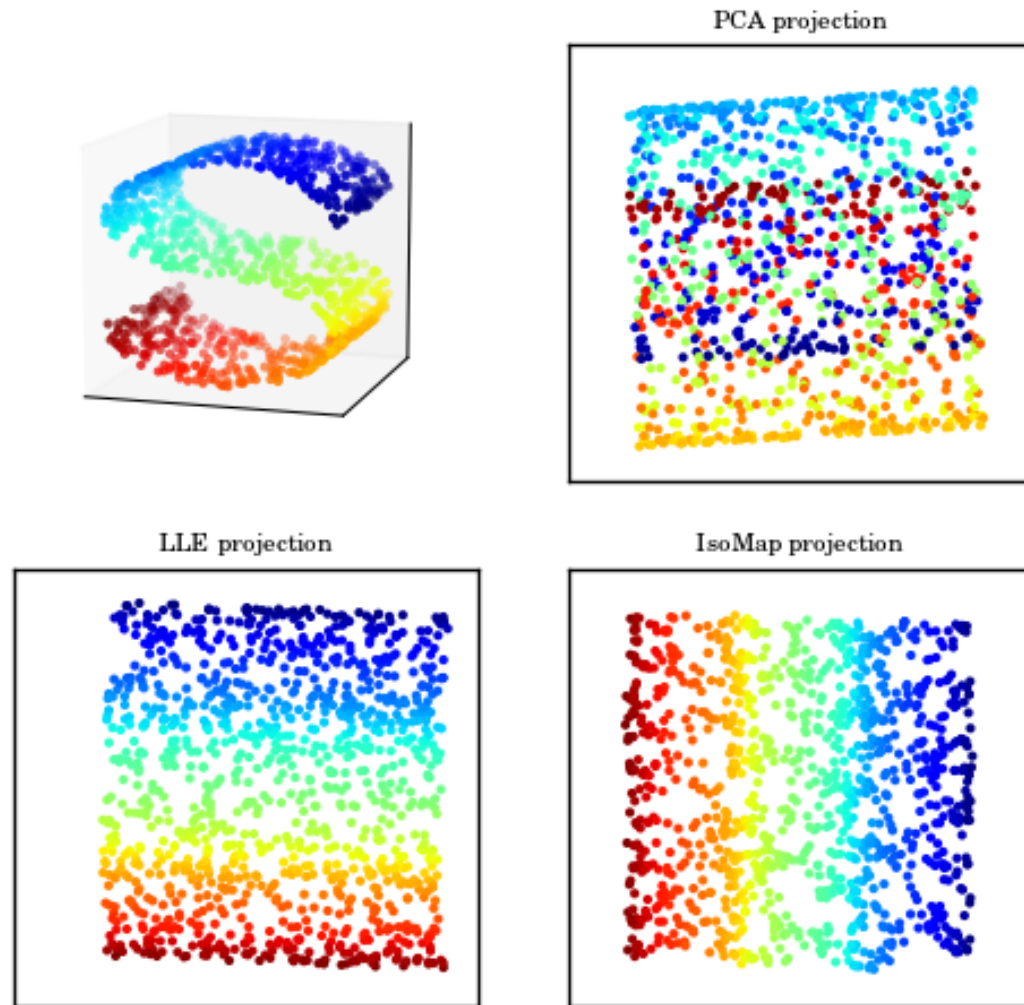
What about non-linear cases ?

Manifolds

Natural data forms lower-dimensional
manifolds in its embedding space



Manifolds

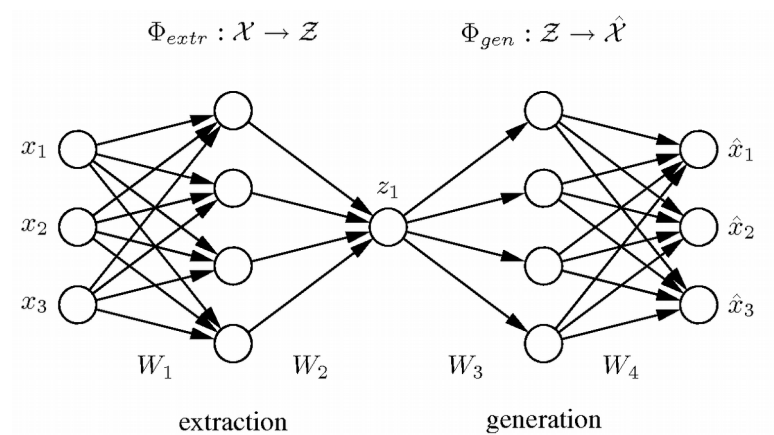
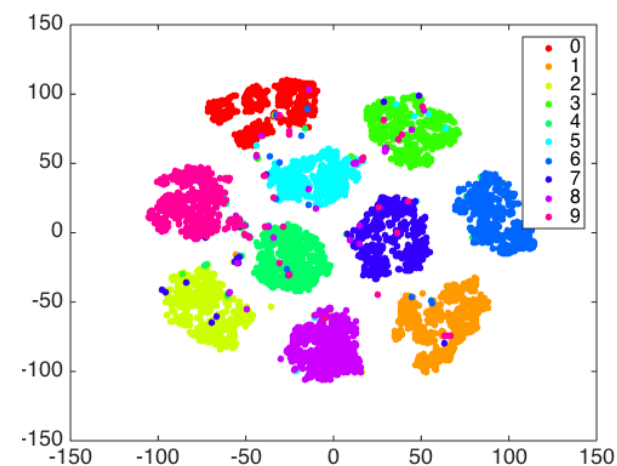


Combination of distance heuristics and multidimensional scaling

Manifolds

Methods

1. ISOMAPS
2. Local Linear Embedding
3. Kernel PCA
4. Spectral Embedding
5. t-SNE
6. Non Linear PCA / Autoencoders



Manifold Learning

Common Strategies

1. Dimensionality reduction methods
 - a. PCA
 - b. LDA



Unsupervised

2. Feature Selection methods



Supervised