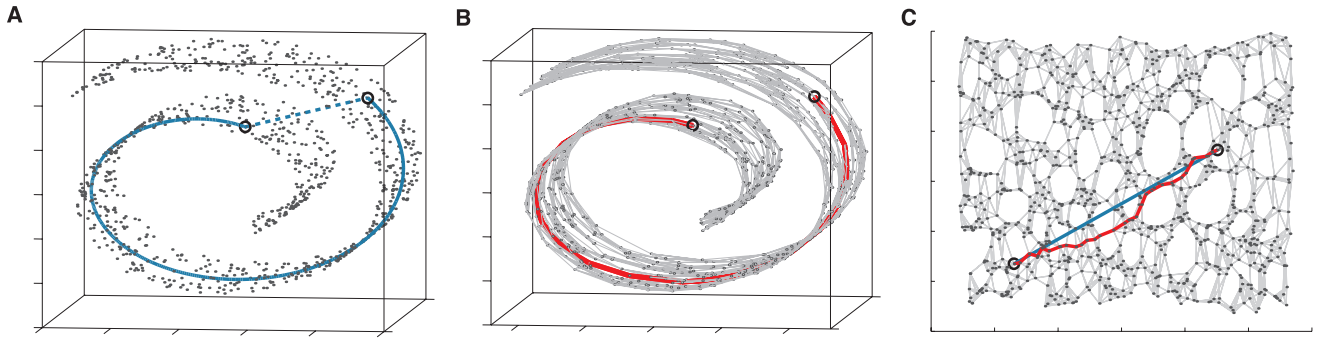
Outline

Isomap

Isomap is useful for non-linear dimension reduction

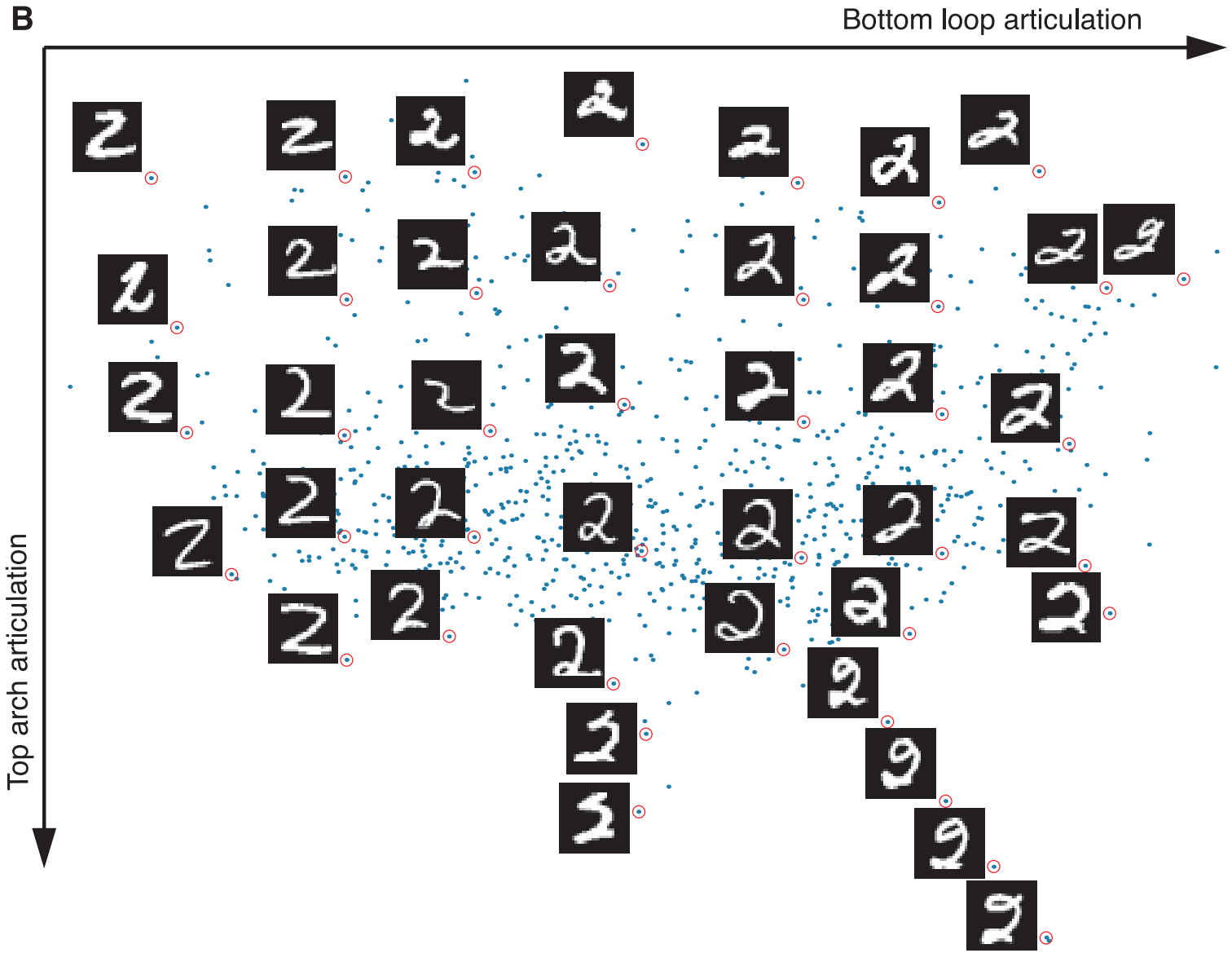
1. Calculate distances d_{ij} for $i, j = 1, \ldots, n$ between all data points, using the Euclidean distance.
2. Form a graph G with the n samples as nodes, and edges between the respective K nearest neighbors (in Euclidean metric).
3. Replace distances d_{ij} by 'shortest-path' distance d_{ij}^G [2] and perform classical MDS, using these distances.



Examples from Tenenbaum et al. (2000)

[2] The path-distance in the graph is, for a given path $i_1 \to i_2 \to \ldots \to i_m$ between two nodes i_1 and i_m that follows the edges of the graph, the sum of the original distances $\sum_{k=1}^{m-1} d_{i_k i_{k+1}}$. The shortest path distance between two points i and j is the minimal path distance along all paths starting in i and ending in j.

Embedding Handwritten Characters



Embedding Faces