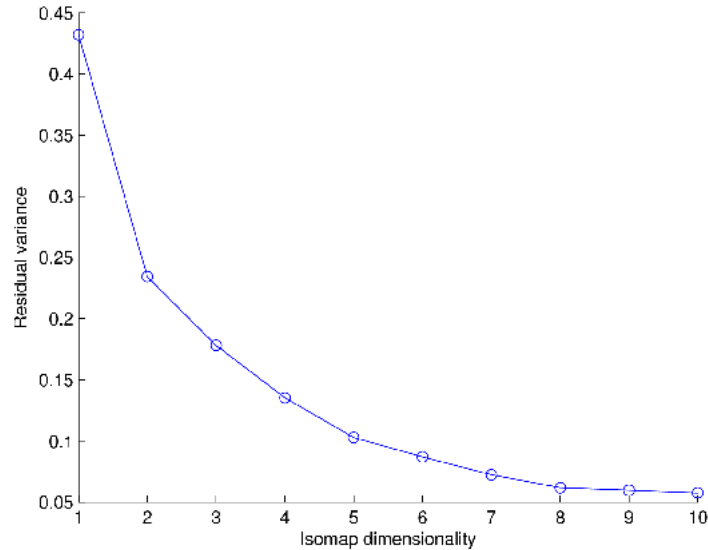


PARTA Question 2 Part D

As obtained from the isomap, the residual variance curve



Intrinsic dimensionality of the handwritten numerals of 4,9 revealed is approximately 2. The intrinsic dimensionality of the data can be estimated by looking for the “elbow“ at which the curve ceases to decrease significantly with added dimensions. Although from the curve, the intrinsic dimensionality may seem to be more than 2, But it can be explained more or less with two dimensionality.

The 2 dimensionality is as followed:

1) Curlness and completeness of the upper portion which is along y axis and becomes more as we go down. This separate out 4 and 9. Because mostly people make 4 open and 9 complete. So 9 will be more in lower portions and 4 in upper portions.

2) Concavity of the middle portions in 4 and 9. As we can see in left part sample shown has middle part concave down like the 4 in upper left one, then as we go towards right it becomes straight and more in right it become concave up.

Factors like thickness will be not an intrinsic dimension because we using tangent-distance embedding.

