Assignment-2
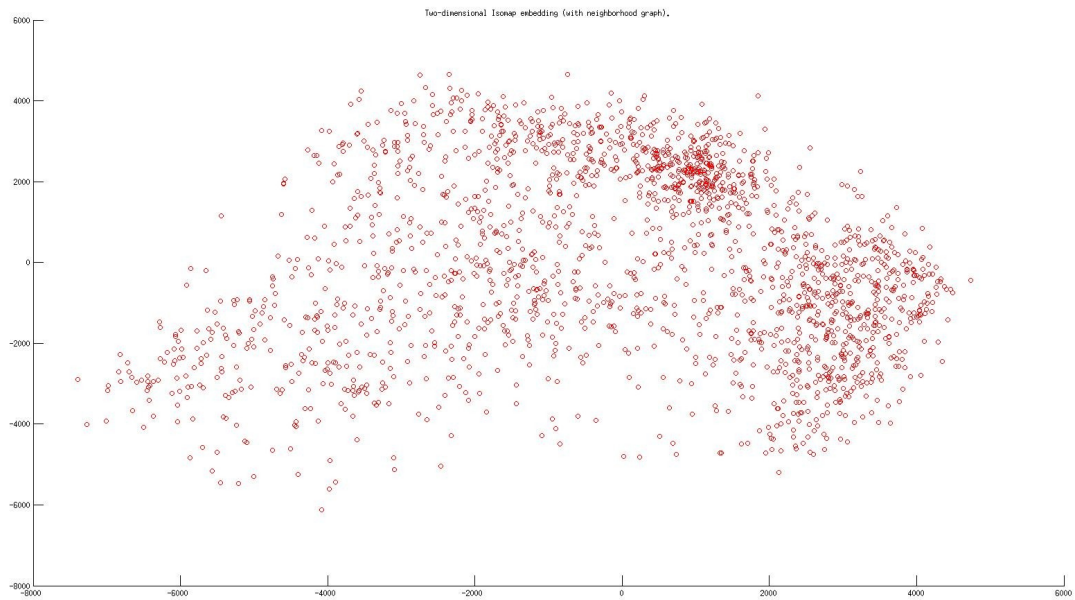## Part A
Q1(Euclidean Metric Distance)

Isomap of first 2000 images of MNSIT DATABASE

Two-dimensional Isomap embedding (with neighborhood graph).
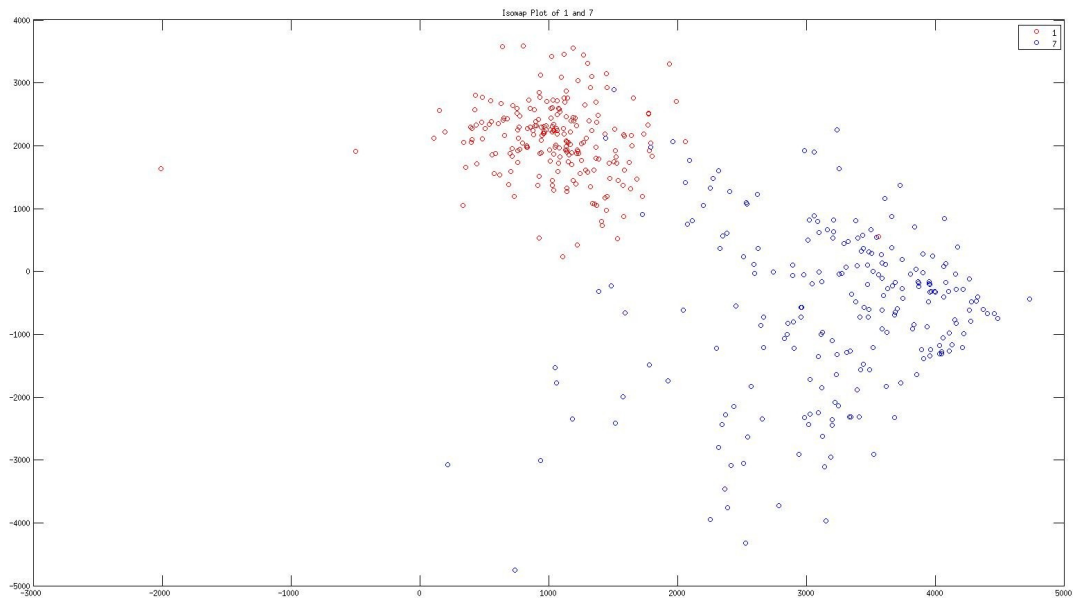
### Residual Variance

Residual variance

Isomap dimensionality
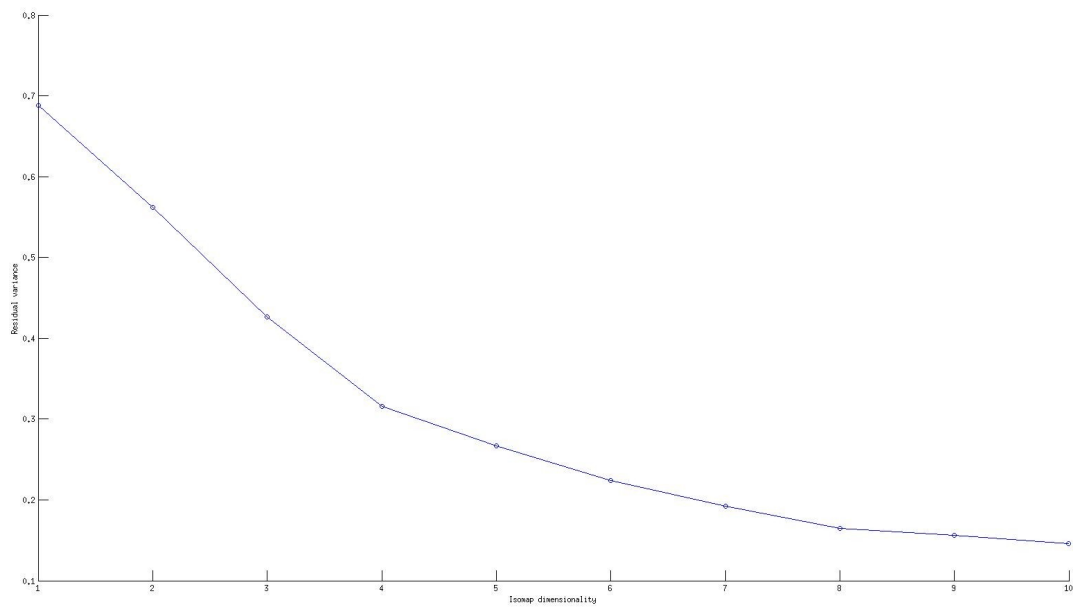
The dimentionality of the data from mnsit is very high approx. 10 dimentional which is in accordance to the fact that we have a lot of DOF in our hands and many things can vary like the pressure applied , strokes used , and many more.

Cluster for 1 and 7

Isomap Plot of 1 and 7

It is clear from the plot that isomap algorithm used with euclidean distance clearly distinguishes 1 and 7 handwritten numerals very clearly.
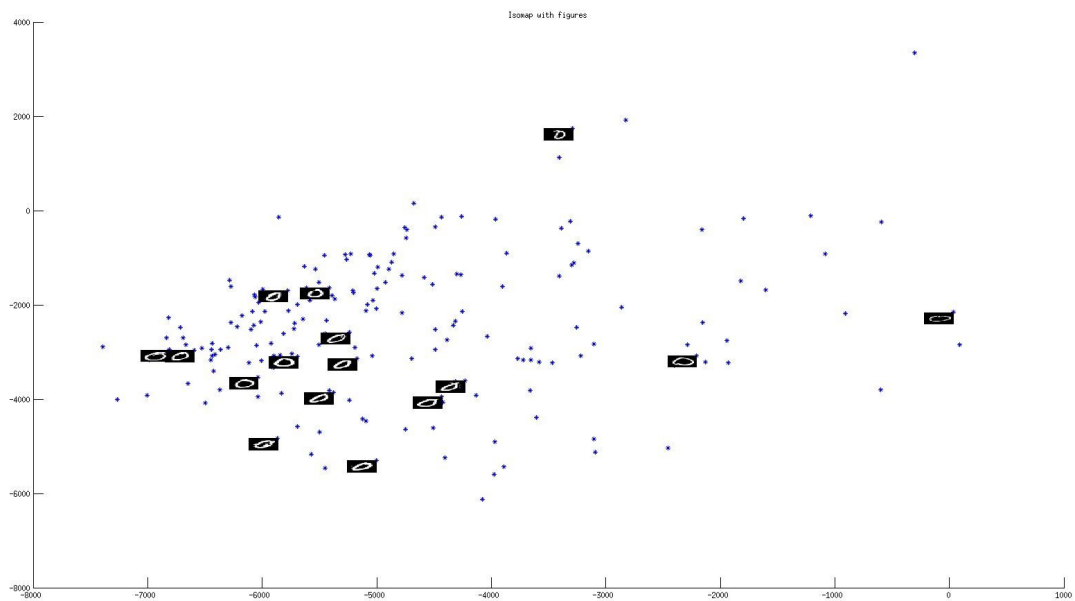
Cluster for 4 and 9

Isomap Plot of 4 and 9
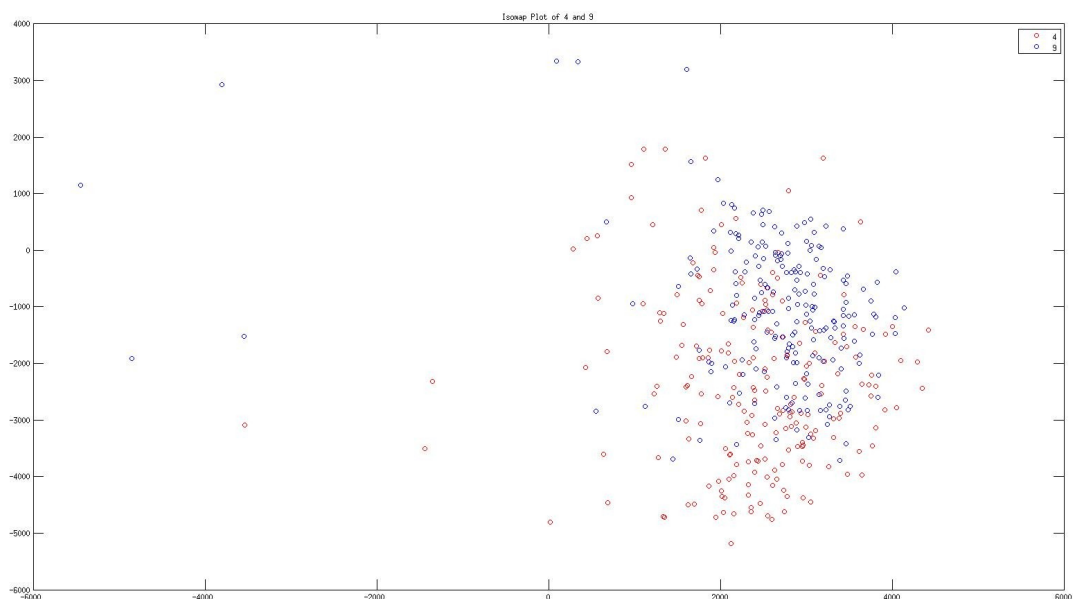
Isomap used with euclidean distance is not very effective in distinguishing 4 and 9 .

Isomap of all digits
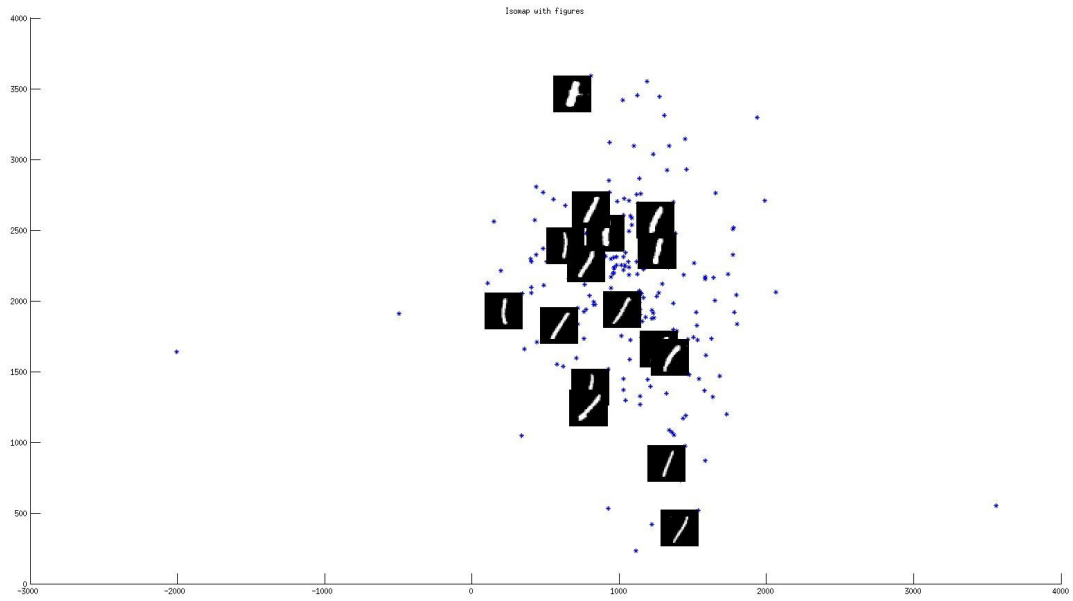

Isomap of all the digits
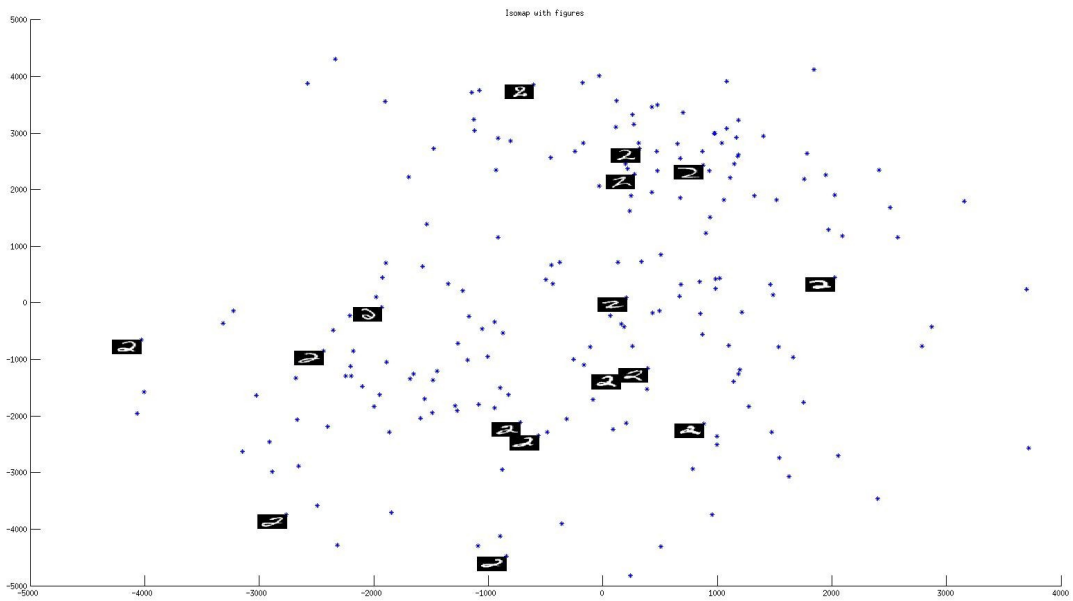
Isomap of 0

Isomap with figures
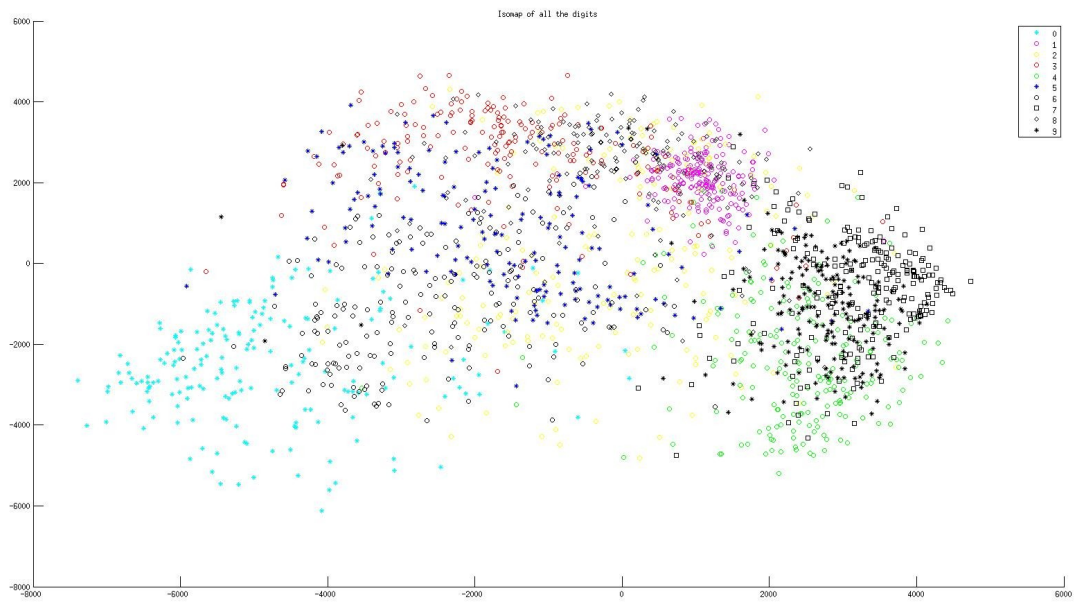
Zero becomes more **flatter** and its witdh increases as we go from **Left to Right**
Zero become more **thinner** and height increases as we go from **Down to UP**
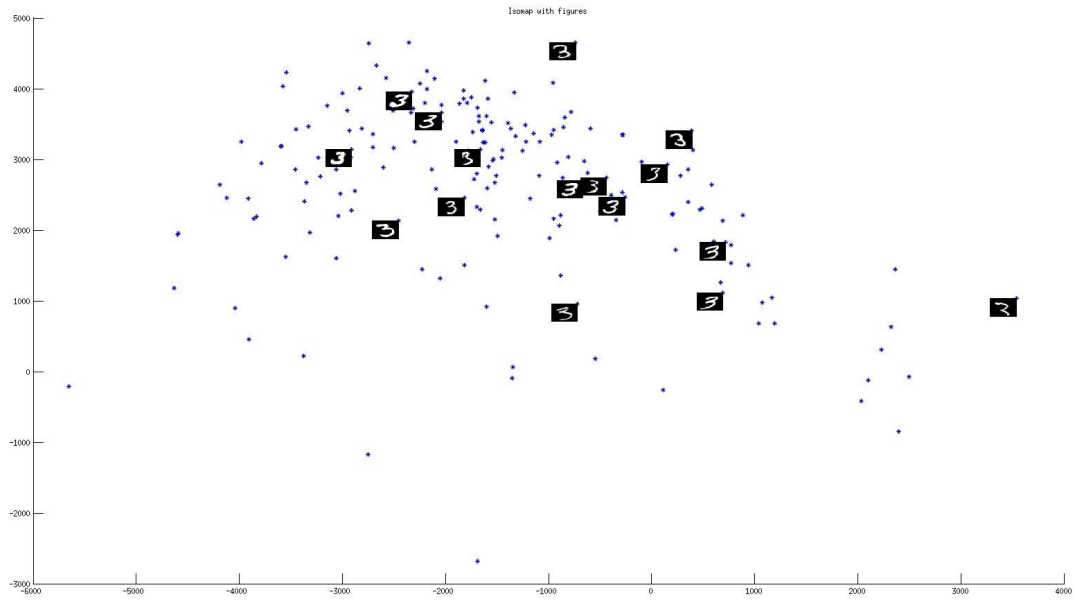
Isomap of 1

One Become more and more **Thicker** as we go from **DOWN** to **UP**
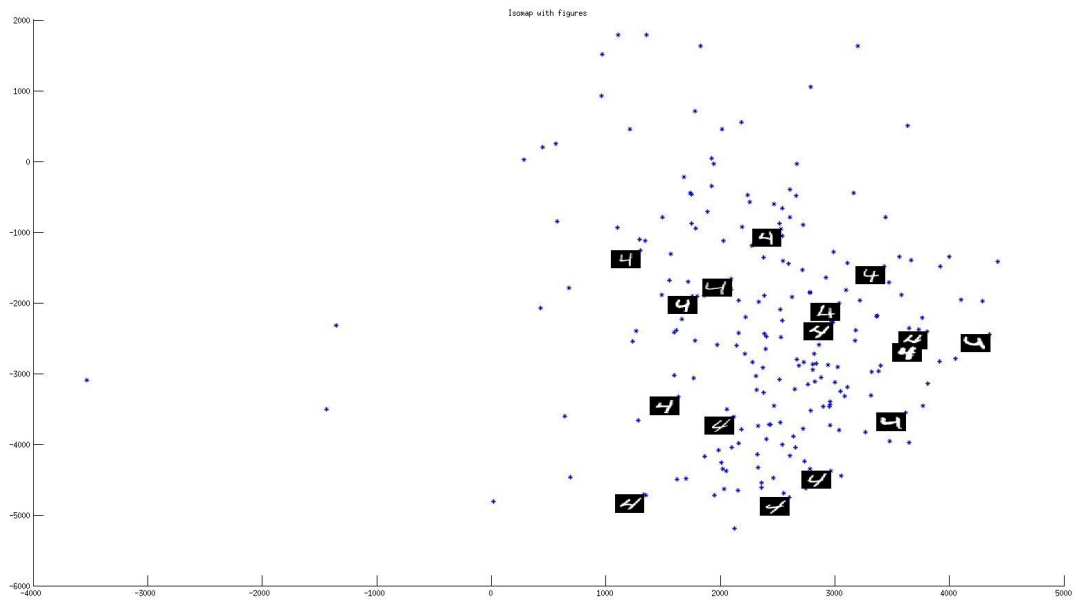
Isomap of 2

Upper **curved** Part of Two Becomes more and more Curved as we go from **DOWN** to **UP**
The **loop** of 2 becomes less as we go from **LEFT** to **RIGHT**
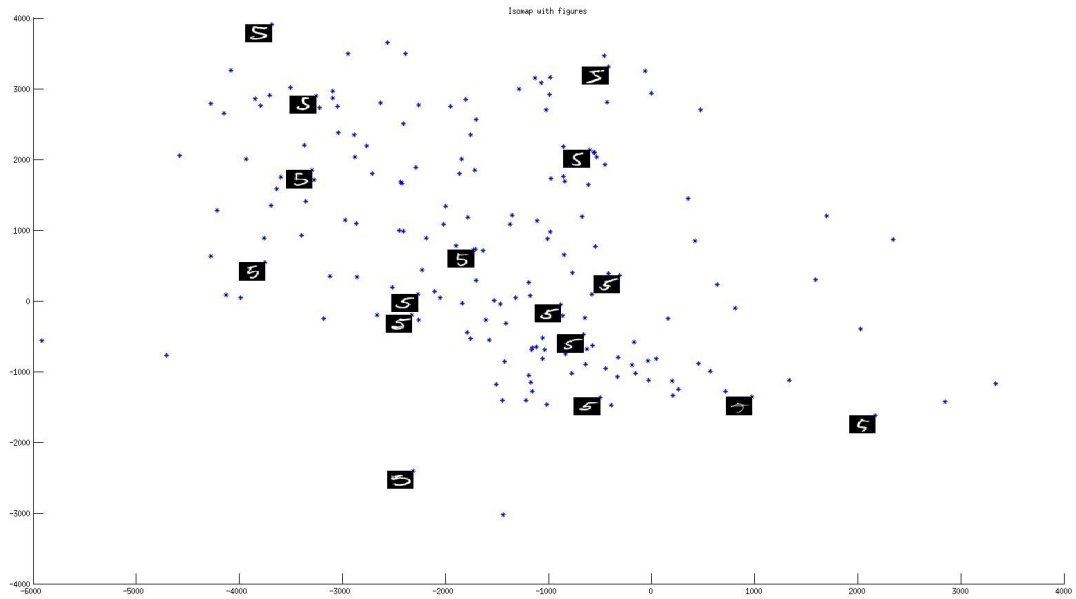
Isomap of 3

The **Lower Loop** of 3 becomes more and more **lighter** as we move from **LEFT** to **RIGHT**
The **upper Loop** of 3 becomes more and more **Bigger** as we move from **DOWN** to **UP**
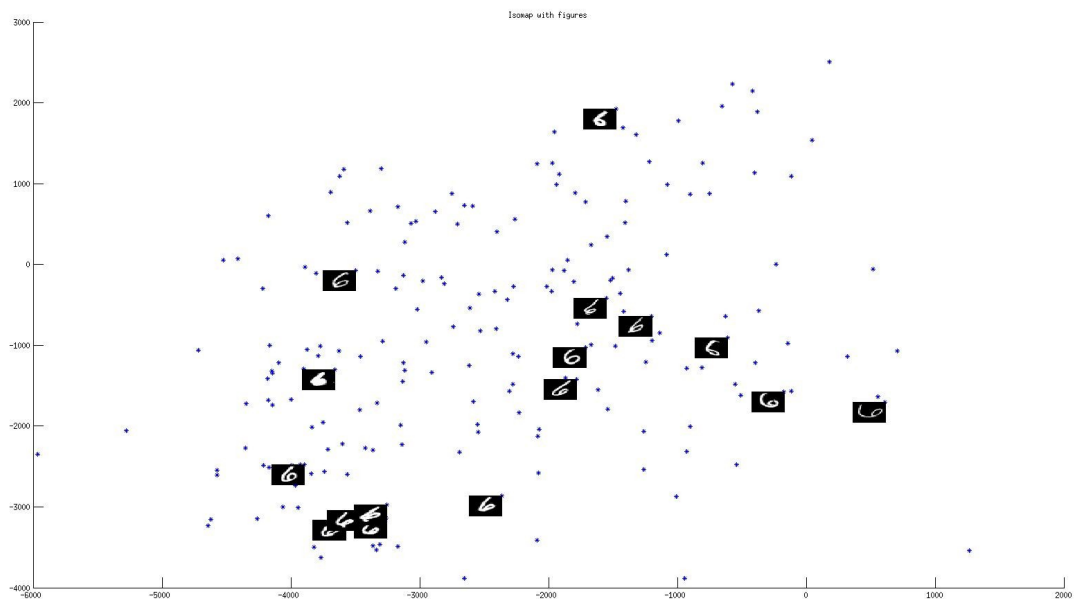
Isomap of 4

Four Becomes more and more **Straight** as we go from **DOWN** to **UP**
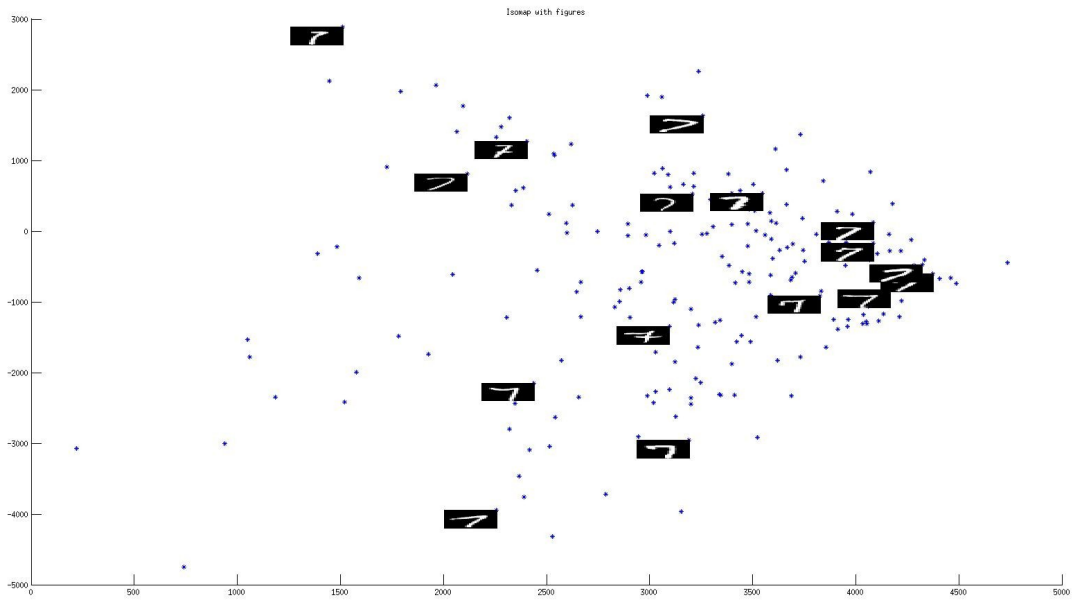
Isomap of 5

Isomap with figures

The Upper **horizontal line** of 5 becomes more and more **long** as we go from **LEFT** to
The **Lower Curve** of 5 becomes more and more **bigger** as we go from **DOWN** to **UP**
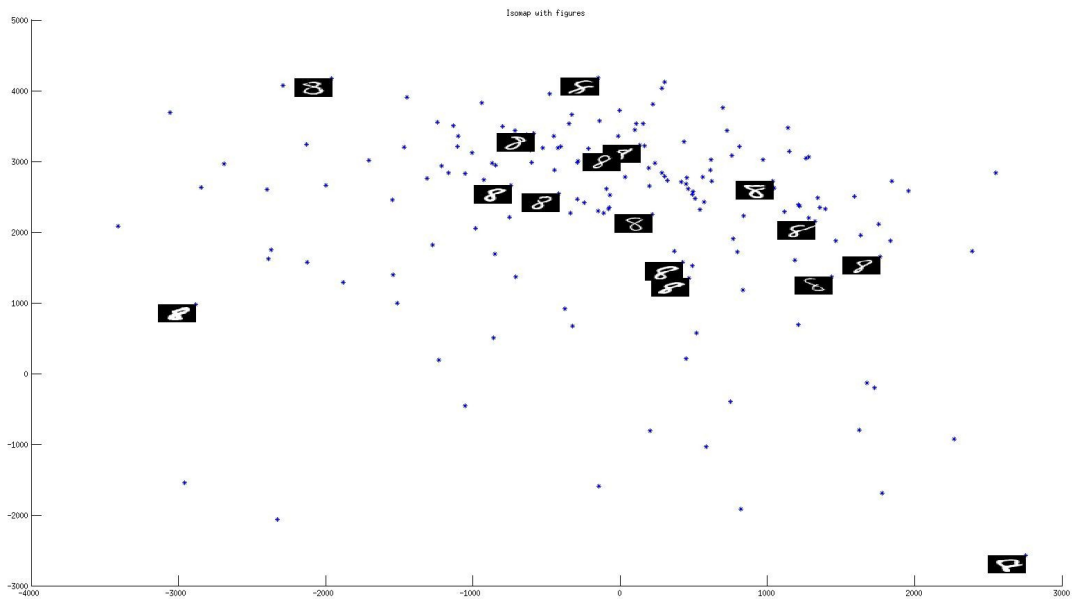
Isomap of 6

Isomap with figures

The upper curve of 6 becomes smaller from **DOWN** to **UP**
6 rotates **anticlockwise** as we go from **LEFT** to
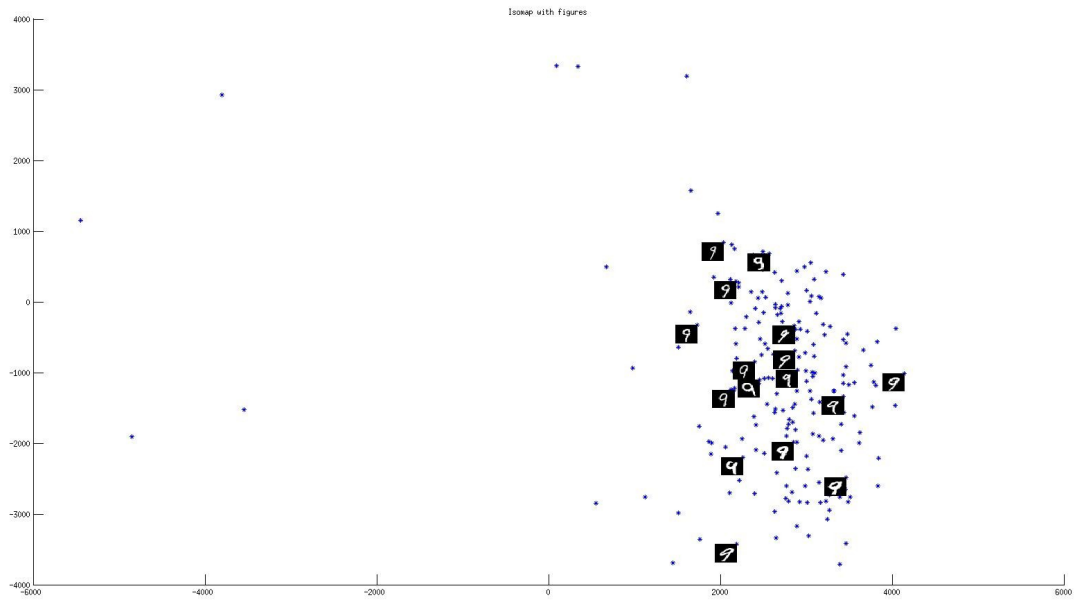
Isomap of 7

Isomap with figures

The **Lower Line** of 7 becomes **more longer** from **DOWN** to **UP**
The **angle of 7** becomes **more acute** as we go from **LEFT** to **RIGHT**

Isomap of 8

Isomap with figures

The **upper loop** of 8 becomes **bigger** as we go from **LEFT** to **RIGHT**
The **lower loop** of 8 becomes **bigger** as we go from **DOWN** to **UP**

Isomap of 9

9 becomes **thinner** as we go from **DOWN** to **UP**