

Report

Q1. The percentage error graph has been plotted for various values of k . It has been found from the graph that the least percentage error is for $k=4$, and the error is between 5.4%-5.55. The error can be improved, however if error is calculated using weights. For example the style of writing 4 and 9 is very similar. So, if 4 is identified as 9 it's weighted error can be assigned a lower value considering the fact that they are written in the same way.

Q2. It is clear from the plot that isomap algorithm with Euclidean distance clearly distinguishes 1 and 7. Because of the similarity in their structure of writing the isomap does not distinguish 4 and 9 effectively. In the plot of all digits together we observe that 1 is becomes thicker from down to up.

The images of digit 1 are clearly distinguished from that of 7. The tangent distance can be used effectively to recognize/separate 1 and 7 here. 4 and 9 are not distinguished properly here. They form a single group in the plot.

Q3. The following observations can be made from the table constructed by varying different parameters. For a low value of epoch and learning rate and high value of batch size the error was sizeable (~8%). As the batch size and learning rate was increased the error increased. However, on reducing the batch size the error reduced substantially (from 12% to ~3%). On reducing the learning rate a bit it was observed that the error increased slightly. Therefore, when the epoch was increased the error started decreasing. On increasing the epoch a slight decrease in the error was observed. However, after a certain time there was no effect on the error by increasing the epoch.