EE 626 : Quiz 2

Duration: 45 minutes **Marks:10** **Date: Apr 7' 2025**

Note: No clarifications or discussions on the questions will be entertained during the examination session.

1. Perform a DTW match between the temporal sequence of vectors

$$\mathbf{X} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \begin{bmatrix} -2 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ -3 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and}$$

$$\mathbf{Y} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

   (a) Fill up the elements of the cost matrix of size 4×6 by using the Manhattan / City- block distance.

   (b) Fill up the elements of the accumulator matrix of size 4×6 by using the cost matrix in part (a).

   (c) Determine the DTW cost between $\mathbf{X}$ and $\mathbf{Y}$.

   (d) Write down the indices of the warping path obtained.

[2 +2.5 + 1.5 + 2 = 8 marks]

2. Assume that we have a single training pair $(\mathbf{x}_1, y_1)$, where $\mathbf{x}_1 \neq 0$. If we used the following strategy to adjust the weights, defined by

$$\mathbf{w}_{k+1} = \mathbf{w}_k + \eta \frac{e_k \mathbf{x}_1}{\mathbf{x}_1^T \mathbf{x}_1}$$

where

$$e_k = (y_1 - \mathbf{w}_k^T \mathbf{x}_1)$$

Find an expression for e_{k+1} as a function of e_k and η. **[2 marks]**