1.1

L1 norm between X and Y =

2 + 4 + 7 + 1 + 0 + 1 + 2 + 1 + 0 + 1 + 0 + 1 + 3 + 6 + 7 + 7 + 3 + 3 + 1 + 1 = 51

1.2

DTW distance between X and Y =25

The optimal path =(1,1) -> (1, 2) -> (2, 3) -> (3, 4) -> (3, 5) -> (4, 5) -> (5, 5) -> (6, 6) -> (6, 7) -> (7, 8) -> (8, 8) -> (9, 9) -> (10, 10) -> (10, 11) -> (10, 12) -> (10, 13) -> (10, 14) -> (10, 15) -> (10, 16) -> (10, 17) -> (11, 17) -> (12, 17) -> (13, 18) -> (14, 19) -> (15, 20) -> (16, 20) -> (17, 20) -> (18, 20) -> (19, 20) -> (20, 20)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

2.1 Adjacency matrix A for G:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| 3 | 0 | 1 | 0 | 1 | 1 | 1 |
| 4 | 1 | 0 | 0 | 1 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 1 |
| 6 | 0 | 1 | 0 | 0 | 0 | 0 |

2.2 column stochastic matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 0 | 0 | 0 | 1/2 | 0 | 0 |
| 2 | 0 | 0 | 1/4 | 0 | 0 | 1 |
| 3 | 1/2 | 1 | 0 | 0 | 0 | 0 |
| 4 | 1/2 | 0 | 1/4 | 1/2 | 0 | 0 |
| 5 | 0 | 0 | 1/4 | 0 | 0 | 0 |
| 6 | 0 | 0 | 1/4 | 0 | 1 | 0 |

2.3

PageRank scores of nodes in G:

R0 =



Node 1 0.11934435

Node 2 0.19832024

=

Node 3 0.23972726

Node 4 0.21502754

Node 5 0.08127879

Node 6 0.14630182

2.4

Personalized PageRank scores of nodes in G for query Node 1:

R0 =



Node 1 0.30967218

Node 2 0.09916012

Node 3 0.20319697

=

Node 4 0.27418044

Node 5 0.04063939

Node 6 0.07315091