

# Bitonic TSP

Intuition - Scanning from left to right you connect each point to its closest neighbor. As the scan of the graph occurs you pick up a new point and connect it to the vertex closest to the point that is already in the bitonic tour.

If  $Z$  represents the cost of the shortest bitonic path from  $i$ , through all vertices, and  $1 \leq i \leq n, j > i$  then

$$Z_{i,j} = d(i, i+1) + Z_{i+1,j} \text{ where } j \neq i+1$$

which represents the addition of a new point to the tour, and

$$Z_{i,i+1} = \min_{k > i+1} d(i, k) + Z_{i+1,k}$$

It takes  $O(i)$  to compute  $Z_{i,j}$ .

Time complexity is  $\Theta(\sum_{i=1}^n i)$  which is  $\Theta(n^2)$ .