Application 4.1 Approximating Piecewise Linear Functions

Background

- Numerous Applications with different scientific fields use piecewise linear functions.
- These functions contain a large of breakpoints.
- They are hence very expensive to store, manipulate and even to evaluate.
- Approximating Piecewise Linear Function Saves on
- Storage Space.
- Cost of using the function

Application 4.1 Approximating Piecewise Linear Functions

We define-

- $F_1(x)$- piecewise linear function of scalar 'x'
- It passes through 'n' points where $a_1=(x_1,y_1)$,…a_n
- The function varies linearly between every two consecutive points x_i and x_{i+1}
- We consider situations in which n is very large and for practical reasons

We wish to approximate the function $F_1(x)$ by another function $F_2(x)$ that passes through only a subset of the points a_1,…a_n

Application 4.1 Approximating Piecewise Linear Functions

We will formulate the problem –

- As the shortest path problem on a network G with n nodes.
- The network contains an arc(i,j) for each pair of nodes i and j such that i<j

We define Total Cost

$$c_{ij} = \alpha + \beta[\Sigma(f_1(x_k) - f_2(x_k)^2]$$