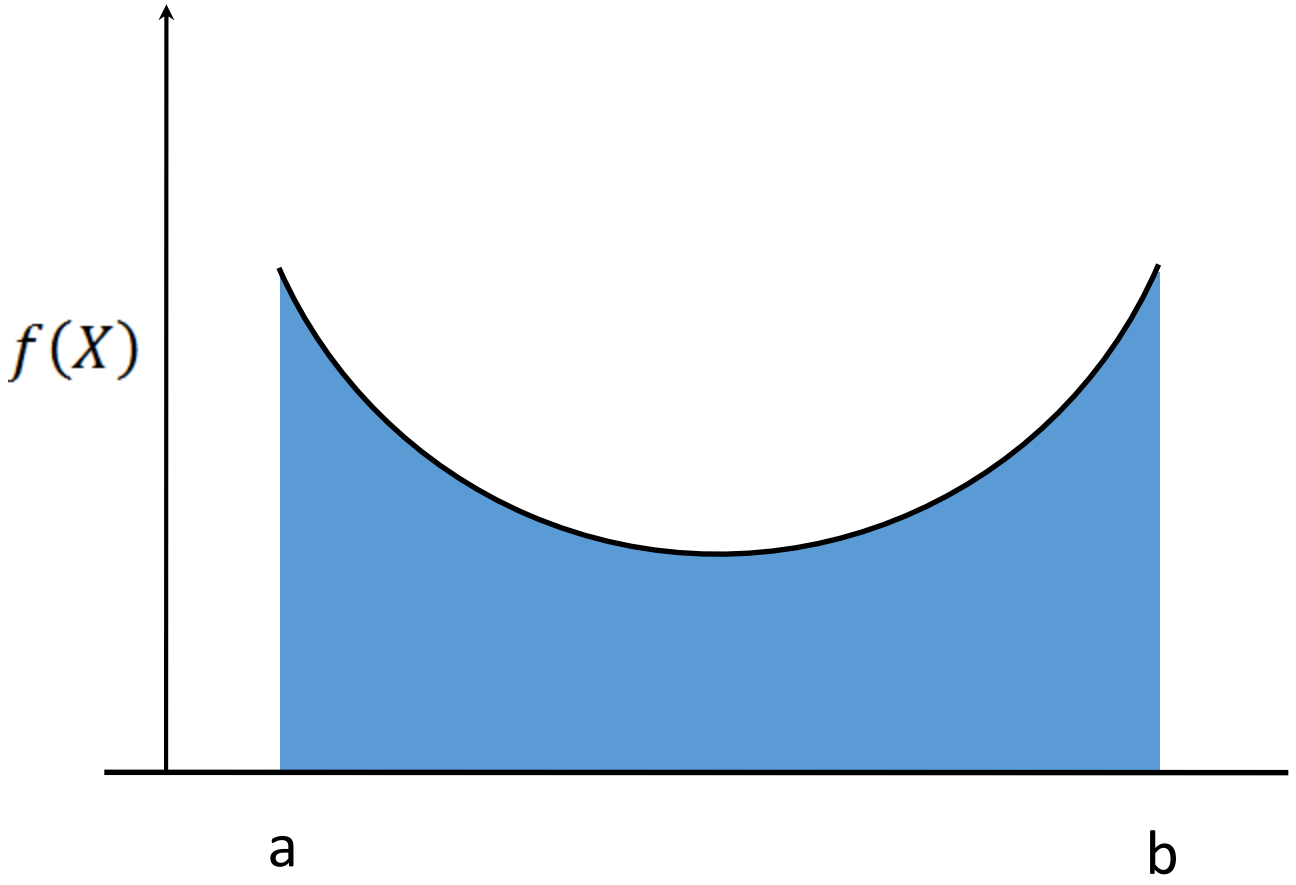
Line Search Methods

Prof. (Dr.) Rajib Kumar Bhattacharjya

Professor, Department of Civil Engineering
Indian Institute of Technology Guwahati, India
Room No. 005, M Block
Email: rkbc@iitg.ernet.in, Ph. No 2428

Search Methods



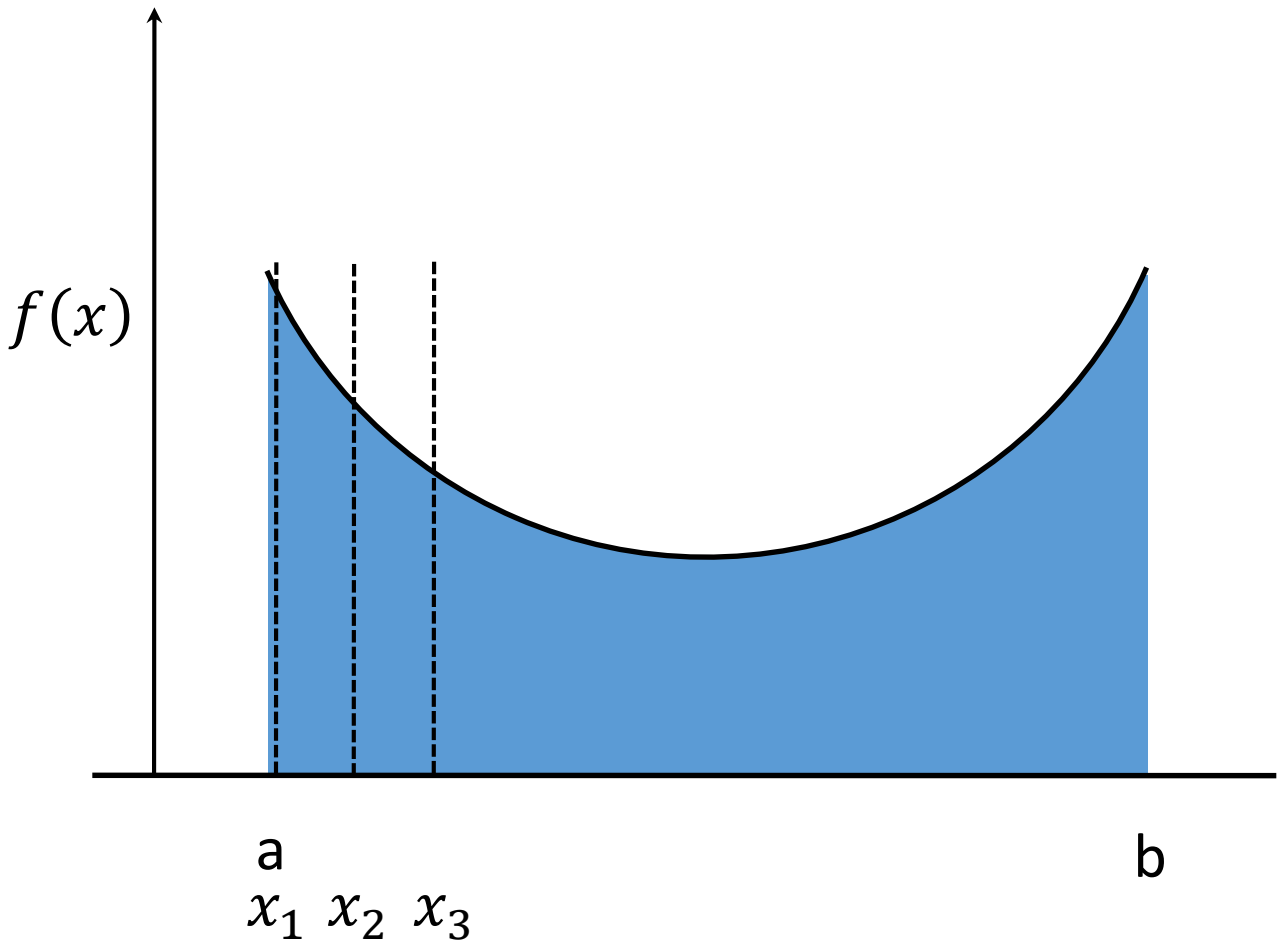
Step 1: A crude technique is used to find the lower and upper bound of the minimum

Step 2: A sophisticated method is used to obtain the optimal solution using the lower and upper bound obtained in step 1

Bracketing method

- ✓ Exhaustive search method
- ✓ Bounding phase method

Search Methods



Exhaustive search method

Algorithm

Step 1

- ✓ Take $x_1 = a$,
- ✓ $\Delta x = \frac{(b-a)}{n}$, n is the number of intermediate points.
- ✓ Set $x_2 = x_1 + \Delta x$ and $x_3 = x_2 + \Delta x$

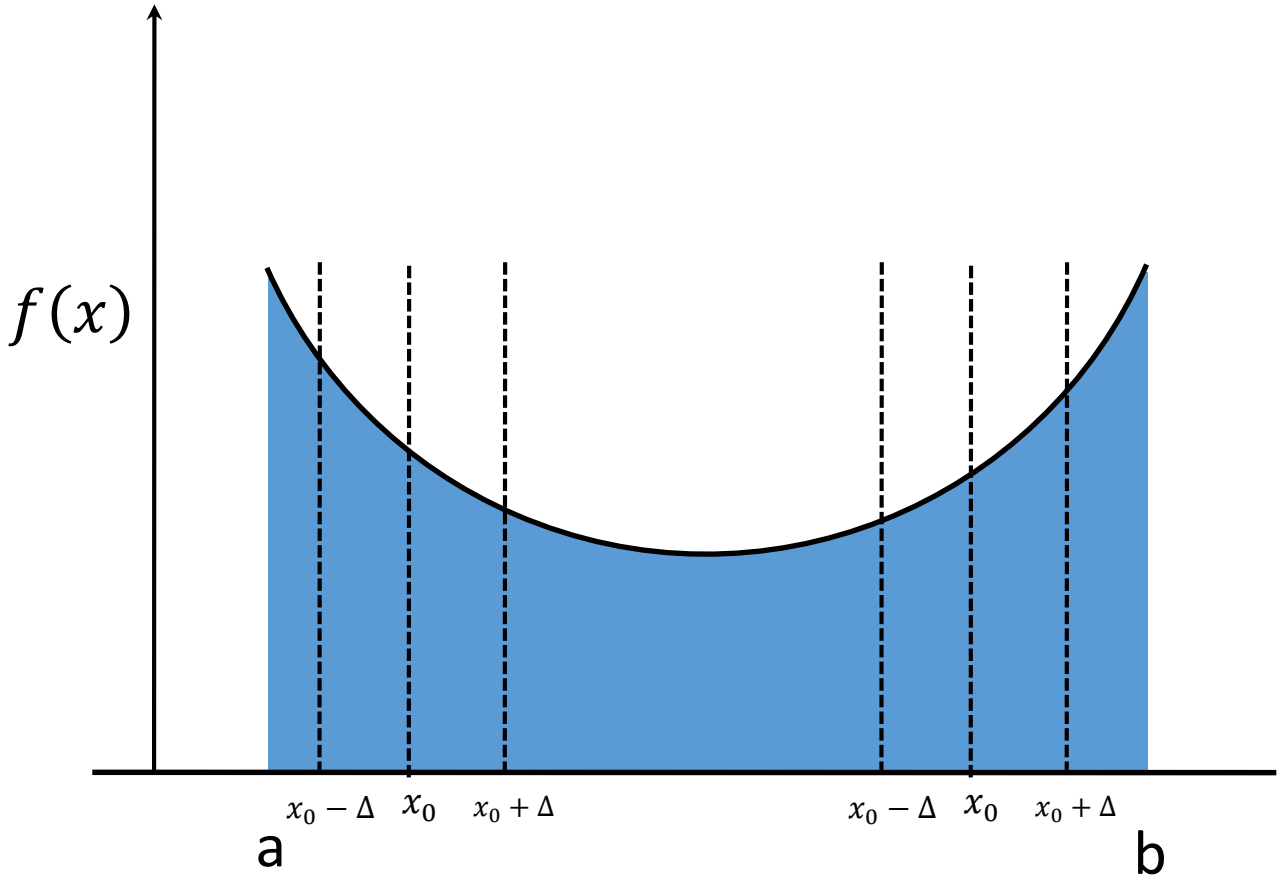
Step 2

- ✓ If $f(x_1) \geq f(x_2) \leq f(x_3)$, the minimum points lies between x_1 and x_3. Terminate
- ✓ Else $x_1 = x_2$, $x_2 = x_3$, $x_3 = x_2 + \Delta x$. Go to step 3

Step 3

- ✓ Is $x_3 < b$? If yes, go to Step 2,
- ✓ Else no minimum point exists between a and b

Search Methods



Bounding phase method

Algorithm

Step 1

- ✓ Take an initial guess x_0 and an increment Δ
- ✓ Set $n = 0$

Step 2

- ✓ If $f(x_0 - |\Delta|) \geq f(x_0) \geq f(x_0 + |\Delta|)$, then Δ is positive.
- ✓ Else If $f(x_0 - |\Delta|) \leq f(x_0) \leq f(x_0 + |\Delta|)$, then Δ is negative.
- ✓ Else go to step 1

Step 3

- ✓ Set $x_{n+1} = x_n + 2^n\Delta$

Step 4

- ✓ If $f(x_{n+1}) < f(x_n)$, set $n = n + 1$ and go to step 3
- ✓ Else minimum is between x_{n-1} and x_{n+1}
- ✓ Terminate