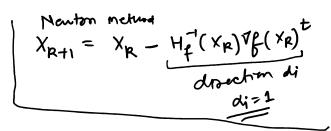
DFP Method:

Ouri Newton method



1. start with the initial point

> x_1 and positive definite symmetric matrix B_1 (If matrix B_1 is not given, take Identity matrix.) of order n, when function has Set i = 1

- 2. Compute $\nabla f(x_1)$ and set $d_i = -[B_i]\nabla f(x_i)$.
- 3. find α_i by minimizing function $f(x_i + \alpha_i \alpha_i)$
- $4. \operatorname{set} x_{i+1} = x_i + \alpha_i d_i$
- 5. Check

 x_{i+1} for optimality condition. If it satisfies then stop, otherwise go to the next step.

6. Update matrix B_i to B_{i+1} using $B_{i+1} = B_i + M_i + N_i$

Bg = B1 + M1 + N1 1. where $M_i = \alpha_i \frac{d_i d_i^t}{d_i^t a_i}$ $M_1 = \alpha_1 \frac{d_1 d_1^T}{d_1^T g_1}$ 2. And $N_i = \frac{-(B_i g_i)(B_i g_i)^t}{g_i t_{B_i} g_i}$, where $g_i = \nabla f(x_i + 1) - \nabla f(x_i)$

3. Set i = i + 1 and go to step 2.

 $g_i = \nabla f(x_{i+1}) - \nabla f(x_i)$ $g_1 = \nabla f(X_2) - \nabla f(X_1)$

Note: d_i is column vector and hence d_i^t is row vector, similar for other vectors

question: Minimize $f(x, y) = 3x^2 - 4xy + 2y^2 + 4x + 6$ question: Minimize $f(x,y) = 3x^2 - 4xy + 2y^2 + 4x + 6$ starting from the point (0,0) using DFP Method. (Quan Newton Method)

 $f(n,y) = 3x^2 - 4ny + 2y^2 + 4n + 6$

 $\nabla f(x,y) = \begin{pmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{pmatrix} = \begin{pmatrix} 6x - 4y + 4 \\ -4x + 4y \end{pmatrix} - 12 + 8 + 44 \\ \frac{\partial f}{\partial y} \end{pmatrix} = \begin{pmatrix} -4x + 4y \\ -4x + 3 \end{pmatrix}$

Of (0,0) = (4)

 $d_1 = -\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \end{bmatrix} = -\begin{bmatrix} 4 \\ 0 \end{bmatrix} = \begin{bmatrix} -4 \\ 0 \end{bmatrix}$

the optimal length or, by ninmisting

Find the optimal length
$$w_1$$
 by

 $g_1 = f(0,0) + \alpha_1(-4,0)$
 $g_1 = f(-4\alpha_1,0)$
 $g_1 = f(-4\alpha_1,0)$
 $g_1 = 3(-4\alpha_1)^2 + 4(-4\alpha_1) + 6$
 $g_1 = (16\times3)\alpha_1^2 - 16\alpha_1 + 6$
 $\frac{dg_1}{d\alpha_1} = (32\times3)\alpha_1 - 16$
 $\frac{dg_1}{d\alpha_1} = 32\times3 > 0$
 $\frac{dg_1}{d\alpha_1^2} = 32\times3 > 0$

Set

 $x_2 = x_1 + x_1 d_1$
 $= (0,0) + \frac{1}{6}(-4,0) = (-\frac{2}{3},0)$

Stopping condition

 $x_1 = x_2 + x_3 + x_4 = (0,0)$
 $x_2 = x_3 + x_4 = (0,0)$
 $x_3 = x_4 + x_4 = (0,0)$
 $x_4 = (0,0) + \frac{1}{6}(-4,0) = (0,0)$
 $x_4 = (0,0) + \frac{1}{6}(-4,0) = (0,0)$
 $x_4 = (0,0) + (0,0)$
 $x_4 = (0,0)$
 $x_4 =$

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$$M_{1} = \alpha_{1} \frac{d_{1}d_{1}^{t}}{d_{1}^{t}g_{1}} \qquad g_{1} = \nabla f(x_{2}) - \nabla f(x_{1})$$

$$g_{1} = \nabla f(x_{2}) - \nabla f(x_{1})$$

$$g_{1} = \nabla f(x_{2}) - \nabla f(x_{1})$$

$$g_{1} = (0, \frac{3}{3}) - (4, 0)$$

$$g_{1} = (-\frac{3}{3}) - (-\frac{3}{3}) - (-\frac{3}{3})$$

$$g_{1} = (-\frac{3$$

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