CSE 5368 Neural Networks Fall 2020

Quiz: 11/17/2020

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$$F(x) = 5x_1^4 - x_2^3 + 3x_2 - 5x_1 + 6$$

$$\nabla F(x) = \begin{bmatrix} 20x_1^3 - 5 \\ -3x_2^2 + 3 \end{bmatrix} = \begin{bmatrix} 20 & -5 \\ -12 & +3 \end{bmatrix} = \begin{bmatrix} 15 \\ -9 \end{bmatrix}$$

$$\nabla^2 F(x) = \begin{bmatrix} 60 & 0 \\ 0 & -12 \end{bmatrix}$$

$$\alpha_k = \frac{-g_k^T p_k}{p_k^T A_k p_k} = \frac{-[15 \ -9] \begin{bmatrix} -15 \\ 9 \end{bmatrix}}{[15 \ -9] \begin{bmatrix} 60 & 0 \\ 0 & -12 \end{bmatrix} \begin{bmatrix} -15 \\ 9 \end{bmatrix}}$$

$$\alpha_k = 0.0244$$

$$x_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} - 0.0244 \begin{bmatrix} 15 \\ -9 \end{bmatrix} = \begin{bmatrix} 0.639 \\ 2.22 \end{bmatrix}$$

$$\therefore \nabla F(x) = \begin{bmatrix} 0.0968 \\ -11.78 \end{bmatrix}$$

$$\nabla^2 F(x) = \begin{bmatrix} 24.11 & 0 \\ 0 & -13.318 \end{bmatrix}$$

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$$\alpha_k = \frac{-\begin{bmatrix} 0.0968 & -11.78 \end{bmatrix} \begin{bmatrix} -0.0968 \\ 11.78 \end{bmatrix}}{\begin{bmatrix} 0.0968 & -11.78 \end{bmatrix} \begin{bmatrix} 24.11 & 0 \\ 0 & -13.318 \end{bmatrix} \begin{bmatrix} -0.0968 \\ 11.78 \end{bmatrix}}$$

$$\alpha_k = \frac{-138.778}{-1847.88} = 0.0751$$

$$X_2 = \begin{bmatrix} 0.634 \\ 2.22 \end{bmatrix} - 0.0751 \begin{bmatrix} 0.0988 \\ -11.78 \end{bmatrix}$$

$$X_2 = \begin{bmatrix} 0.62 \\ 3.10 \end{bmatrix}$$