CSE-5368 Neural Networks
Fall 2022 Quiz 04

Time: 12 Minutes

Consider the following performance surface

$$F(X) = x_1 - 2x_2^2 + 3x_1 x_2$$

Given the initial point $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$, take one step in the direction of $\begin{bmatrix} 0 \\ 5 \end{bmatrix}$ minimizing along a line to calculate alpha.

Show the resulting position after one step.

Summary results in Chapter 9:

$$\mathbf{x}_{k+1} = \mathbf{x}_k + \alpha_k \mathbf{p}_k \qquad \Delta \mathbf{x}_k = (\mathbf{x}_{k+1} - \mathbf{x}_k) = \alpha_k \mathbf{p}_k \qquad \mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k \mathbf{g}_k$$

$$\alpha < \frac{2}{\lambda_{max}} \qquad \alpha_k = -\frac{\mathbf{g}_k^T \mathbf{p}_k}{\mathbf{p}_k^T \mathbf{A} \mathbf{p}_k} \qquad \mathbf{g}_{k+1}^T \mathbf{p}_k = 0$$

$$\mathbf{x}_{k+1} = \mathbf{x}_k - \mathbf{A}_k^{-1} \mathbf{g}_k \qquad \text{Where } \mathbf{A}_k \equiv \nabla^2 F(\mathbf{x})\big|_{\mathbf{x} = \mathbf{x}_k}$$