Modified Newton Method

Goal:

$$\min_{x \in \mathbb{R}^n} f(x)$$

Gradient descent:

$$\left[x_{k+1} = \underline{x_k} - \underline{\alpha_k} \underline{\nabla f(x_k)}, \ \alpha_k > 0 \right]$$

Newton method:

$$x_{k+1} = \underline{x_k} - \underline{[\nabla^2 f(x_k)]^{-1}} \nabla f(x_k)$$

Modified Newton method: [Method of Deflected Gradients]

$$x_{k+1} = x_k - \underline{\alpha_k} \underline{S_k} \underline{\nabla f(x_k)}$$

$$S_k \in \mathbb{R}^{n \times n}, \ \alpha_k \in \mathbb{R}$$

Special cases:

$S_k = I_n$: Gradient descent

$S_k = [\nabla^2 f(x_k)]^{-1}$: Newton method