Gauß-Newton

Bobitsmagic

$$f(x, y) = \sum_i^P x_i y_i$$

$$E(x) = \frac{1}{2} \sum_s^S \left(f(x, p_s) - t_s\right)^2$$

$$\Delta E = \begin{pmatrix} \frac{\delta E}{\delta x_0} \\ \frac{\delta E}{\delta x_1} \\ \vdots \end{pmatrix}$$

$$\Delta_E = \begin{pmatrix} \sum_s^S (f(x, p^s) - t^s)(p_0^s) \\ \sum_s^S (f(x, p^s) - t^s)(p_1^s) \\ \vdots \end{pmatrix}$$

$$H_E = \begin{pmatrix} \sum \left(p_0^s\right)^2 & \sum p_0^s p_1^s & \cdots \\ \sum p_1^s p_0^s & \sum \left(p_1^s\right)^2 & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

$$H_E v = \Delta_E$$

$$E(x) = \sum_s \left(\left(\sum_p x_p y_{sp} \right) - t_s \right)^2$$

$$\frac{1}{2} \left(f_{s(x)}\right)^2 = \left(\left(\sum_p x_p y_{sp} \right) - t_s \right)^2$$

$$f_{s(x)} = \sqrt{2} \left(\left(\sum_p x_p y_{sp} \right) - t_s \right)$$

$$J = \begin{pmatrix} \frac{\delta f_0}{\delta x_0} & \frac{\delta f_0}{\delta x_1} & \cdots \\ \frac{\delta f_1}{\delta x_0} & \frac{\delta f_1}{\delta x_1} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

$$J = \sqrt{2} \begin{pmatrix} y_{00} & y_{01} & \cdots \\ y_{10} & y_{11} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

$$J^T J = \left(y_{00}^2\right)$$