- $$\chi^2(\vec{\theta}) = \sum_{i=1}^{N} \left(y_i - M(\vec{\theta}, x_i)\right)^2 = \left(y_1 - M(\vec{\theta}, x_1)\right)^2 + \left(y_2 - M(\vec{\theta}, x_2)\right)^2 + \dots + \left(y_N - M(\vec{\theta}, x_N)\right)^2$$

$\Rightarrow$ Derivada es operador lineal

$$\frac{\partial \chi^2(\vec{\theta})}{\partial \theta_i} = 2\left(y_1 - M(\vec{\theta}, x_1)\right) \cdot -\frac{\partial M(\vec{\theta}, x_1)}{\partial \theta_i} + 2\left(y_2 - M(\vec{\theta}, x_2)\right) \cdot -\frac{\partial M(\vec{\theta}, x_2)}{\theta_i} + \dots + 2\left(y_N - M(\vec{\theta}, x_N)\right) \cdot -\frac{\partial M(\vec{\theta}, x_N)}{\partial \theta_i}$$

$$\frac{\partial \chi^2(\vec{\theta})}{\partial \theta_i} = \sum_{i=1}^{N} -2\left(y_i - M(\vec{\theta}, x_i)\right) \frac{\partial M(\vec{\theta}, x_i)}{\partial \theta_i}$$

$$= \boxed{-2 \sum_{i=1}^{N} \left(y_i - M(\vec{\theta}, x_i)\right) \frac{\partial M(\vec{\theta}, x_i)}{\partial \theta_i}}$$

- $$\theta_{s+1} = \theta_s - \gamma \vec{\nabla}_\theta \chi^2(\vec{\theta}_s)$$

$\rightarrow$ $$\nabla_\theta \chi^2(\vec{\theta}_s) = \left[\frac{\partial \chi^2(\vec{\theta}_s)}{\partial \theta_0}, \frac{\partial \chi^2(\vec{\theta}_s)}{\partial \theta_1}, \frac{\partial \chi^2(\vec{\theta}_s)}{\partial \theta_2}\right]$$

$$= -2 \sum_{i=1}^{N} \left(y_i - M(\vec{\theta}_s, x_i)\right) \left[\frac{\partial M(\vec{\theta}_s, x_i)}{\partial \theta_0}, \frac{\partial M(\vec{\theta}_s, x_i)}{\partial \theta_1}, \frac{\partial M(\vec{\theta}_s, x_i)}{\partial \theta_2}\right]$$

$$= -2 \sum_{i=1}^{N} \left(y_i - M(\vec{\theta}_s, x_i)\right) \nabla_\theta M(\vec{\theta}_s, x_i)$$

$\Rightarrow$ $$\boxed{\theta_{s+1} = \theta_s - \gamma\left(-2 \sum_{i=1}^{N} \left(y_i - M(\vec{\theta}_s, x_i)\right) \nabla_\theta M(\vec{\theta}_s, x_i)\right)}$$