

# Course2\_final Assignment

Sunday, May 29, 2022

1:18 AM

$$f(\mathbf{x}; \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(\mathbf{x} - \mu)^2}{2\sigma^2}\right)$$

$$\chi^2 = |\mathbf{y} - f(\mathbf{x}; \mu, \sigma)|^2$$

$$\mathbf{J} = \left[ \frac{\partial(\chi^2)}{\partial\mu}, \frac{\partial(\chi^2)}{\partial\sigma} \right]$$

$$\frac{\partial(\chi^2)}{\partial\mu} = -2(\mathbf{y} - f(\mathbf{x}; \mu, \sigma)) \cdot \frac{\partial f}{\partial\mu}(\mathbf{x}; \mu, \sigma)$$

$$\frac{\partial(\chi^2)}{\partial\sigma} = -2(\mathbf{y} - f(\mathbf{x}; \mu, \sigma)) \cdot \frac{\partial f}{\partial\sigma}(\mathbf{x}; \mu, \sigma)$$

$$\frac{\partial f}{\partial\mu} = \frac{-1}{\sigma\sqrt{2\pi}} \frac{(\mathbf{x} - \mu)}{\sigma^2} \exp\left(-\frac{(\mathbf{x} - \mu)^2}{2\sigma^2}\right)$$

$$f(\mathbf{x}, \mu, \sigma) = \frac{1}{\sqrt{2\pi}} \sigma^{-1} \exp\left(-\frac{1}{2}(\mathbf{x} - \mu)^2 \sigma^{-2}\right)$$

$$\frac{\partial f}{\partial\sigma} = -\frac{1}{\sqrt{2\pi}} \sigma^{-2} \exp\left(-\frac{1}{2}(\mathbf{x} - \mu)^2 \sigma^{-2}\right) + \frac{1}{\sqrt{2\pi}} \sigma^{-4} (\mathbf{x} - \mu)^2 \exp\left(-\frac{1}{2}(\mathbf{x} - \mu)^2 \sigma^{-2}\right)$$

$$-\sigma^{-1} f(\mathbf{x}) + \sigma^{-3} (\mathbf{x} - \mu)^2 f(\mathbf{x})$$

$$f(\mathbf{x})$$