Course: ML

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Assignment 1

Given, $f(z) = \ln(1+z)$; where $z = x^T x$

Solve using chain rule:

we know that,

$$\frac{df}{dx} = \frac{df}{dz} \cdot \frac{dz}{dx}$$

here, $\frac{df}{dz} = \frac{1}{1+z}$

and, $\frac{dz}{dx} = 2x$

$$\therefore \frac{df}{dx} = \frac{1}{1+z} \cdot 2x = \frac{2x}{1+x^T x}$$

Assignment 2

Given: $f(z) = e^{-z/2}$

where, $z = g(y) = y^T S^{-1} y$

$y = h(x) = x - \mu$

Solve using chain rule,

As we know,

$$\frac{dz}{dx} = \frac{df}{dz} \cdot \frac{dz}{dy} \cdot \frac{dy}{dx}$$

here, $\frac{df}{dz} = -\frac{1}{2} e^{-\frac{z}{2}}$ —(1)

$$\frac{dz}{dy} = I$$

$$\frac{df}{dz} = -\frac{1}{2} e^{-\frac{z}{2}} \cdot 2 S^{-1} y$$

$$= -e^{-\frac{\{(x-\mu)^T \cdot S^{-1}(x-\mu)\}}{2}} \cdot S^{-1}(x-\mu)$$