Formulario

Cálculo de probabilidades - Evaluación 4

Integración doble

```r
library(pracma)
f <- function(y, x) 2*x + 5*y + 4
ymin_val <- 0
ymax_val <- 1
xmin_fun <- 0
xmax_fun <- function(y) y
integral2(f, ymin_val, ymax_val, xmin_fun, xmax_fun)$Q
```

Distribución acumulada conjunta

$$F_{X,Y}(x,y) = \sum_{u \le x} \sum_{v \le y} f_{X,Y}(u,v)$$
$$F_{X,Y}(x,y) = P(X \le x, Y \le y)$$

Esperanza conjunta

$$E[g(\mathbf{X})] = \sum_{\mathbf{x}} g(\mathbf{x})\, f_{\mathbf{X}}(\mathbf{x})$$
$$E[g(X,Y)] = \sum_{x} \sum_{y} g(x,y) f_{X,Y}(x,y)$$

Distribución normal bivariada

$$\mu = \begin{pmatrix} \mu_X \\ \mu_Y \end{pmatrix}, \qquad \Sigma = \begin{pmatrix} \sigma_X^2 & \rho\sigma_X\sigma_Y \\ \rho\sigma_X\sigma_Y & \sigma_Y^2 \end{pmatrix}.$$

Distribución condicional normal multivariada

$$\mathbf{X} = \begin{pmatrix} \mathbf{X}_1 \\ \mathbf{X}_2 \end{pmatrix}, \qquad \mu = \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix}, \qquad \Sigma = \begin{pmatrix} \Sigma_{11} & \Sigma_{12} \\ \Sigma_{21} & \Sigma_{22} \end{pmatrix}.$$

$$\mathbf{X}_1 \mid \mathbf{X}_2 = \mathbf{x}_2 \sim \mathcal{N}\big(\mu_1 + \Sigma_{12}\Sigma_{22}^{-1}(\mathbf{x}_2 - \mu_2),\ \Sigma_{11} - \Sigma_{12}\Sigma_{22}^{-1}\Sigma_{21}\big).$$

Propiedades Normal Multivariada

$$a^\top \mathbf{X} \sim \mathcal{N}(a^\top \mu,\ a^\top \Sigma a)$$

$$A\mathbf{X} + b \sim \mathcal{N}(A\mu + b,\ A\Sigma A^\top).$$