1_Graficas_superf_NM

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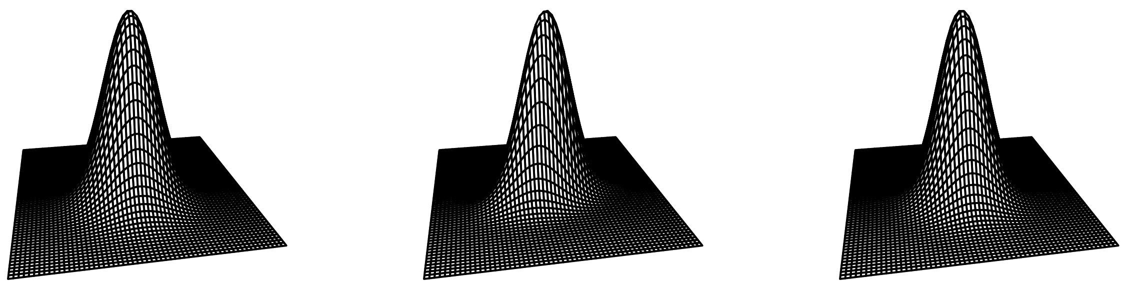
Gráficas Varias de Superficies Normales 2-Variada

```
library(MASS)
library(mvtnorm)
library(MVN)
library(clusterGeneration)
### package clusterGeneration, para generar MSDP ###
```

Primera Vista

```
# datos para grafica1
media1 <- c(0, 0)
sigma1<-genPositiveDefMat("eigen",dim=2)$Sigma

x <- seq(from=-12, to=12, length.out=60)
y <- seq(from=-12, to=12, length.out=60)

fun1 <- function(x, y) dmvnorm(c(x, y), mean=media1,
                               sigma=sigma1)
fun1 <- Vectorize(fun1)
z1 <- outer(x, y, fun1)

# datos para grafica2
media2 <- c(0, 0)
sigma2<-genPositiveDefMat("eigen",dim=2)$Sigma

fun2 <- function(x, y) dmvnorm(c(x, y), mean=media2,
                               sigma=sigma2)
fun2 <- Vectorize(fun2)
z2 <- outer(x, y, fun2)

# datos para grafica3
media3 <- c(0, 0)
sigma3<-genPositiveDefMat("eigen",dim=2)$Sigma

fun3 <- function(x, y) dmvnorm(c(x, y), mean=media3,
                               sigma=sigma3)
```

```r
fun3 <- Vectorize(fun3)
z3 <- outer(x, y, fun3)

# realización de las 3-gráficas
par(mfrow=c(1, 3), mar=c(1, 1, 1, 1))
persp(x, y, z1, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
persp(x, y, z2, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
persp(x, y, z3, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
```



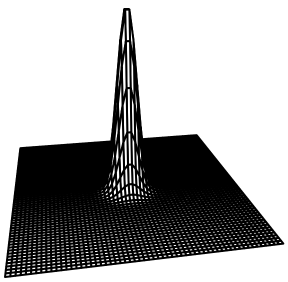
Varianza Generalizadas (detrminnates de $\boldsymbol{S}$) y Máximos Obtenidos para cada caso.

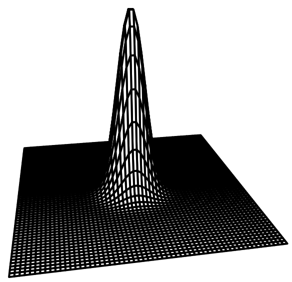
$$\boldsymbol{S1} = 66.9850573 \quad , \quad \boldsymbol{S1} = 28.6875065 \quad \text{y} \quad \boldsymbol{S1} = 47.8404196$$

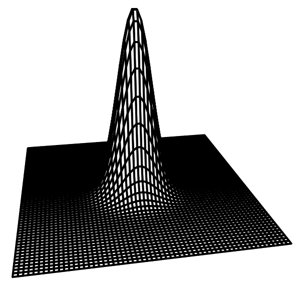
$$L_1(\hat{\underline{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_1, \boldsymbol{S}_1) = 0.0193485 \quad , \quad L_2(\hat{\underline{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_2, \boldsymbol{S}_2) = 0.0295426 \quad \text{y} \quad L_3(\hat{\underline{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_3, \boldsymbol{S}_3) = 0.0228756 \quad ,$$

Segunda Vista

```r
## datos para primera gráfica
media1 <- c(0, 0)
sigma1 <- matrix(c(1, 0, 0, 1), ncol=2)

x <- seq(from=-12, to=12, length.out=60)
y <- seq(from=-12, to=12, length.out=60)

fun1 <- function(x, y) dmvnorm(c(x, y), mean=media1,
                               sigma=sigma1)
fun1 <- Vectorize(fun1)
z1 <- outer(x, y, fun1)

## datos para segunda gráfica
media2 <- c(0, 0)
sigma2 <- matrix(c(2, 0, 0, 2), ncol=2)

fun2 <- function(x, y) dmvnorm(c(x, y), mean=media2,
                               sigma=sigma2)
fun2 <- Vectorize(fun2)
z2 <- outer(x, y, fun2)

## datos para tercera gráfica
media3 <- c(0, 0)
sigma3 <- matrix(c(3, 0, 0, 3), ncol=2)

fun3 <- function(x, y) dmvnorm(c(x, y), mean=media3,
                               sigma=sigma3)
fun3 <- Vectorize(fun3)
z3 <- outer(x, y, fun3)

# realización de las 3-gráficas
par(mfrow=c(1, 3), mar=c(1, 1, 1, 1))
persp(x, y, z1, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
persp(x, y, z2, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
persp(x, y, z3, theta=-10, phi=20, expand=0.8, axes=FALSE,box=F)
```







Varianza Generalizadas (detrminnates de $\boldsymbol{S}$) y Máximos Obtenidos para cada caso.

$$\boldsymbol{S1} = 1 \quad , \quad \boldsymbol{S1} = 4 \quad \text{y} \quad \boldsymbol{S1} = 9$$

$$L_1(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_1, \boldsymbol{S}_1) = 0.1527054 \quad , \quad L_2(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_2, \boldsymbol{S}_2) = 0.0779484 \;\; \text{y} \;\; L_3(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_3, \boldsymbol{S}_3) = 0.0523251 \quad ,$$

Tercera Vista

```
x<-seq(-12,12,len=50)
y<-seq(-13,12,len=50)

normal.bivariada<-function(x,y,rho,mu1,sigma1,mu2,sigma2)
{
  1/(2*pi*sigma1*sigma2*sqrt(1-rho^2))*exp(-1/(2*(1-rho^2))*
  (((x-mu1)/sigma1)^2-2*rho*((x-mu1)/sigma1)*
      ((y-mu2)/sigma2)+
((y-mu2)/sigma2)^2))
}
```

```r
## datos primera gráfica
f1<-outer(x,y,normal.bivariada,rho=0,mu1=0,mu2=0,
          sigma1=1,sigma2=1)

sigma1 <- matrix(c(1, 0, 0, 1), ncol=2)

## datos segunda gráfica
f2<-outer(x,y,normal.bivariada,rho=0,mu1=0,mu2=0,
          sigma1=2,sigma2=2)

sigma3 <- matrix(c(2, 0, 0, 2), ncol=2)

## datos tercera gráfica
f3<-outer(x,y,normal.bivariada,rho=0,mu1=0,mu2=0,
          sigma1=3,sigma2=3)

sigma3 <- matrix(c(3, 0, 0, 3), ncol=2)

### realización de las tres Grafias
library(latex2exp)

nf<-layout(matrix(c(1,2,3),ncol=3,byrow=T),
            widths=c(rep(12,4)),heights=c(rep(12,2)),
           respect=T)

par( mar=c(1,1,1,1) )
persp(x,y,f1,theta = 30, phi = 30, col = "lightblue",
      xlab = "X", ylab = "Y", zlab = "Z",
  main = TeX('$\\rho=0$, \ $\\mu_1=0$, \ $\\mu_2=0$,
             \ $\\sigma_1=1$, \ $\\sigma_2=1$') ,
  cex.main=0.8)
```

```
## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa

## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa
```

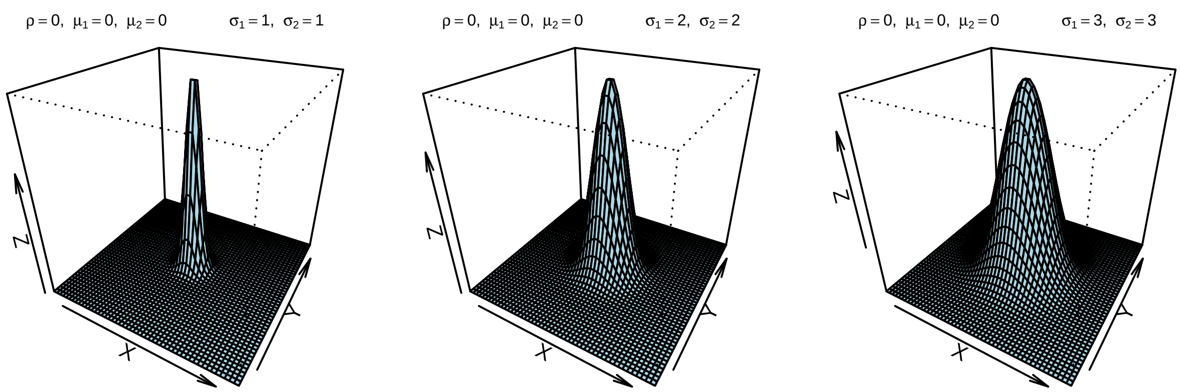
```r
persp(x,y,f2,theta = 30, phi = 30, col = "lightblue",
      xlab = "X", ylab = "Y", zlab = "Z",
      main = TeX('$\\rho=0$, \ $\\mu_1=0$, \ $\\mu_2=0$,
             \ $\\sigma_1=2$, \ $\\sigma_2=2$') ,
      cex.main=0.8)
```

```
## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa

## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa
```

```r
persp(x,y,f3,theta = 30, phi = 30, col = "lightblue",
      xlab = "X", ylab = "Y", zlab = "Z",
```

```r
      main = TeX('$\\rho=0$, \ $\\mu_1=0$, \ $\\mu_2=0$,
             \ $\\sigma_1=3$, \ $\\sigma_2=3$') ,
      cex.main=0.8)
```

```
## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa

## Warning in title(main = main, sub = sub, ...): font metrics unknown for
## character 0xa
```



Varianza Generalizadas (detrminnates de S) y Máximos Obtenidos para cada caso.

$$\boldsymbol{S1} = 1 \quad , \quad \boldsymbol{S1} = 4 \quad \text{y} \quad \boldsymbol{S1} = 9$$

$$L_1(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_1, \boldsymbol{S}_1) = 0.1527054 \quad , \quad L_2(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_2, \boldsymbol{S}_2) = 0.0779484 \quad \text{y} \quad L_3(\underline{\hat{\mu}}, \hat{\boldsymbol{\Sigma}}) = L(\underline{\overline{x}}_3, \boldsymbol{S}_3) = 0.0523251 \quad ,$$