analisis de outlier

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Datos anatómicos de gatos domésticos.

Descripción: **Los pesos del corazón y del cuerpo de muestras de gatos machos y hembras utilizados para experimentos *con digital*. Todos los gatos eran adultos y pesaban más de 2 kg. *Uso:* cats. *Formato:* Este marco de datos contiene las siguientes columnas:**

Sex: sexo: Factor con niveles "F" y "M".

Bwt: peso corporal en kg.

Hwt: peso del corazón en g.

```
library(MASS)
data("cats")
head(cats)
```

```
  Sex Bwt Hwt
1   F 2.0 7.0
2   F 2.0 7.4
3   F 2.0 9.5
4   F 2.1 7.2
5   F 2.1 7.3
6   F 2.1 7.6
```

```
datos = data.frame(peso_corporal=log(cats$Bwt),
                   peso_corazon=log(cats$Hwt))
head(datos,10)
```

```
   peso_corporal peso_corazon
1      0.6931472     1.945910
2      0.6931472     2.001480
3      0.6931472     2.251292
4      0.7419373     1.974081
5      0.7419373     1.987874
```

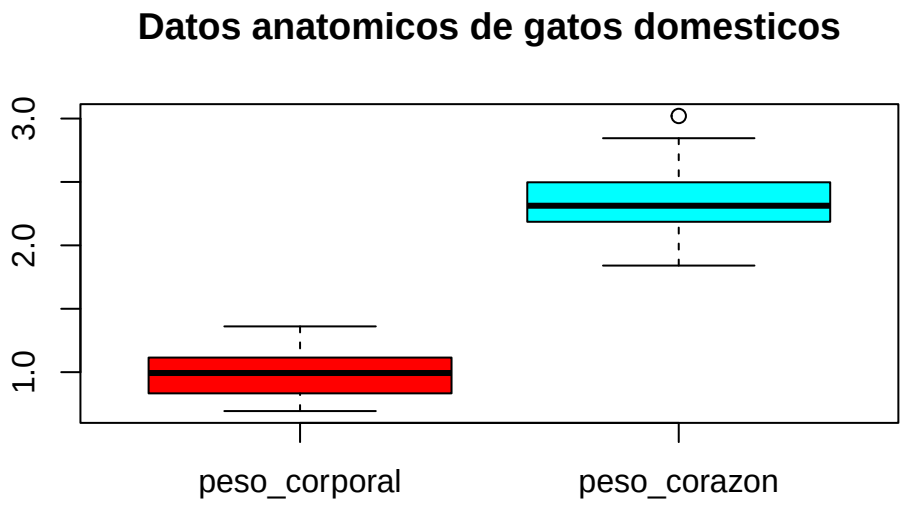
```
6       0.7419373     2.028148
7       0.7419373     2.091864
8       0.7419373     2.104134
9       0.7419373     2.116256
10      0.7419373     2.140066
```

```r
summary(datos)
```

```
 peso_corporal     peso_corazon
 Min.   :0.6931   Min.   :1.841
 1st Qu.:0.8329   1st Qu.:2.192
 Median :0.9933   Median :2.313
 Mean   :0.9866   Mean   :2.339
 3rd Qu.:1.1068   3rd Qu.:2.495
 Max.   :1.3610   Max.   :3.020
```

Grafica de caja y bigote.

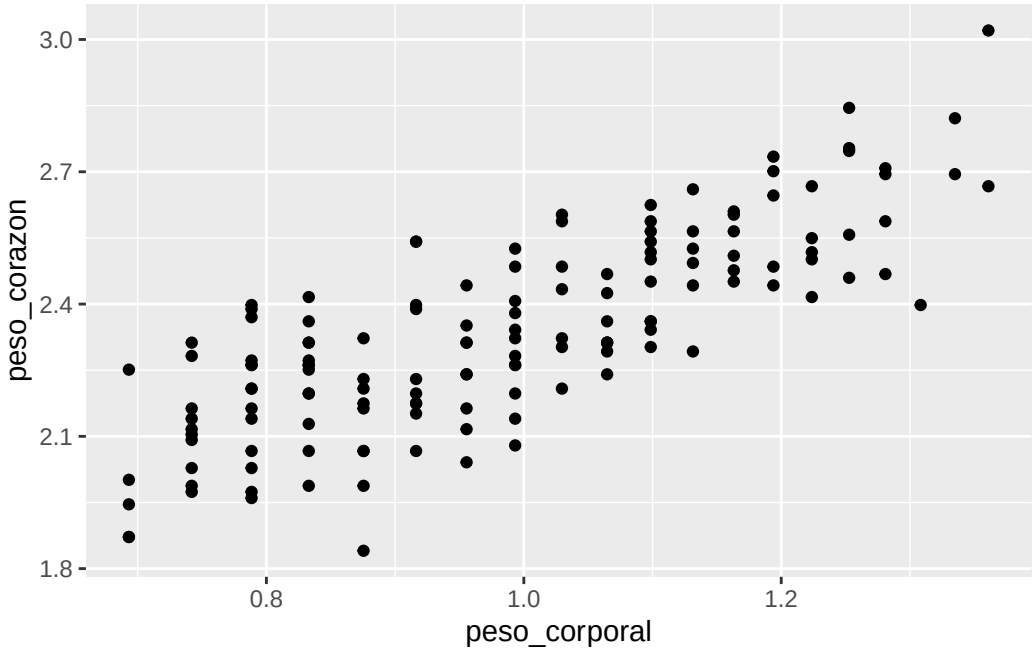
```r
boxplot(datos ,main= "Datos anatomicos de gatos domesticos", col = rainbow(ncol(datos)))
```



En el diagrama de cajas y bigotes se observa que solamente hay un valor atípico univariado en el peso del corazón, en todo lo demás no hay valores atípicos, pero hace falta ver si hay valores atípicos en el entorno multivariante.

Grafico de dispersion.

```
library(ggplot2)
attach(datos)
ggplot(datos, aes(x=peso_corporal, y=peso_corazon))+ geom_point()
```



Al crear el grafico de dispersión se puede observar que hay dos valores atípicos multivariados. Pero no están tan separados de los demás datos por lo que debemos detectar los valores atípicos estimando correctamente la estructura de covarianza.

Elipsoide de tolerancia basado en la distancia de Mahalanobis.

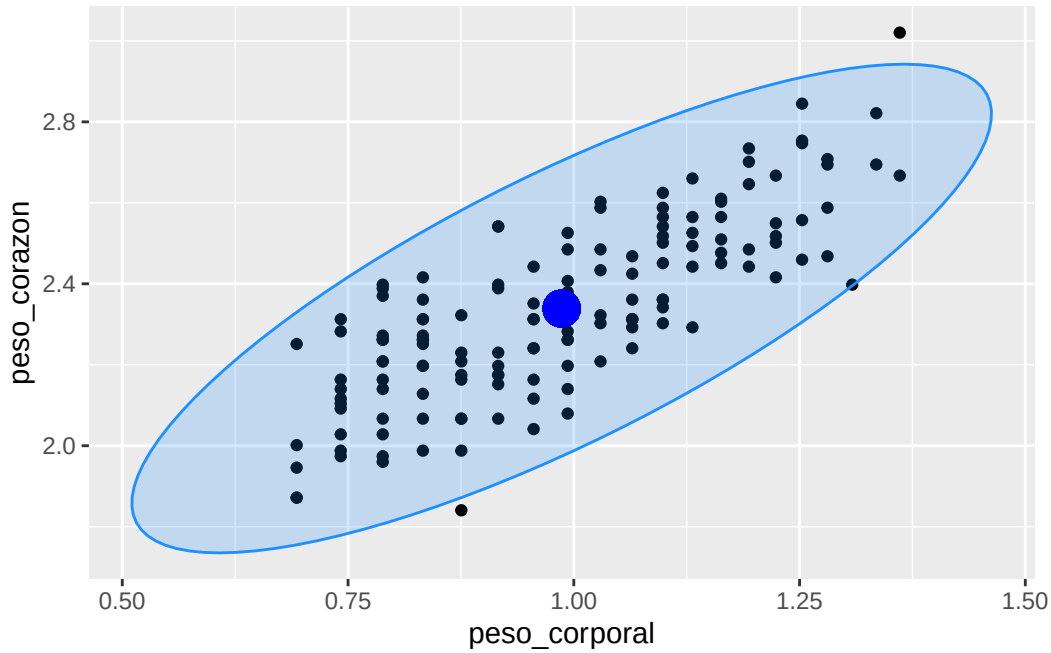
```
cats.clcenter=colMeans(datos)
cats.clcov=cov(datos)

radio=sqrt(qchisq(0.975, df= ncol(datos)))
```

```
library(car)
```

```
Loading required package: carData
```

```
ellipse.cl=data.frame(ellipse(center = cats.clcenter,
                              shape =cats.clcov,radius = radio,
                              segments = 100,draw = FALSE))
colnames(ellipse.cl)=colnames(datos)
ggplot(data=datos,mapping=aes(x=peso_corporal, y=peso_corazon))+geom_point()+
  geom_polygon(data=ellipse.cl,color= "dodgerblue",fill= "dodgerblue",
               alpha=0.2)+ geom_point(aes(x=cats.clcenter[1],
                                          y=cats.clcenter[2]),
                                      color="blue", size=6)
```

```
Warning in geom_point(aes(x = cats.clcenter[1], y = cats.clcenter[2]), color = "blue", : All
i Please consider using `annotate()` or provide this layer with data containing
  a single row.
```



Se observa que hay dos datos que son atipicos en la grafica, esto se debe a que hay dos especies de gatos que tienen medidas diferentes a los demas.

```
library(robustbase)
cats.mcd=covMcd(datos)
cats.mcd
```

```
Minimum Covariance Determinant (MCD) estimator approximation.
Method: Fast MCD(alpha=0.5 ==> h=73); nsamp = 500; (n,k)mini = (300,5)
Call:
covMcd(x = datos)
Log(Det.):  -9.44

Robust Estimate of Location:
peso_corporal   peso_corazon
       0.9803         2.3305
Robust Estimate of Covariance:
               peso_corporal  peso_corazon
peso_corporal        0.03217       0.03036
peso_corazon         0.03036       0.04656
```

```
  cats.mcd$center #Estimación robusta de ubicación
```

```
peso_corporal  peso_corazon
    0.9802948     2.3305302
```

```
  cats.mcd$cov
```

```
              peso_corporal peso_corazon
peso_corporal    0.03216656   0.03036431
peso_corazon     0.03036431   0.04656100
```

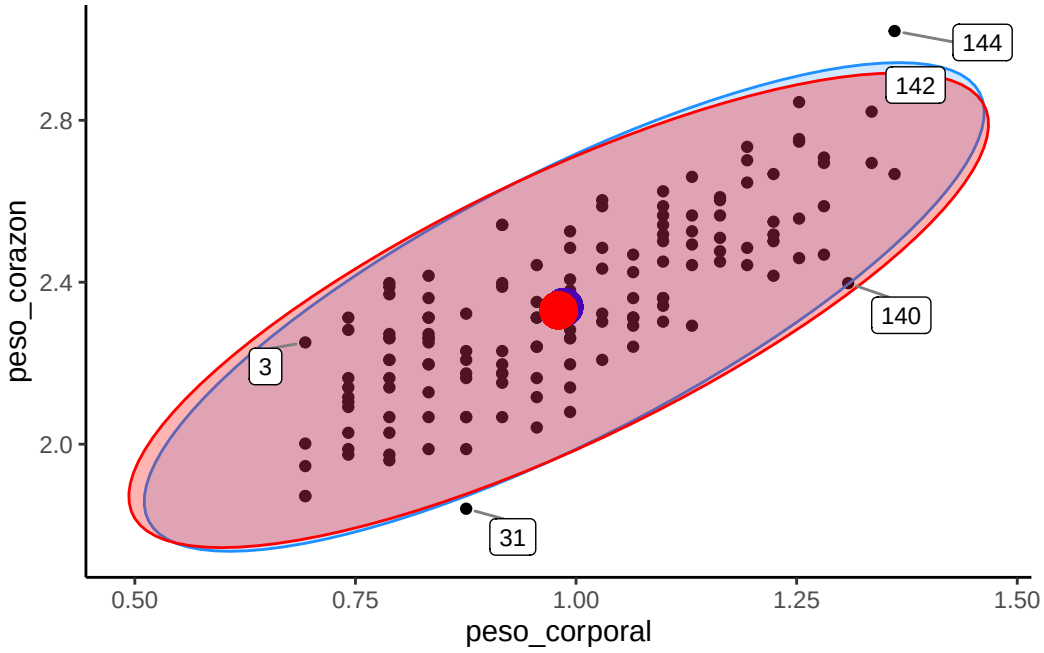
```
  #Construimos el elipsoide de tolerancia robusto.
  ellipse.mcd=data.frame(ellipse(center=cats.mcd$center,
                                 shape=cats.mcd$cov,
                                 radius=radio,
                                 segments=100,draw=FALSE))
  colnames(ellipse.mcd)=colnames(datos)
  fig2 = ggplot(data=datos,mapping=aes(x=peso_corporal, y=peso_corazon),
                label=row.names(datos))+geom_point()+
    geom_polygon(data=ellipse.cl, color= "dodgerblue",fill= "dodgerblue",
                 alpha=0.2)+geom_point(aes(x=cats.clcenter[1],
                                           y= cats.clcenter[2]),
                                       color="blue", size=6)+
    geom_polygon(data=ellipse.mcd,color= "red", fill= "red",alpha=0.3)+
    geom_point(aes(x=cats.mcd$center[1], y=
                     cats.mcd$center[2]),color="red", size=6)
```

```
  library(ggrepel)
  fig2 + geom_label_repel(aes(label= row.names(datos)),size= 3,
                          box.padding=0.5,point.padding = 0.3,
                          segment.color = 'grey50')+theme_classic()
```

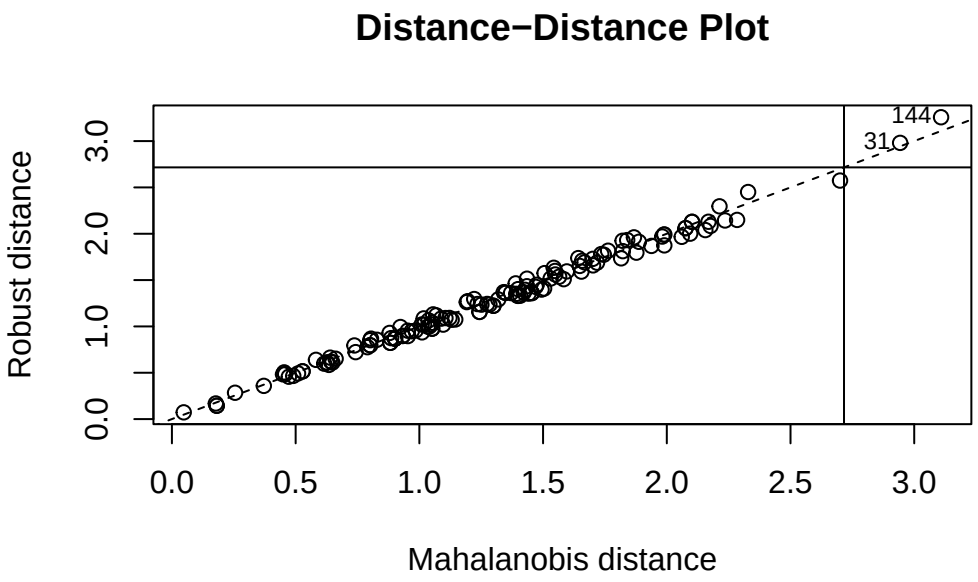
```
Warning in geom_point(aes(x = cats.clcenter[1], y = cats.clcenter[2]), color = "blue", : All
i Please consider using `annotate()` or provide this layer with data containing
  a single row.
```

```
Warning in geom_point(aes(x = cats.mcd$center[1], y = cats.mcd$center[2]), : All aesthetics h
i Please consider using `annotate()` or provide this layer with data containing
  a single row.
```

```
Warning: ggrepel: 139 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```




```
plot(cats.mcd, which="dd")
```




```
row.names.data.frame(cats)
```

```
  [1] "1"   "2"   "3"   "4"   "5"   "6"   "7"   "8"   "9"   "10"  "11"  "12"
 [13] "13"  "14"  "15"  "16"  "17"  "18"  "19"  "20"  "21"  "22"  "23"  "24"
 [25] "25"  "26"  "27"  "28"  "29"  "30"  "31"  "32"  "33"  "34"  "35"  "36"
 [37] "37"  "38"  "39"  "40"  "41"  "42"  "43"  "44"  "45"  "46"  "47"  "48"
 [49] "49"  "50"  "51"  "52"  "53"  "54"  "55"  "56"  "57"  "58"  "59"  "60"
 [61] "61"  "62"  "63"  "64"  "65"  "66"  "67"  "68"  "69"  "70"  "71"  "72"
 [73] "73"  "74"  "75"  "76"  "77"  "78"  "79"  "80"  "81"  "82"  "83"  "84"
 [85] "85"  "86"  "87"  "88"  "89"  "90"  "91"  "92"  "93"  "94"  "95"  "96"
 [97] "97"  "98"  "99"  "100" "101" "102" "103" "104" "105" "106" "107" "108"
[109] "109" "110" "111" "112" "113" "114" "115" "116" "117" "118" "119" "120"
[121] "121" "122" "123" "124" "125" "126" "127" "128" "129" "130" "131" "132"
[133] "133" "134" "135" "136" "137" "138" "139" "140" "141" "142" "143" "144"
```

Se observa que los dos datos atipicos son el 31 y 144.

Se ve que todos los datos van siguiendo una linea pero los datos atipicos estan muy alejados de los demas , si siguen la misma linea , pero mucho mas arriba.