CU18_MODEL_DEVELOPMENT_03_EJEMPLOS

June 12, 2023

#

CU18_Comportamienta Infra. Eventos extremos

1 IV. Model development

En este anexo se incluye el código utilizado durante el desarrollo de los modelos incluidos en el caso de uso.

1.1 Ejemplos pasos

1.1.1 Paso 4 cluster

[10]:

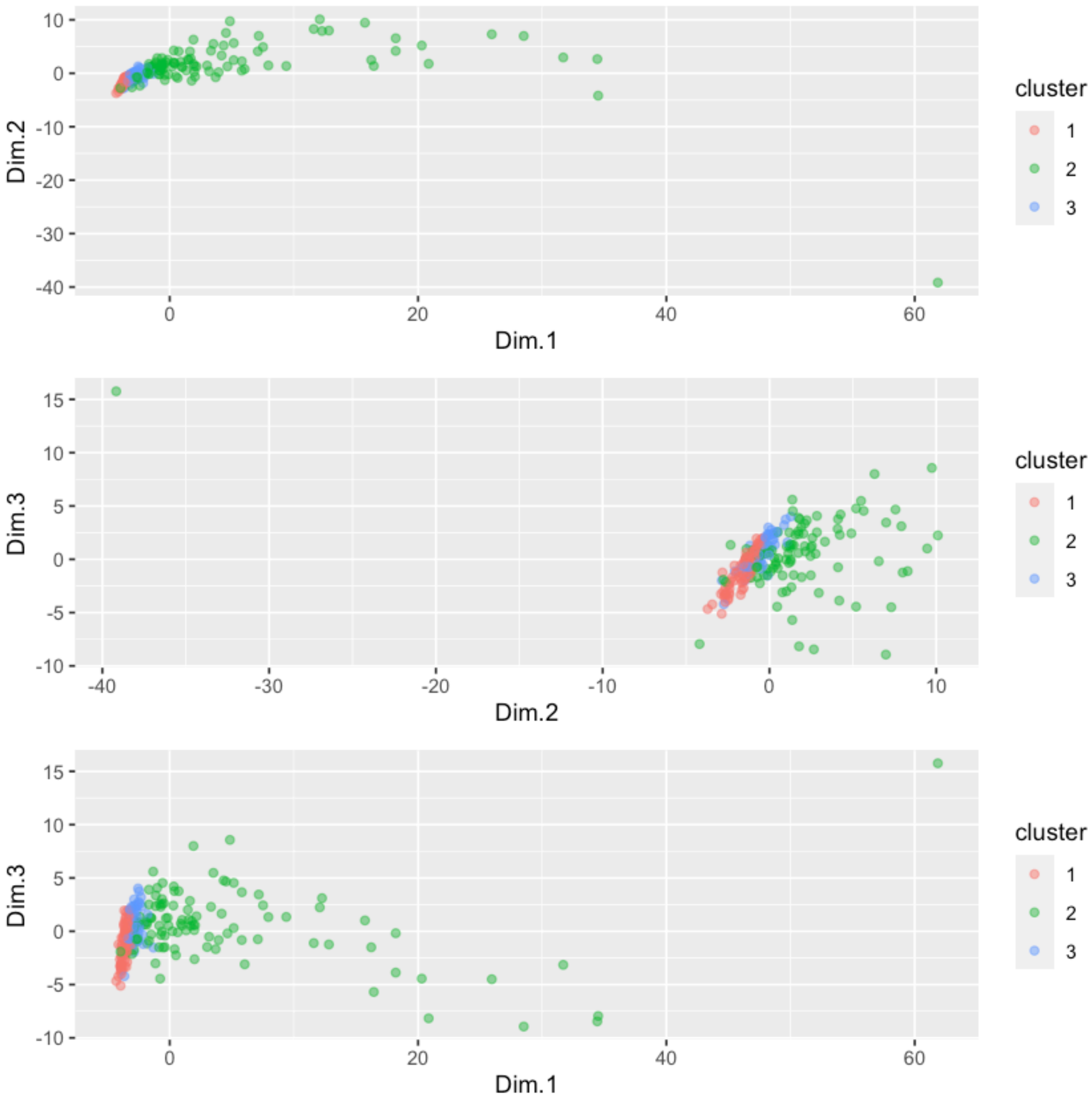
```
library(readr)
library(dplyr)
library(ggplot2)
library(gridExtra)
library(mclust)
library(DT)

## Cluster: DISTRITOS

dfout <- read_rds("datos_cluster_distritos.rds")
df_mc <- read_rds("modelo_cluster_distritos.rds")

## Ejemplo gráfico ----

## pasar a ggplotly

library(ggplot2)
p1 <- dfout |> ggplot(aes(x = Dim.1, y = Dim.2, col = cluster)) +
  geom_point(alpha = 0.5)
p2 <- dfout |> ggplot(aes(x = Dim.2, y = Dim.3, col = cluster)) +
  geom_point(alpha = 0.5)
p3 <- dfout |> ggplot(aes(x = Dim.1, y = Dim.3, col = cluster)) +
  geom_point(alpha = 0.5)

grid.arrange(p1, p2, p3)
```

```r
## Ejemplo tabla

dfout |>
  group_by(cluster) |>
  summarise(n = n(),
            across(9:146, mean)) |>
  datatable()

## Ejemplo predicción escenario

escenario <- read_csv("ESCENARIO_CLUSTER_DIST.csv")

escenario |>
  mutate(Cluster = predict(df_mc, escenario)$classification,
         .before = 1) |>
  datatable()

## ---------------------

## Cluster: DIARIO

dfout <- read_rds("datos_cluster_diario.rds")
df_mc <- read_rds("modelo_cluster_diario.rds")

## Ejemplo gráfico ----
## este son muchos puntos, no pasar a ggplotly

library(ggplot2)
p1 <- dfout |> ggplot(aes(x = Dim.1, y = Dim.2, col = cluster)) +
  geom_point(alpha = 0.5)
p2 <- dfout |> ggplot(aes(x = Dim.2, y = Dim.3, col = cluster)) +
  geom_point(alpha = 0.5)
p3 <- dfout |> ggplot(aes(x = Dim.1, y = Dim.3, col = cluster)) +
  geom_point(alpha = 0.5)

grid.arrange(p1, p2, p3)

## Ejemplo tabla

dfout |>
  group_by(cluster) |>
  summarise(across(9:15, mean)) |>
  datatable()

## Ejemplo predicción escenario

escenario <- read_csv("ESCENARIO_CLUSTER_DIARIO.csv")
escenario |>
  mutate(Cluster = predict(df_mc, escenario)$classification,
         .before = 1) |>
  datatable()
```

```
HTML widgets cannot be represented in plain text (need html)
```

```
Rows: 5 Columns: 139
-- Column specification
--------------------------------------------------------
Delimiter: ","
dbl (139): consultorios_de_salud, helisuperficies,
centros_de_atencion_a_dro…

i Use `spec()` to retrieve the full column specification for this
data.
i Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

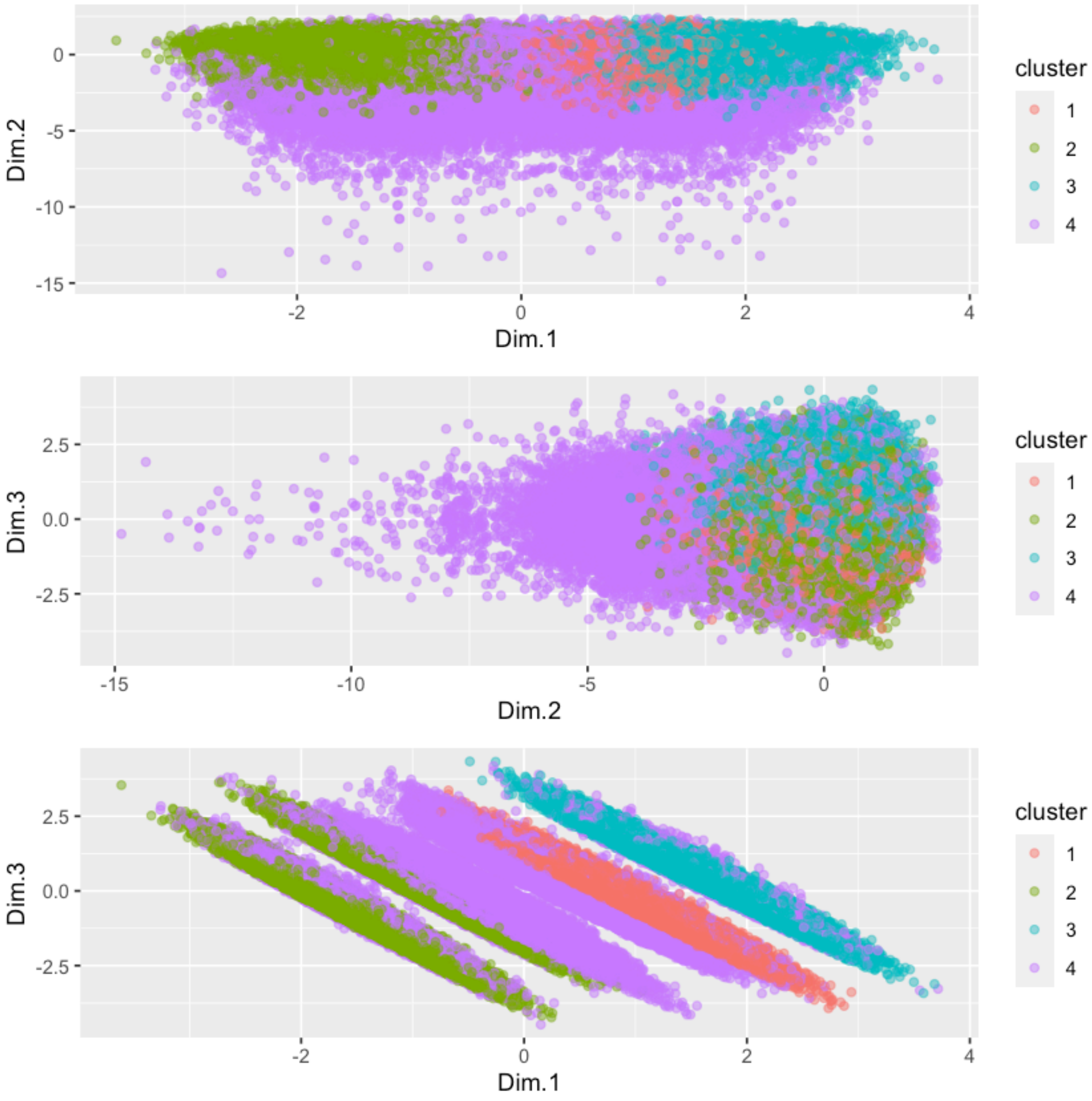
```
HTML widgets cannot be represented in plain text (need html)
```



```
HTML widgets cannot be represented in plain text (need html)
```

```
Rows: 5 Columns: 8
-- Column specification
--------------------------------------------------------
Delimiter: ","
dbl (8): capacidad, demanda, evento_infra, evento_zona, tmed, prec,
velmedia…

i Use `spec()` to retrieve the full column specification for this
data.
i Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

```
HTML widgets cannot be represented in plain text (need html)
```



1.1.2 Datos

[11]:

```
df <- read_csv("CU_18_05_20_diario_infra.csv")
```

```
Rows: 415370 Columns: 10
-- Column specification
---------------------------------------------------------
Delimiter: ","
dbl  (9): id_inf, capacidad, demanda, evento_infra, evento_zona, tmed,
prec,…
date (1): fecha
```

```
i Use `spec()` to retrieve the full column specification for this
data.
i Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

1.1.3 Ajuste modelo

[12]:

```
mod_infra <- df |> select(-c(id_inf, fecha, evento_zona)) |>
  glm(evento_infra ~ ., data = _, family = binomial)

mod_zona <- df |> select(-c(id_inf, fecha, evento_infra)) |>
  glm(evento_zona ~ ., data = _, family = binomial)

write_rds(mod_infra, "mod_glm_infra.rds")
write_rds(mod_zona, "mod_glm_zona.rds")
```

1.1.4 Ejemplos GLM

[13]:

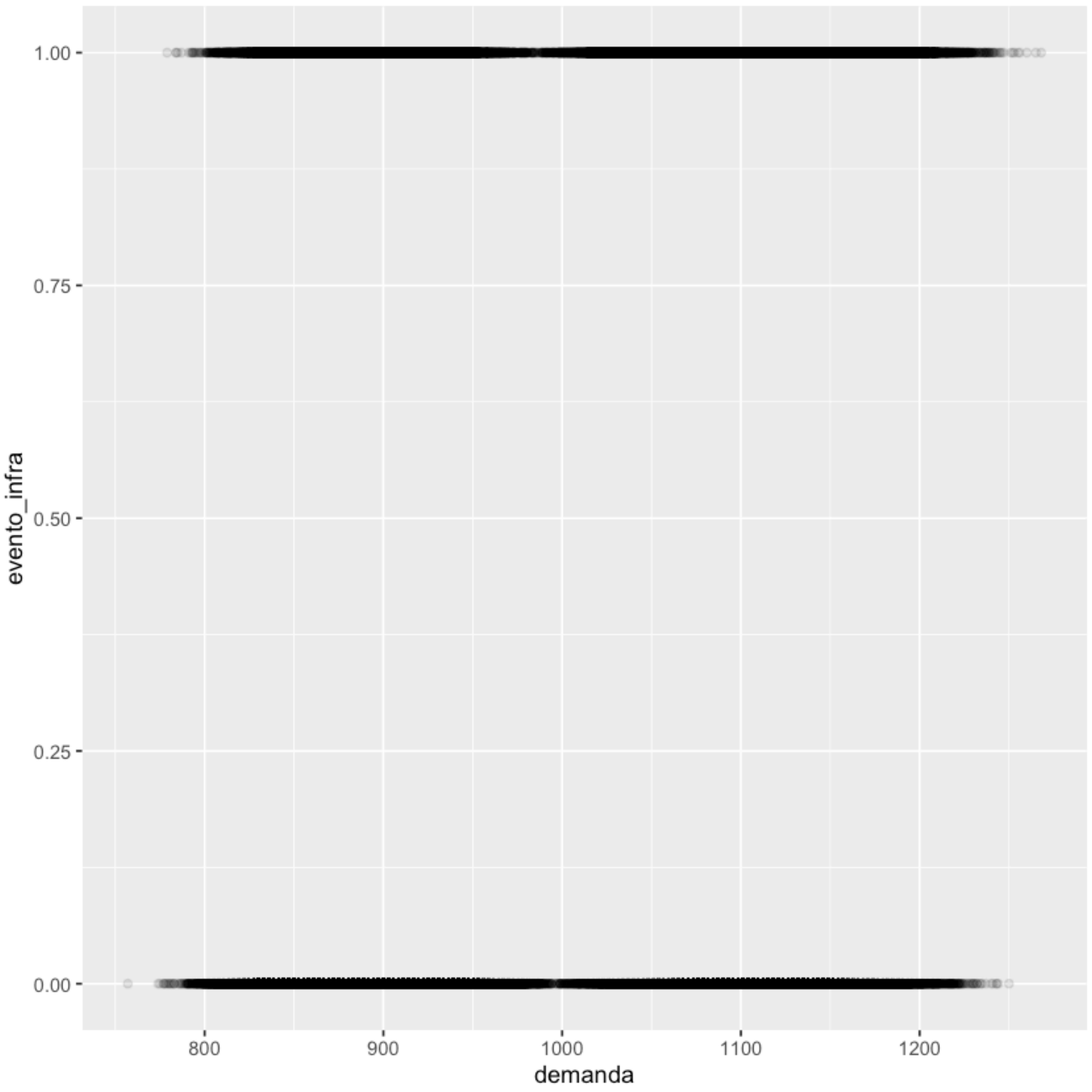
```
library(readr)
library(DT)
library(ggplot2)

mod_infra <- read_rds("mod_glm_infra.rds")
summary(mod_infra)
mod_infra$model |>
  ggplot(aes(x = demanda, y = evento_infra)) +
  geom_point(alpha = 0.1)

escenario <- read_csv("ESCENARIO_REGRESION.csv")

escenario |>
  mutate(Prob.evento = predict(mod_infra, escenario, type = "response")) |>
  datatable()
```

```
Call:
glm(formula = evento_infra ~ ., family = binomial, data = select(df,
    -c(id_inf, fecha, evento_zona)))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.8714  -0.6735   0.6287   0.6721   1.9005

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  2.990e-01  2.063e-01   1.449    0.147
capacidad   -1.286e-02  1.339e-04 -96.038   <2e-16 ***
demanda      1.260e-02  3.699e-05 340.618   <2e-16 ***
```

```
tmed         4.338e-04  5.400e-04   0.803    0.422
prec         2.730e-04  1.025e-03   0.266    0.790
velmedia     1.059e-03  2.539e-03   0.417    0.677
presMax     -5.461e-05  1.722e-04  -0.317    0.751
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 523764  on 377815  degrees of freedom
Residual deviance: 378204  on 377809  degrees of freedom
  (37554 observations deleted due to missingness)
AIC: 378218

Number of Fisher Scoring iterations: 4
```

```
Rows: 10 Columns: 6
-- Column specification --------------------------------------------------------
Delimiter: ","
dbl (6): capacidad, demanda, tmed, prec, velmedia, presMax

i Use `spec()` to retrieve the full column specification for this
data.
i Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

```
HTML widgets cannot be represented in plain text (need html)
```



1.1.5 Ejemplos simulación

[16]:
```
library(readr)
library(mclust)
library(dplyr)
library(purrr)
library(ggplot2)
library(summarytools)

NSIM <- 100

## Simulación clusters
```

```r
dfout <- read_rds("datos_cluster_distritos.rds")
df_mc <- read_rds("modelo_cluster_distritos.rds")

escenario <- read_csv("ESCENARIO_CLUSTER_DIST.csv")
escenariom <- escenario |>
  summarise(across(everything(), mean)) |>
  mutate(across(everything(), ~if_else(.x == 0, 0.1, .x)))

escenarios <- escenario |>
  summarise(across(everything(), sd)) |>
  mutate(across(everything(), ~if_else(.x == 0, 0.01, .x)))

## Continuas
icont <- c(61:75, 136:139)
ncont <- colnames(escenario)[icont]

simulacion <- escenariom |>
  # select(-all_of(irec)) |>
  imap_dfc(~{
    if (.y %in% ncont) {
      rnorm(NSIM, .x, escenarios |> pull(.y))
    }else{
      rpois(NSIM, .x)
    }
  })

simulacion <- simulacion |>
  bind_cols(cluster = predict(df_mc, simulacion)$classification) |>
  relocate(cluster, .before = 1)

simulacion |>
  ggplot(aes(cluster)) +
  geom_bar()

simulacion |> freq(cluster)


## Simulación regresión


escenario_reg <- read_csv("ESCENARIO_REGRESION.csv")

## Uno de estos dos según selección (indicar en gráficos y tablas):
mod_glm <- read_rds("mod_glm_infra.rds")
mod_glm <- read_rds("mod_glm_zona.rds")

escenario_regm <- escenario_reg |>
```

```r
  summarise(across(everything(), mean)) |>
  mutate(across(everything(), ~if_else(.x == 0, 0.1, .x)))

escenario_regs <- escenario_reg |>
  summarise(across(everything(), sd)) |>
  mutate(across(everything(), ~if_else(.x == 0, 0.01, .x)))

simulacion_reg <- escenario_regm |>
  imap_dfc(~{
      rnorm(NSIM, .x, escenario_regs |> pull(.y))
  })

simulacion_reg <- simulacion_reg |>
  bind_cols(evento = predict(mod_glm, simulacion_reg, type = "response") > 0.5)

simulacion_reg |>
  ggplot(aes(evento)) +
  geom_bar()

simulacion_reg |> freq(evento)
```

```
Rows: 5 Columns: 139
-- Column specification
--------------------------------------------------------
Delimiter: ","
dbl (139): consultorios_de_salud, helisuperficies,
centros_de_atencion_a_dro…

i Use `spec()` to retrieve the full column specification for this
data.
i Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

A summarytools: 4 x 5 of type dbl

	Freq	% Valid	% Valid Cum.	% Total	% Total Cum.
2	88	88	88	88	88
3	12	12	100	12	100
<NA>	0	NA	NA	0	100
Total	100	100	100	100	100

```
Rows: 10 Columns: 6
-- Column specification
--------------------------------------------------------
Delimiter: ","
dbl (6): capacidad, demanda, tmed, prec, velmedia, presMax

i Use `spec()` to retrieve the full column specification for this
data.
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```
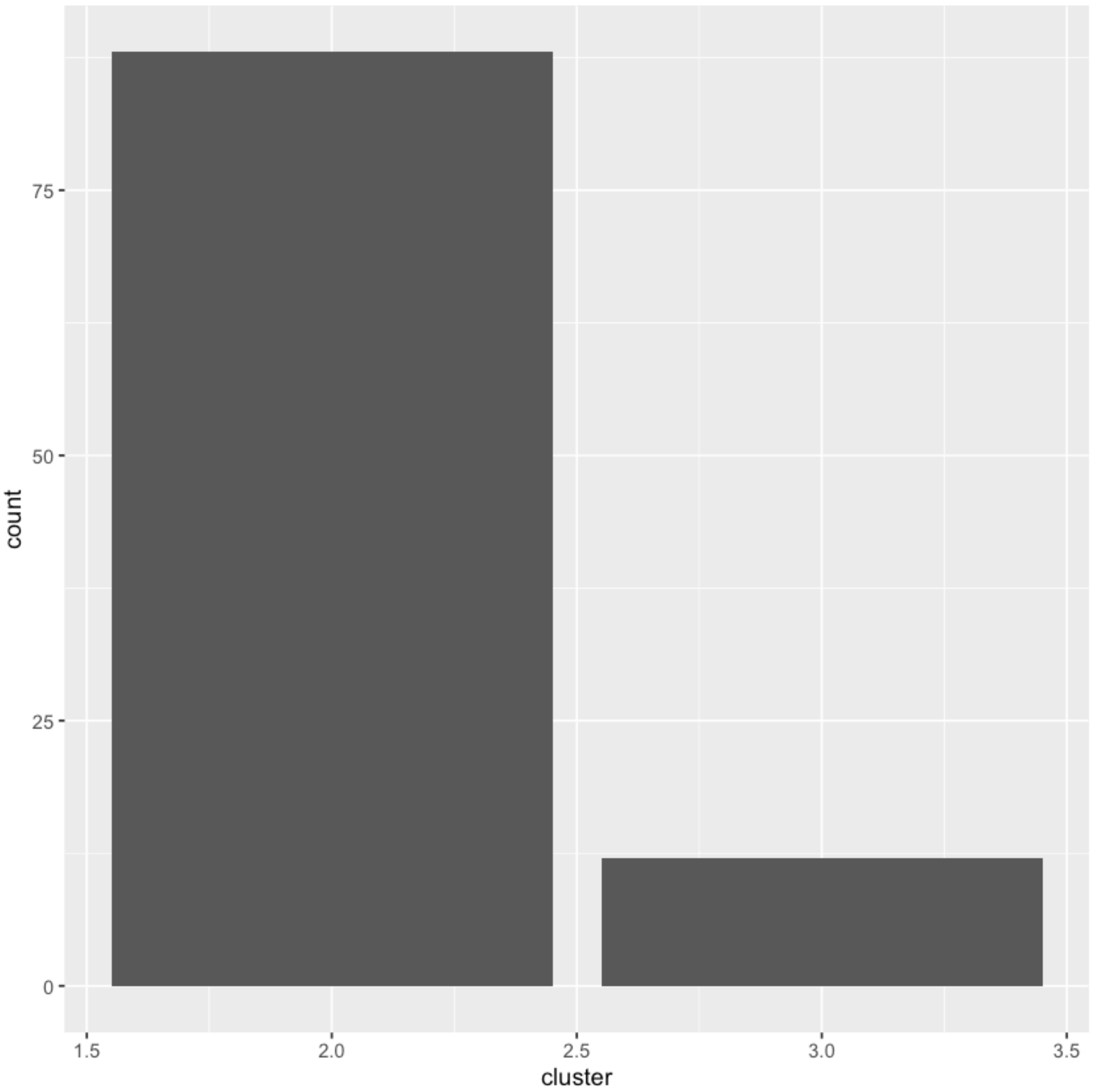
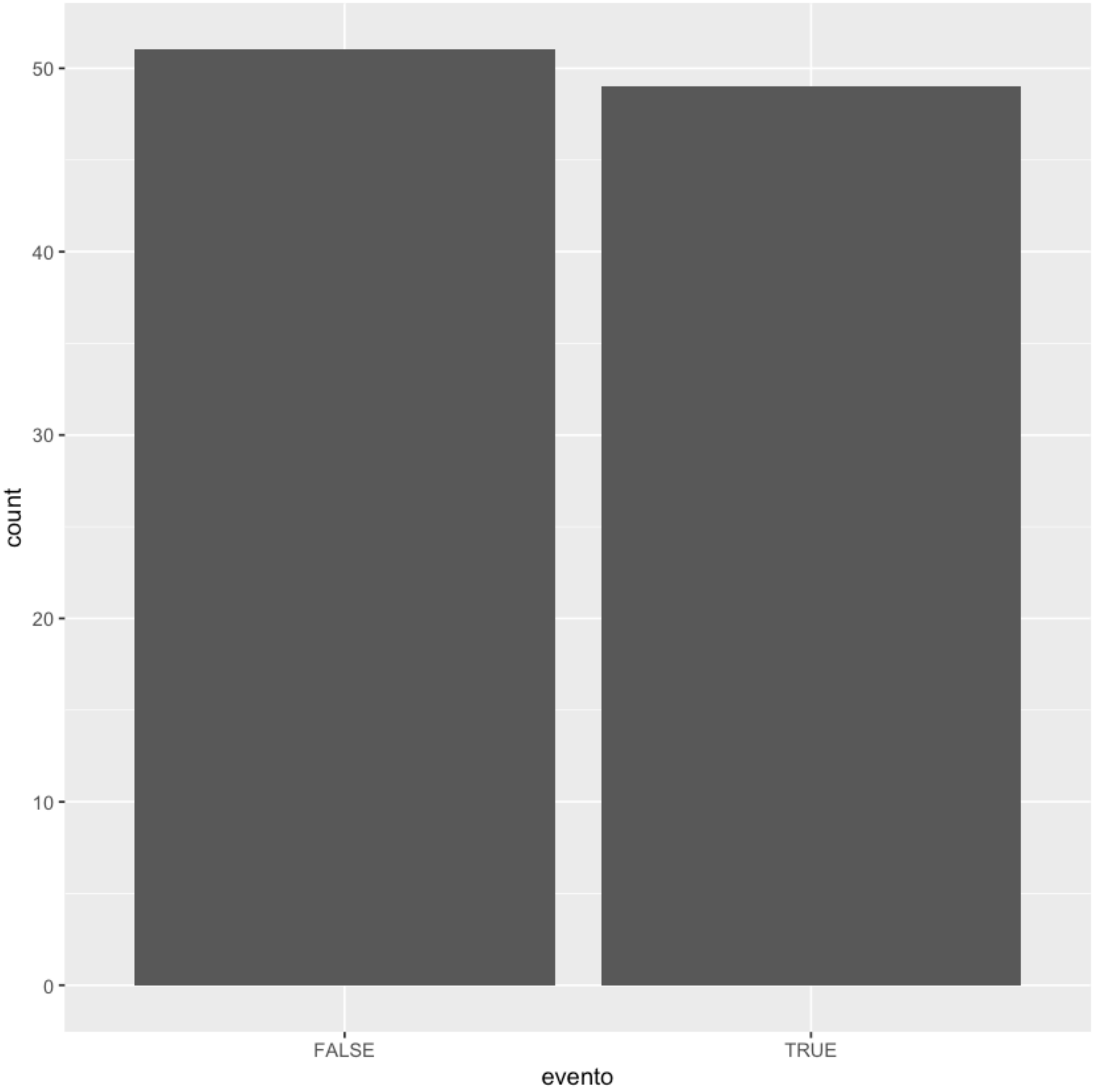

```
this message.
```



A summarytools: 4 x 5 of type dbl

	Freq	% Valid	% Valid Cum.	% Total	% Total Cum.
FALSE	51	51	51	51	51
TRUE	49	49	100	49	100
<NA>	0	NA	NA	0	100
Total	100	100	100	100	100


50
40
30
20
10
0
count
FALSE
TRUE
evento