Solución taller sobre capítulo 4 parte 2

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```
library(foreign)
```

```
## Warning: package 'foreign' was built under R version 4.1.2
```

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

1.

```
datos <- read.dta("polls.dta")

# Usando solo la inf del survey = 9158
datis <- subset(datos, survey == 9158)

library(lme4)
```

```
## Loading required package: Matrix
```

```
M1 <- glmer(bush ~ female + black + (1 | state),
                        data=datis, family=binomial(link="logit"))
```

2

```
length(unique(datis$state))
```

```
## [1] 49
```

3

```
summary(M1)
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula: bush ~ female + black + (1 | state)
##    Data: datis
##
##      AIC      BIC   logLik deviance df.resid
##   2666.7   2689.1  -1329.3   2658.7     2011
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -1.7276 -1.0871  0.6673  0.8422  2.5271
##
## Random effects:
##  Groups Name        Variance Std.Dev.
##  state  (Intercept) 0.1692   0.4113
## Number of obs: 2015, groups:  state, 49
##
## Fixed effects:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.44523    0.10139   4.391 1.13e-05 ***
## female      -0.09705    0.09511  -1.020    0.308
## black       -1.74161    0.20953  -8.312  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##        (Intr) female
## female -0.551
## black  -0.119 -0.005
```

$$y_{ij} \sim Bernoulli(\hat{p_{ij}}) \tag{1}$$
$$\text{logit}(\hat{p_{ij}}) = 0.44523 - 0.09705_{female} - 1.74161_{black} + b_{0i} \tag{2}$$
$$b_0 \sim N(0, 4.052) \tag{3}$$

4

Se tiene que el ser mujer disminuye en 0.09705 unidades el valor de la función logit asociada al modelo y que el ser una persona de color disminuye en 1.74161 unidades el valor de la función logit asociada al modelo.

5 Modelo para state 39

```
random_effects <- ranef(M1)$state
random_effects[39,]
```

```
## [1] 0.357593
```

$$y_{39j} \sim Bernoulli(\hat{p_{39j}}) \tag{4}$$

$$\text{logit}(\hat{p_{39j}}) = 0.44523 - 0.09705_{female} - 1.74161_{black} + 0.357593 \tag{5}$$

6

```
datos_nuevos <- rbind(c(0,0),
                      c(0,1),
                      c(1,1),
                      c(1,0))
colnames(datos_nuevos) <- c("female", "black")
datos_nuevos <- data.frame(datos_nuevos)
datos_nuevos['state'] <- 39

predict(M1, newdata=datos_nuevos, type='response')
```

```
##         1         2         3         4
## 0.5656377 0.1857997 0.1715638 0.5416600
```