

T4 — Gustavo Hernández

Gustavo Hernández

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Contents

Generación de datos simulados y aplicación de los métodos de selección de subconjuntos.

1. Usa una función en R para generar una variable predictora \mathbf{X} de longitud 100, así como un vector de ruido ϵ de longitud 100.
2. Genera un vector de respuesta \mathbf{Y} de longitud 100, de acuerdo al modelo

$$Y = \beta_0 + \beta_1 X + \beta_2 X^2 + \beta_3 X^3 + \epsilon$$

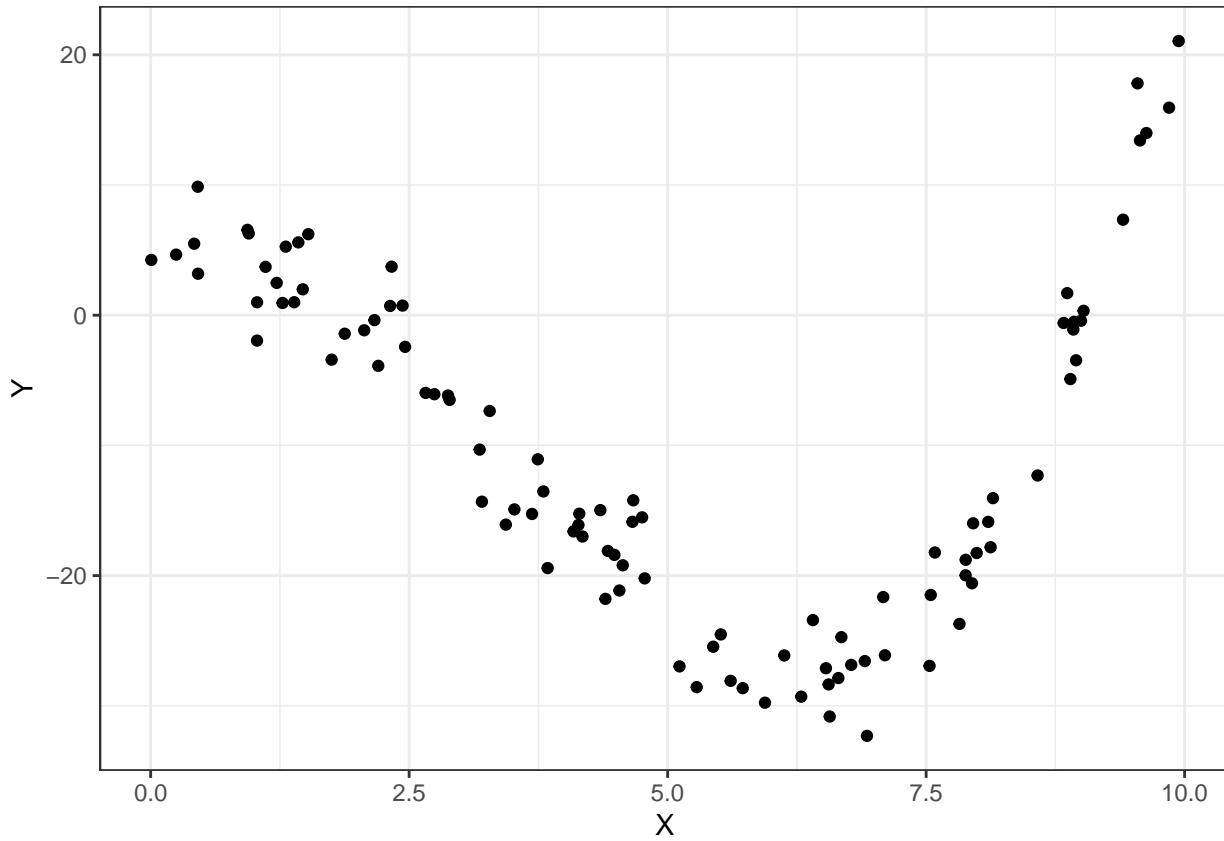
3. Utiliza la función `regsubsets()` para realizar la selección de subconjuntos con el fin de elegir el mejor modelo que contenga los predictores $\mathbf{X}, \mathbf{X}^2, \dots, \mathbf{X}^{10}$. ¿Qué modelo se selecciona como el mejor según el AIC, BIC y el R^2 ajustado? Muestra algunas gráficas que proporcionen evidencia de tu respuesta y reporta los coeficientes de mejor modelo obtenido.
4. Repite (c) usando la selección forward stepwise y backward stepwise. ¿Cómo se compara tu respuesta con los resultados obtenidos en (c)?

Solución

```
set.seed(123) # Para reproducibilidad
n <- 100
X <- runif(n, min=0, max=10) # Variable predictora
epsilon <- rnorm(n, mean = 0, sd = 3) # Vector de ruido

beta_0 <- 5
beta_1 <- 2
beta_2 <- -3
beta_3 <- 0.3
Y <- beta_0 + beta_1 * X + beta_2 * X^2 + beta_3 * X^3 + epsilon

#scatterplot
library(ggplot2)
ggplot() +
  geom_point(mapping=aes(x=X,y=Y)) +
  theme_bw()
```



```

data <- data.frame(Y = Y)
for (i in 1:10) {
  data[[paste0("X", i)]] <- X^i
}

library(leaps)

options(max.print=10000)

regfit.full <- regsubsets(Y ~ ., data = data, nbest=252, really.big=T, nvmax=10)
reg.summary <- summary(regfit.full)
print(reg.summary)

## Subset selection object
## Call: regsubsets.formula(Y ~ ., data = data, nbest = 252, really.big = T,
##   nvmax = 10)
## 10 Variables  (and intercept)
##    Forced in Forced out
## X1      FALSE      FALSE
## X2      FALSE      FALSE
## X3      FALSE      FALSE
## X4      FALSE      FALSE
## X5      FALSE      FALSE
## X6      FALSE      FALSE
## X7      FALSE      FALSE
## X8      FALSE      FALSE
## X9      FALSE      FALSE
## X10     FALSE      FALSE

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## 252 subsets of each size up to 10
## Selection Algorithm: exhaustive
##          X1  X2  X3  X4  X5  X6  X7  X8  X9  X10
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## [ reached 'max' / getOption("max.print") -- omitted 23 rows ]

# Mejor subset segun bic
bics = reg.summary$bic
idx_menor = which.min(bics)
cat(paste("Numero de variables: ", sum(reg.summary$which[idx_menor,]), "\n"))

## Numero de variables: 4
reg.summary$which[idx_menor,]

## (Intercept)      X1      X2      X3      X4      X5
##     TRUE    FALSE    TRUE    FALSE    FALSE    TRUE
##     X6      X7      X8      X9      X10
##     FALSE   TRUE   FALSE   FALSE   FALSE

# Mejor subset segun adjr2
adjr2s = reg.summary$adjr2
idx_menor = which.min(adjr2s)
reg.summary$which[idx_menor,]

## (Intercept)      X1      X2      X3      X4      X5
##     TRUE    FALSE    TRUE    FALSE    FALSE   FALSE
##     X6      X7      X8      X9      X10
##     FALSE   FALSE   FALSE   FALSE   FALSE

```

```
plot(regfit.full, scale='adjr2')
```

