

TAREA_3

Code ▼

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```
library(dplyr)
```

```
Warning: package 'dplyr' was built under R version 4.2.3  
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
```

Hide

```
library(ggplot2)
```

```
Warning: package 'ggplot2' was built under R version 4.2.3
```

Hide

```
library(corrplot)
```

```
Warning: package 'corrplot' was built under R version 4.2.3corrplot 0.92 loaded
```

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```
library(PerformanceAnalytics)
```

```
Warning: package 'PerformanceAnalytics' was built under R version 4.2.3Loading required package:
xts
Warning: package 'xts' was built under R version 4.2.3Loading required package: zoo
Warning: package 'zoo' was built under R version 4.2.3
Attaching package: 'zoo'
```

The following objects are masked from 'package:base':

```
as.Date, as.Date.numeric
```

```
##### Warning from 'xts' package #####
#
# The dplyr lag() function breaks how base R's lag() function is supposed to #
# work, which breaks lag(my_xts). Calls to lag(my_xts) that you type or #
# source() into this session won't work correctly. #
#
# Use stats::lag() to make sure you're not using dplyr::lag(), or you can add #
# conflictRules('dplyr', exclude = 'lag') to your .Rprofile to stop #
# dplyr from breaking base R's lag() function. #
#
# Code in packages is not affected. It's protected by R's namespace mechanism #
# Set `options(xts.warn_dplyr_breaks_lag = FALSE)` to suppress this warning. #
#
#####
```

Attaching package: 'xts'

The following objects are masked from 'package:dplyr':

```
first, last
```

Attaching package: 'PerformanceAnalytics'

The following object is masked from 'package:graphics':

```
legend
```

[Hide](#)

```
dataset<-read.csv("Admisions.csv")

print(dataset)
```

Serial.No.	GRE.Sc...	TOEFL.Score	University.Rating	S..	L..	C...	Resear...	Chance.of.Adn
<int>	<int>	<int>	<int>	<dbl>	<dbl>	<dbl>	<int>	<dbl>
1	337	118	4	4.5	4.5	9.65	1	0.

Serial.No.	GRE.Sc...	TOEFL.Score	University.Rating	S..	L..	C...	Resear...	Chance.of.Adn				
<int>	<int>	<int>	<int>	<dbl>	<dbl>	<dbl>	<int>	<dbl>				
2	324	107	4	4.0	4.5	8.87	1	0.				
3	316	104	3	3.0	3.5	8.00	1	0.				
4	322	110	3	3.5	2.5	8.67	1	0.				
5	314	103	2	2.0	3.0	8.21	0	0.				
6	330	115	5	4.5	3.0	9.34	1	0.				
7	321	109	3	3.0	4.0	8.20	1	0.				
8	308	101	2	3.0	4.0	7.90	0	0.				
9	302	102	1	2.0	1.5	8.00	0	0.				
10	323	108	3	3.5	3.0	8.60	0	0.				
1-10 of 500 rows			Previous	1	2	3	4	5	6	...	50	Next

<		>
		Hide

```
dataset<-dataset %>%
  select(-Serial.No.)
```

```
dataset
```

GRE.Score	TOEFL.Score	University.Rating	S..	L...	C...	Research	Chance.of.Admit					
<int>	<int>	<int>	<dbl>	<dbl>	<dbl>	<int>	<dbl>					
337	118	4	4.5	4.5	9.65	1	0.92					
324	107	4	4.0	4.5	8.87	1	0.76					
316	104	3	3.0	3.5	8.00	1	0.72					
322	110	3	3.5	2.5	8.67	1	0.80					
314	103	2	2.0	3.0	8.21	0	0.65					
330	115	5	4.5	3.0	9.34	1	0.90					
321	109	3	3.0	4.0	8.20	1	0.75					
308	101	2	3.0	4.0	7.90	0	0.68					
302	102	1	2.0	1.5	8.00	0	0.50					
323	108	3	3.5	3.0	8.60	0	0.45					
1-10 of 500 rows			Previous	1	2	3	4	5	6	...	50	Next

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NA

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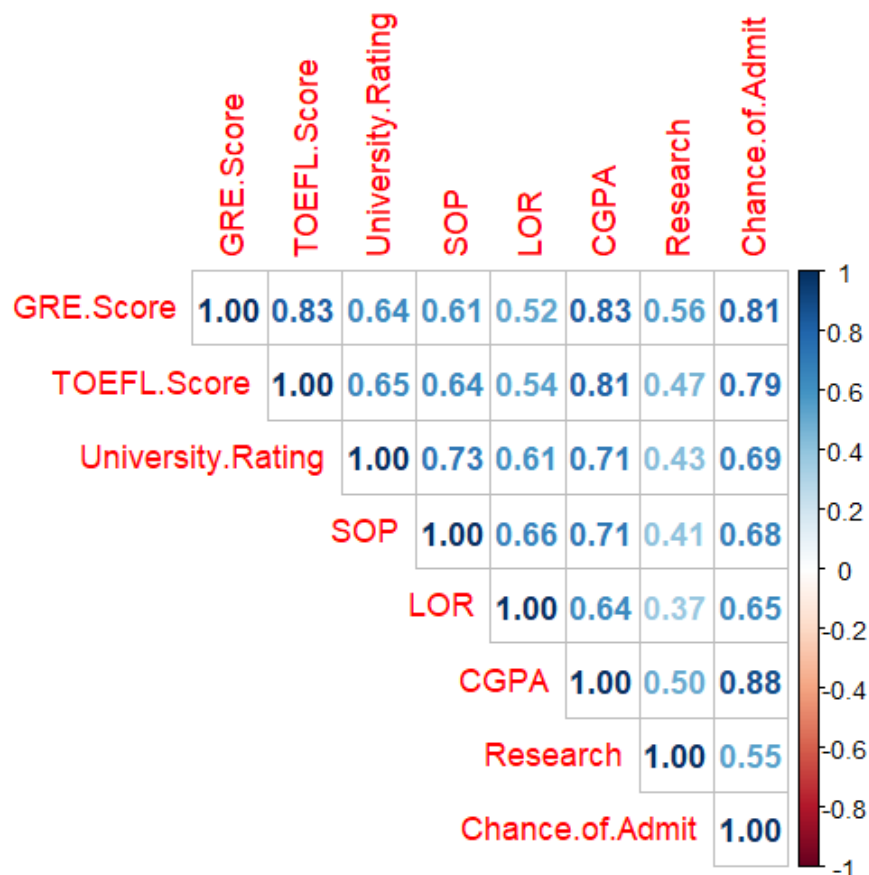
cor(dataset)

	GRE.Score	TOEFL.Score	University.Rating	SOP	LOR	CGPA
GRE.Score	1.0000000	0.8272004	0.6353762	0.6134977	0.5246794	0.8258780
TOEFL.Score	0.8272004	1.0000000	0.6497992	0.6444104	0.5415633	0.8105735
University.Rating	0.6353762	0.6497992	1.0000000	0.7280236	0.6086507	0.7052543
SOP	0.6134977	0.6444104	0.7280236	1.0000000	0.6637069	0.7121543
LOR	0.5246794	0.5415633	0.6086507	0.6637069	1.0000000	0.6374692
CGPA	0.8258780	0.8105735	0.7052543	0.7121543	0.6374692	1.0000000
Research	0.5633981	0.4670121	0.4270475	0.4081158	0.3725256	0.5013110
Chance.of.Admit	0.8103506	0.7922276	0.6901324	0.6841365	0.6453645	0.8824126

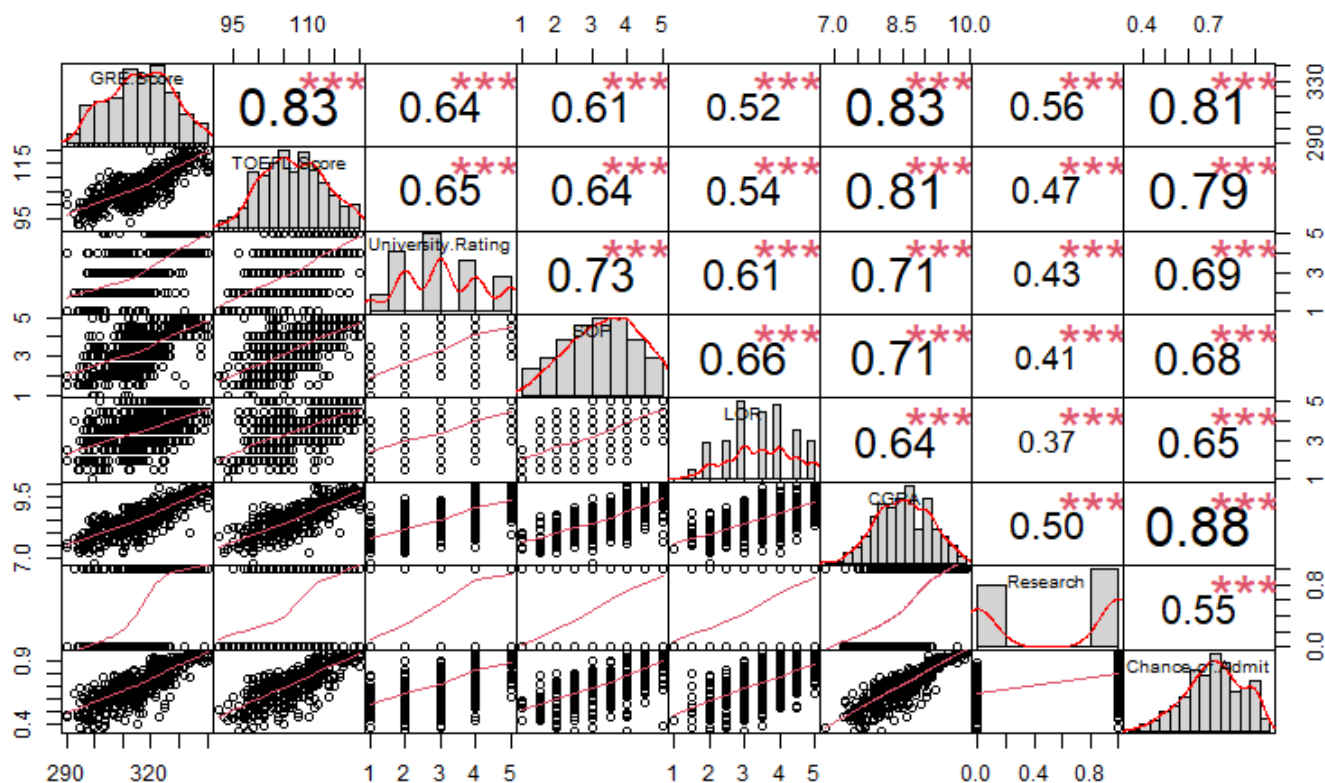
	Research	Chance.of.Admit
GRE.Score	0.5633981	0.8103506
TOEFL.Score	0.4670121	0.7922276
University.Rating	0.4270475	0.6901324
SOP	0.4081158	0.6841365
LOR	0.3725256	0.6453645
CGPA	0.5013110	0.8824126
Research	1.0000000	0.5458710
Chance.of.Admit	0.5458710	1.0000000

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```
corrplot(cor(dataset),
         method = "number",
         type = "upper")
```


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```
chart.Correlation(dataset, histogram = TRUE, cex=1)
```



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```
dataset<-dataset %>%  
  select(GRE.Score,Chance.of.Admit)
```

EJERICICIO 1

PREGUNTA 1

Un arreglo con los valores de los estimadores para β_0 y β_1

RESPUESTA 1

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```
n_1<-nrow(dataset)  
  
dataset <- dataset %>% mutate(xy = GRE.Score * Chance.of.Admit)  
dataset <- dataset %>% mutate(xx = GRE.Score * GRE.Score)  
  
resum_1<-dataset %>%  
  summarise(  
    sum_x = sum(GRE.Score),  
    sum_y = sum(Chance.of.Admit),  
    sum_xy = sum(xy),  
    sum_xx = sum(xx)  
  )  
  
x_sum<-as.double(resum_1$sum_x)  
y_sum<-as.double(resum_1$sum_y)  
xy_sum<-as.double(resum_1$sum_xy)  
xx_sum<-as.double(resum_1$sum_xx)  
  
beta_1<-((x_sum*y_sum-n_1*xy_sum)/(x_sum*x_sum-n_1*xx_sum))  
  
print("BETA 1")
```

```
[1] "BETA 1"
```

Hide

```
print(beta_1)
```

```
[1] 0.01012587
```

[Hide](#)

```
beta_0<-((y_sum-beta_1*x_sum)/(n_1))
```

```
print("BETA 0")
```

```
[1] "BETA 0"
```

[Hide](#)

```
print(beta_0)
```

```
[1] -2.482815
```

EJERICICIO 1

PREGUNTA 2

El valor del coeficiente de determinación R^2 del modelo.

RESPUESTA 2

[Hide](#)

```

y_mean <- mean(dataset$Chance.of.Admit)

dataset <- dataset %>% mutate(y_test = beta_0+GRE.Score *beta_1)

dataset <- dataset %>% mutate(error_dif_y_ymean = (Chance.of.Admit-y_mean)^2)

dataset <- dataset %>% mutate(error_dif_ytest_ymean = (y_test-y_mean)^2)

dataset <- dataset %>% mutate(error_dif = abs(y_test-Chance.of.Admit))

resum_2<-dataset %>%
  summarise(
    sum_y_ymean = sum(error_dif_y_ymean),
    sum_ytest_ymean = sum(error_dif_ytest_ymean)
  )

y_ymean_sum<-as.double(resum_2$sum_y_ymean)
ytest_ymean_sum<-as.double(resum_2$sum_ytest_ymean)

val_r2<-ytest_ymean_sum/y_ymean_sum

print(val_r2)

```

```
[1] 0.6566682
```

_____ EJERICICIO 1

_____ PREGUNTA 3

El coeficiente de correlación r (raíz cuadrada de $r^{\#}$).

_____ RESPUESTA 3 _____

[Hide](#)

```

val_r<-sqrt(val_r2)
print(val_r)

```

```
[1] 0.8103506
```


EJERCICIO 1

PREGUNTA 4

Un arreglo con los valores de los residuos.

RESPUESTA 4

[Hide](#)

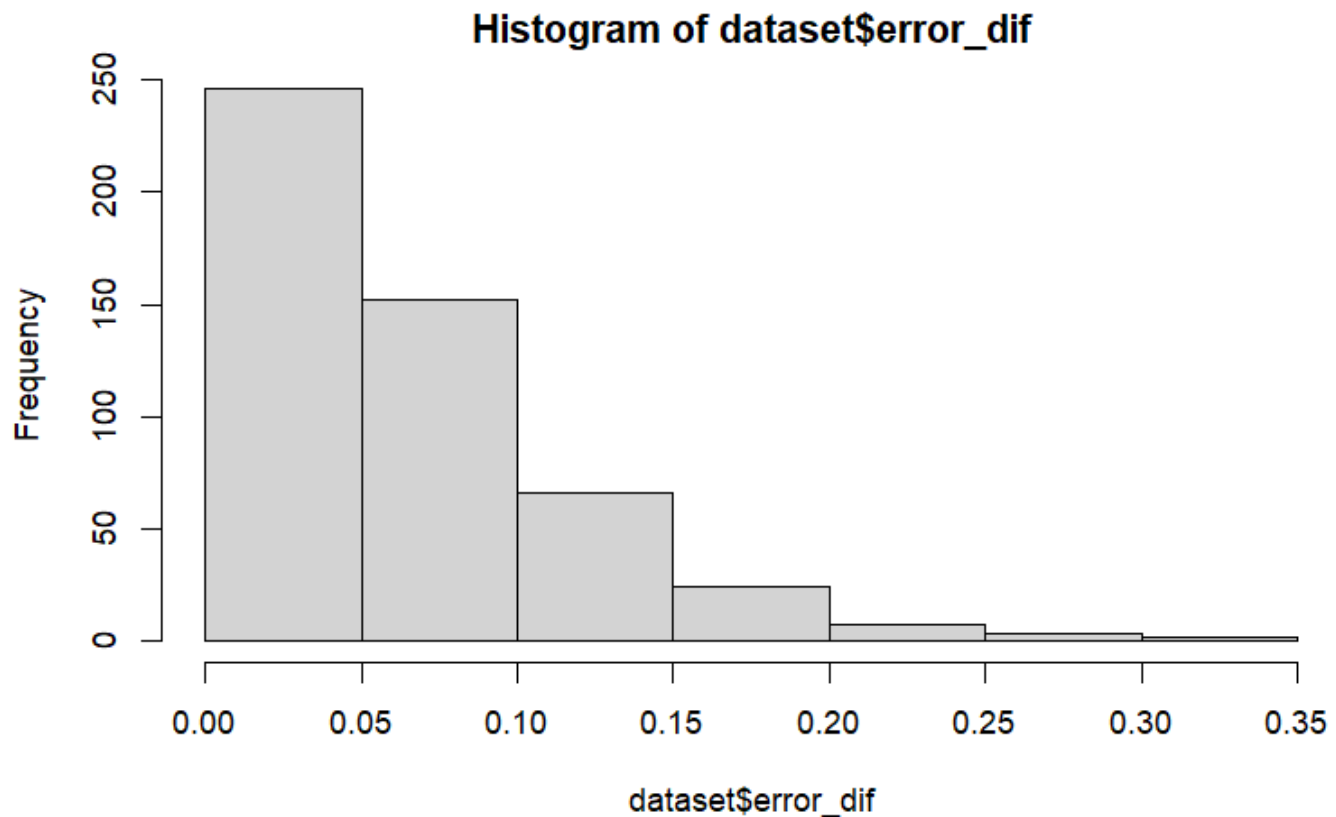
```
print(dataset$error_dif)
```

[1] 9.603881e-03 3.796756e-02 3.039411e-03 2.228418e-02 4.670885e-02 4.127722e-02
[7] 1.758994e-02 4.404638e-02 7.519839e-02 3.378417e-01 2.880934e-01 1.165483e-02
[13] 5.847104e-02 5.827749e-03 5.633123e-02 1.567088e-01 6.708646e-02 9.733820e-02
[19] 1.072123e-01 3.467573e-02 3.645710e-02 1.080934e-01 1.015290e-01 5.077373e-02
[25] 5.052199e-02 1.998149e-02 1.771582e-02 9.469491e-02 4.431730e-02 1.162054e-01
[31] 9.505335e-02 8.834517e-02 2.972975e-02 5.998149e-02 7.115135e-02 1.225359e-01
[37] 9.517922e-02 2.505335e-02 7.545014e-02 1.458277e-01 1.759536e-01 2.269606e-01
[43] 1.565830e-01 8.974526e-03 9.178070e-02 1.022842e-01 1.140309e-02 5.985562e-02
[49] 5.241006e-02 4.834517e-02 7.341702e-02 1.164571e-01 1.192263e-01 7.796756e-02
[55] 7.771582e-02 1.174641e-01 7.696059e-02 7.469491e-02 1.949467e-01 2.463312e-01
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[73] 1.624101e-01 1.432912e-01 4.329115e-02 1.285969e-01 8.834517e-02 7.492748e-02
[79] 7.444317e-02 3.419143e-02 1.764571e-01 1.850568e-05 1.625359e-01 1.422842e-01
[85] 1.998149e-02 1.266180e-02 1.316528e-02 6.708646e-02 5.670885e-02 2.303941e-02
[91] 9.721233e-02 1.648208e-01 1.946949e-01 1.250725e-01 2.253243e-01 1.754501e-01
[97] 1.357019e-01 8.848655e-03 2.102547e-02 2.158314e-03 6.771582e-02 3.645710e-02
[103] 7.670885e-02 1.570865e-01 7.821930e-02 2.696059e-02 2.140309e-02 2.972975e-02
[109] 6.115135e-02 8.454986e-02 4.423993e-03 7.758994e-02 5.492748e-02 3.746407e-02
[115] 7.633123e-02 3.794638e-03 1.517922e-02 3.687941e-03 4.444317e-02 1.183452e-01
[121] 3.064786e-02 4.077373e-02 8.620536e-02 2.595362e-02 4.927477e-03 8.505335e-02
[127] 6.215831e-02 3.266180e-02 2.178070e-02 3.089960e-02 1.014438e-02 1.846757e-01
[133] 6.392051e-02 2.158314e-03 8.996031e-04 1.232912e-01 8.354290e-02 6.960589e-03
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[151] 3.077373e-02 6.102547e-02 9.241006e-02 7.967557e-03 1.821930e-02 9.354290e-02
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[169] 1.559344e-01 1.633123e-02 3.542895e-03 9.226268e-03 8.228418e-02 1.021583e-01
[175] 1.024101e-01 9.253593e-02 5.140309e-02 7.266180e-02 7.392051e-02 1.041723e-01
[181] 1.550533e-01 1.044240e-01 1.351792e-01 5.329115e-02 3.039411e-03 6.165483e-02
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[199] 3.366877e-02 3.341702e-02 2.913540e-03 1.316528e-02 1.001851e-02 7.077373e-02
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[211] 1.809343e-02 1.847104e-02 1.027025e-02 7.089960e-02 7.115135e-02 7.127722e-02
[217] 1.322842e-01 8.241006e-02 4.203244e-02 6.354290e-02 7.341702e-02 3.303941e-02
[223] 3.796756e-02 7.404638e-02 6.442399e-02 9.555683e-02 1.429812e-02 3.645710e-02
[229] 2.721233e-02 2.203244e-02 4.341702e-02 7.338202e-03 1.354290e-02 4.454986e-02
[235] 5.127722e-02 6.178070e-02 4.190657e-02 1.140309e-02 4.379464e-02 4.517922e-02
[241] 8.555683e-02 7.708646e-02 9.796756e-02 4.809343e-02 6.670885e-02 2.847104e-02
[247] 3.039411e-03 4.366877e-02 2.032443e-03 2.410056e-03 1.746407e-02 1.696059e-02
[253] 2.721233e-02 2.064786e-02 8.241006e-02 1.641723e-01 1.139205e-01 1.796756e-02
[259] 4.821930e-02 3.115135e-02 4.165483e-02 3.354290e-02 6.404638e-02 9.796756e-02
[265] 5.809343e-02 2.341702e-02 4.354290e-02 3.329115e-02 1.654829e-03 1.340464e-01
[271] 1.042981e-01 4.820781e-03 4.191426e-03 1.564571e-01 1.268347e-01 2.284185e-03
[277] 4.140309e-02 5.746407e-02 2.404638e-02 7.454986e-02 1.366877e-02 7.291354e-02
[283] 1.335429e-01 3.241006e-02 1.998149e-02 6.115135e-02 5.219899e-04 9.203244e-02
[289] 1.232912e-01 1.034170e-01 4.582775e-02 5.053348e-03 1.519839e-02 3.645710e-02
[295] 1.069606e-01 4.708646e-02 1.037946e-01 1.025359e-01 4.127722e-02 1.044240e-01
[301] 2.607949e-02 8.733820e-02 1.277158e-01 5.784169e-02 6.658298e-02 2.758994e-02
[307] 2.158314e-03 8.093428e-03 1.354290e-02 6.404638e-02 2.535927e-03 1.528958e-03

```
[313] 1.136688e-01 1.049275e-01 5.442399e-02 1.404638e-02 5.305090e-03 2.505335e-02
[319] 7.967557e-03 2.834517e-02 2.291354e-02 5.784169e-02 2.329115e-02 1.442399e-02
[325] 3.683472e-02 8.219299e-03 8.517922e-02 1.856827e-01 2.032443e-03 9.456904e-02
[331] 2.834517e-02 6.366877e-02 1.140464e-01 3.733820e-02 5.354290e-02 2.190657e-02
[337] 2.733820e-02 6.102547e-02 2.215831e-02 1.203244e-02 7.354290e-02 2.821930e-02
[343] 5.595362e-02 1.557601e-02 3.431730e-02 2.269606e-01 1.254501e-01 1.248208e-01
[349] 5.198394e-03 6.658298e-02 2.787669e-03 7.809343e-02 5.467573e-02 7.505335e-02
[355] 6.543096e-02 2.913540e-03 3.834517e-02 1.149275e-01 3.291153e-03 4.241006e-02
[361] 7.228418e-02 3.077373e-02 2.972975e-02 7.429812e-02 8.341702e-02 1.277216e-03
[367] 1.746407e-02 9.633123e-02 2.469491e-02 1.049275e-01 6.379464e-02 9.203244e-02
[373] 3.052199e-02 2.241006e-02 3.168347e-01 2.154501e-01 1.845690e-01 1.631206e-02
[379] 2.532427e-02 4.366877e-02 2.284185e-03 1.733820e-02 2.203244e-02 6.505335e-02
[385] 1.850568e-05 5.064786e-02 1.151984e-01 9.582775e-02 2.444317e-02 2.535927e-03
[391] 5.670885e-02 2.721233e-02 2.178070e-02 4.291354e-02 4.140309e-02 2.203244e-02
[397] 3.190657e-02 5.127722e-02 6.457105e-03 6.089960e-02 3.454986e-02 4.683472e-02
[403] 1.796756e-02 5.127722e-02 4.633123e-02 5.519839e-02 1.677158e-01 4.530509e-02
[409] 4.543096e-02 5.505335e-02 2.507252e-02 1.265830e-01 1.067088e-01 2.370865e-01
[415] 4.758994e-02 6.834517e-02 5.683472e-02 1.969606e-01 4.607949e-02 5.595362e-02
[421] 1.248208e-01 2.410056e-03 4.771582e-02 4.077373e-02 1.019066e-01 1.321583e-01
[427] 3.354290e-02 5.379464e-02 2.696059e-02 9.981494e-03 7.366877e-02 2.746407e-02
[433] 6.203244e-02 6.960589e-03 2.429812e-02 9.607949e-02 7.620536e-02 1.170865e-01
[439] 6.721233e-02 1.645710e-02 7.557601e-02 8.897453e-02 5.115135e-02 1.024101e-01
[445] 1.220324e-01 7.152896e-02 1.016548e-01 8.253593e-02 1.235429e-01 8.316528e-02
[451] 6.253593e-02 9.203244e-02 9.152896e-02 1.733820e-02 5.379464e-02 1.557601e-02
[457] 3.482078e-02 1.343173e-01 1.354290e-02 4.140309e-02 2.266180e-02 1.149275e-01
[463] 5.827749e-03 2.545014e-02 8.469491e-02 6.557601e-02 1.329115e-02 4.278767e-02
[469] 2.215831e-02 4.178070e-02 1.125359e-01 2.633123e-02 7.165483e-02 4.696059e-02
[475] 3.404638e-02 3.505335e-02 2.454986e-02 3.920509e-03 2.721233e-02 1.809343e-02
[481] 3.241006e-02 7.841686e-03 8.471042e-03 1.145499e-01 2.913540e-03 3.366877e-02
[487] 6.733820e-02 3.834517e-02 1.771582e-02 7.480161e-02 4.417225e-02 1.543096e-02
[493] 4.694910e-03 6.505335e-02 1.149275e-01 8.974526e-03 3.039612e-02 7.127722e-02
[499] 5.354290e-02 1.165483e-02
```

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```
hist(dataset$error_dif)
```



EJERICICIO 1

PREGUNTA 5

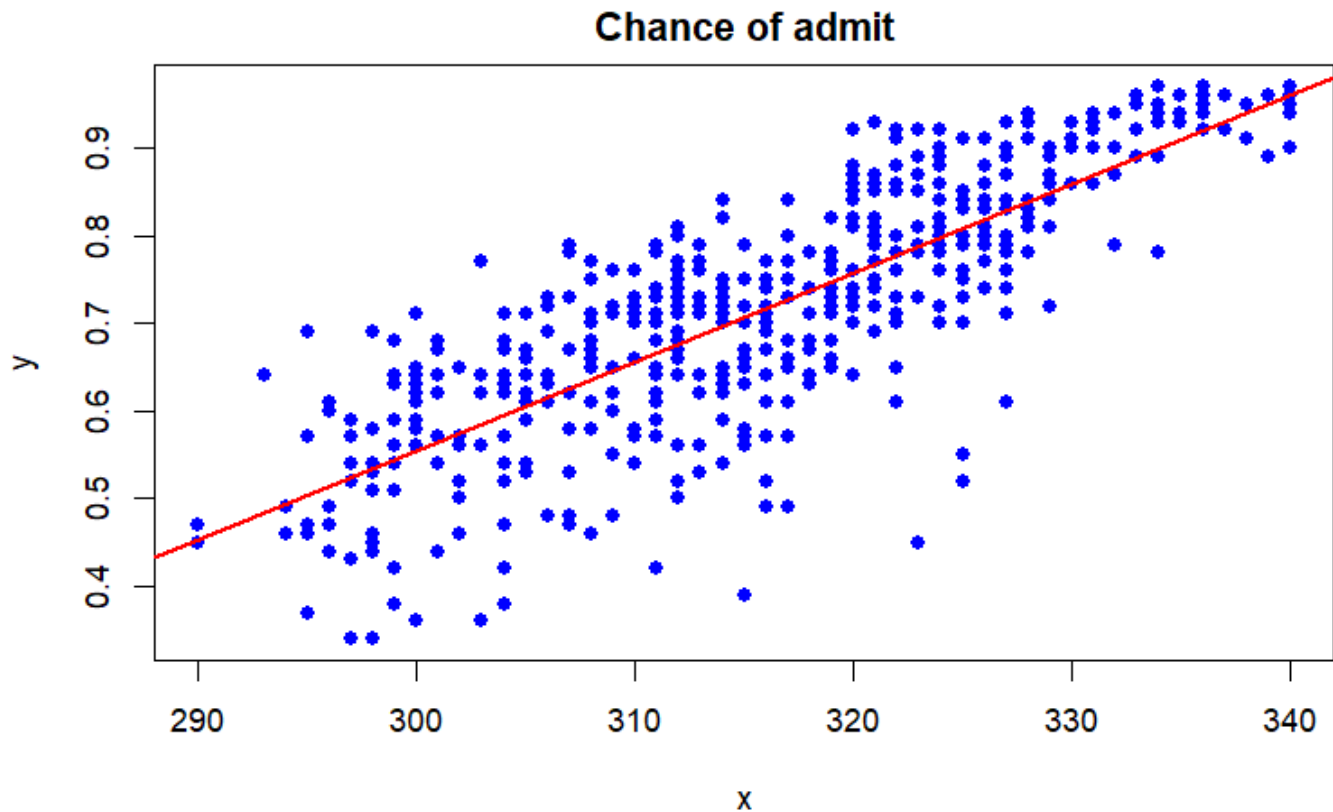
Una gráfica con la nube de puntos y la recta de regresión del modelo.

RESPUESTA 5

[Hide](#)

```
# Graficar la nube de puntos desde el dataframe
plot(dataset$GRE.Score, dataset$Chance.of.Admit, pch = 16, col = "blue", xlab = "x", ylab = "y",
main = "Chance of admit")

abline(a = beta_0, b = beta_1, col = "red", lwd = 2)
```



EJERICICIO 2

PREGUNTA 1

Realice un análisis estadístico sobre todas las variables del

dataset, recuerde que puede usar la función `summary()`.

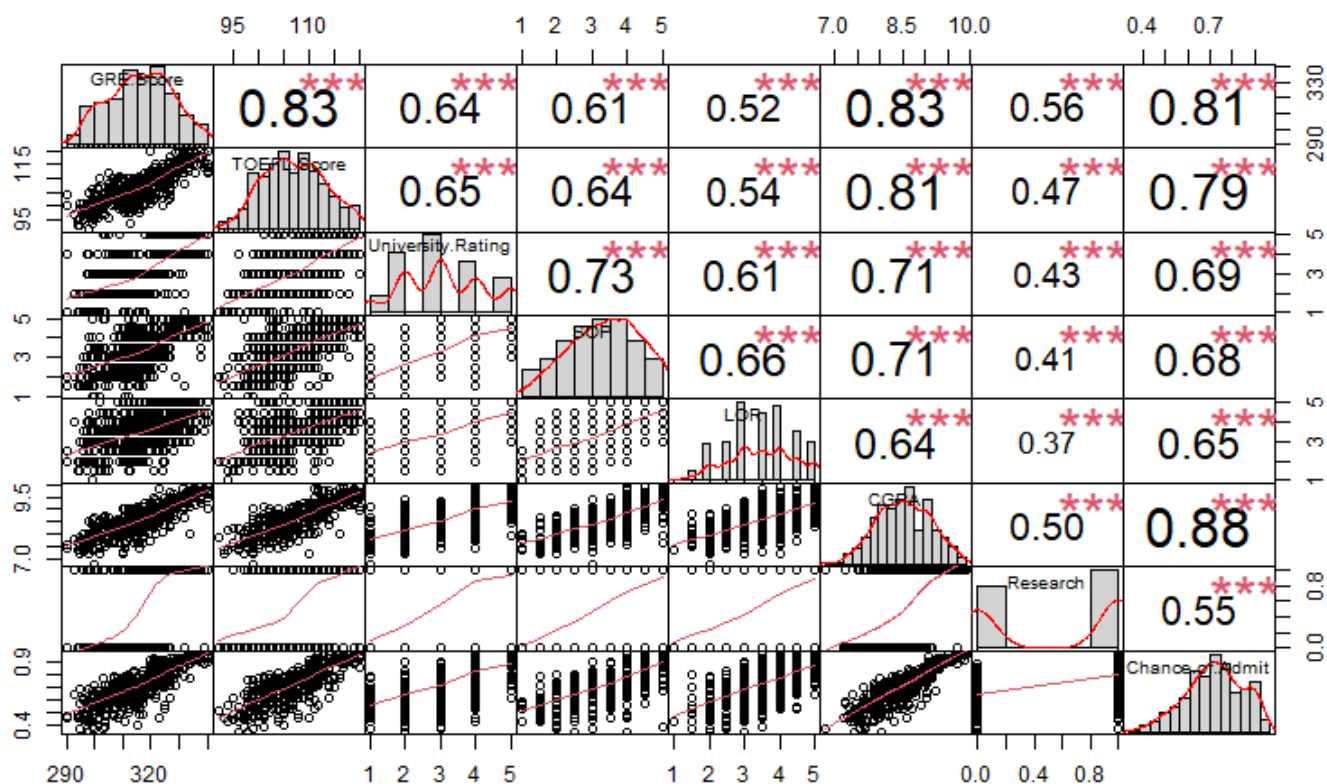
RESPUESTA 1

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```
dataset<-read.csv("Admissions.csv")

dataset<-dataset %>%
  select(-Serial.No.)

chart.Correlation(dataset, histogram = TRUE, cex=1)
```


[Hide](#)

```
lm1<-dataset %>%
  lm(formula = Chance.of.Admit ~ .)

summary(lm1)
```

Call:

```
lm(formula = Chance.of.Admit ~ ., data = .)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.266657	-0.023327	0.009191	0.033714	0.156818

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	-1.2757251	0.1042962	-12.232	< 2e-16	***
GRE.Score	0.0018585	0.0005023	3.700	0.000240	***
TOEFL.Score	0.0027780	0.0008724	3.184	0.001544	**
University.Rating	0.0059414	0.0038019	1.563	0.118753	
SOP	0.0015861	0.0045627	0.348	0.728263	
LOR	0.0168587	0.0041379	4.074	5.38e-05	***
CGPA	0.1183851	0.0097051	12.198	< 2e-16	***
Research	0.0243075	0.0066057	3.680	0.000259	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05999 on 492 degrees of freedom

Multiple R-squared: 0.8219, Adjusted R-squared: 0.8194

F-statistic: 324.4 on 7 and 492 DF, p-value: < 2.2e-16

EJERICICIO 2

PREGUNTA 2

Realice una gráfica de densidad para cada una de las variables

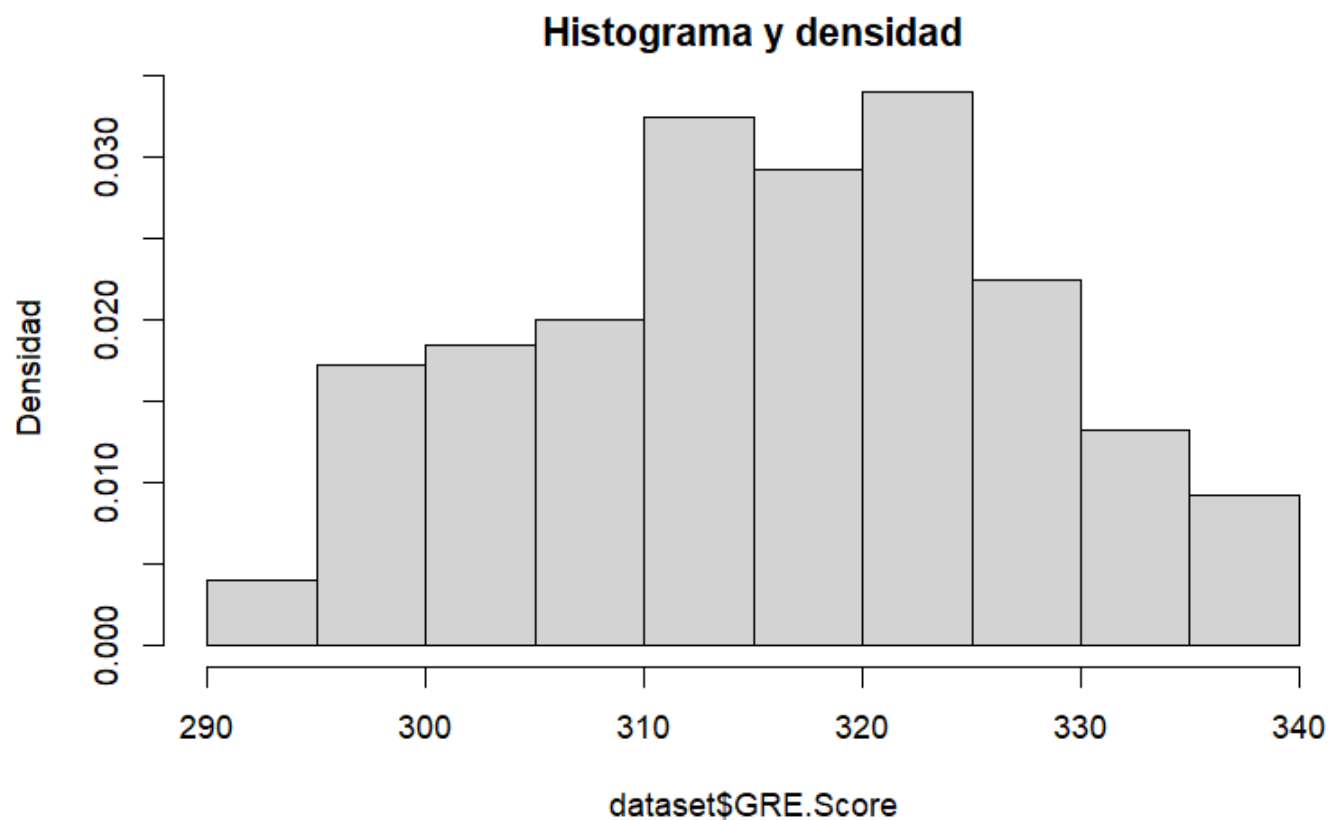
numéricas en el dataset: GRE.Score, TOEFEL.Score, CGPA y Chance of

Admit.

RESPUESTA 2

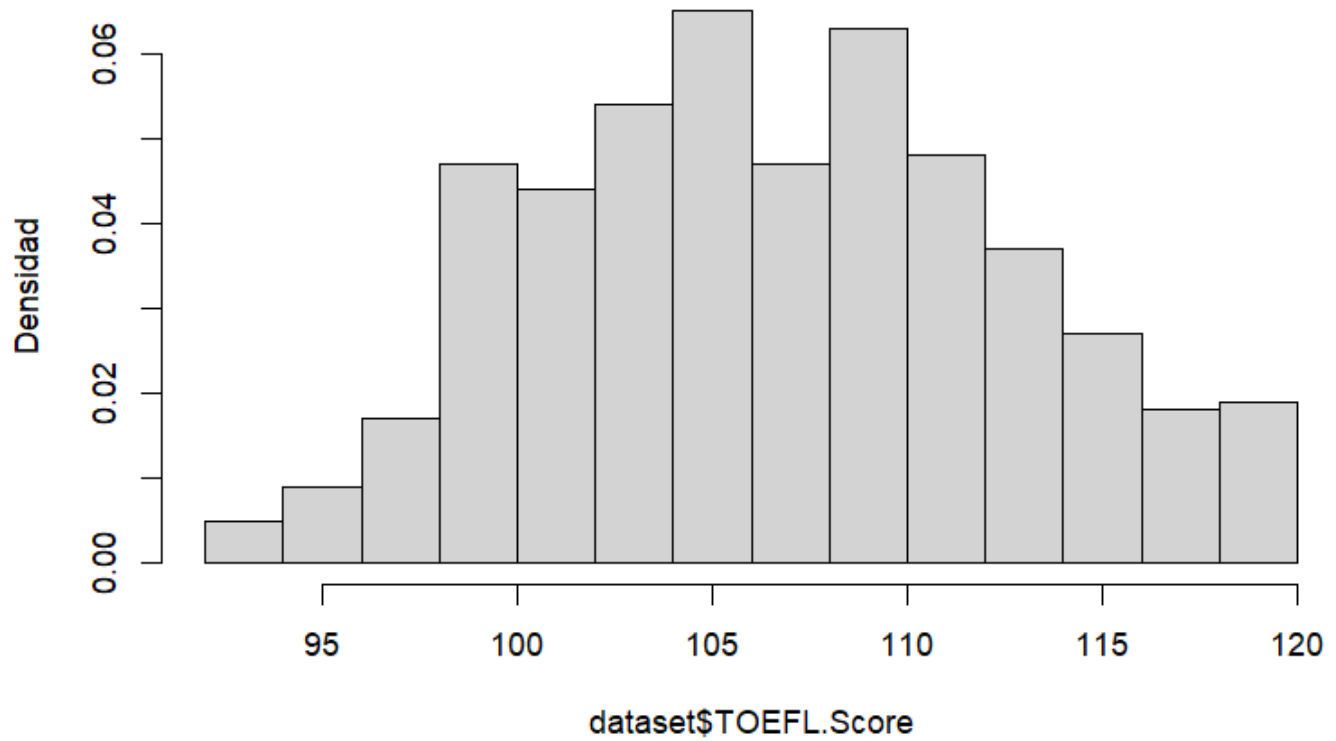
Hide

```
hist(dataset$GRE.Score, freq = FALSE, main = "Histograma y densidad",  
      ylab = "Densidad")
```

[Hide](#)

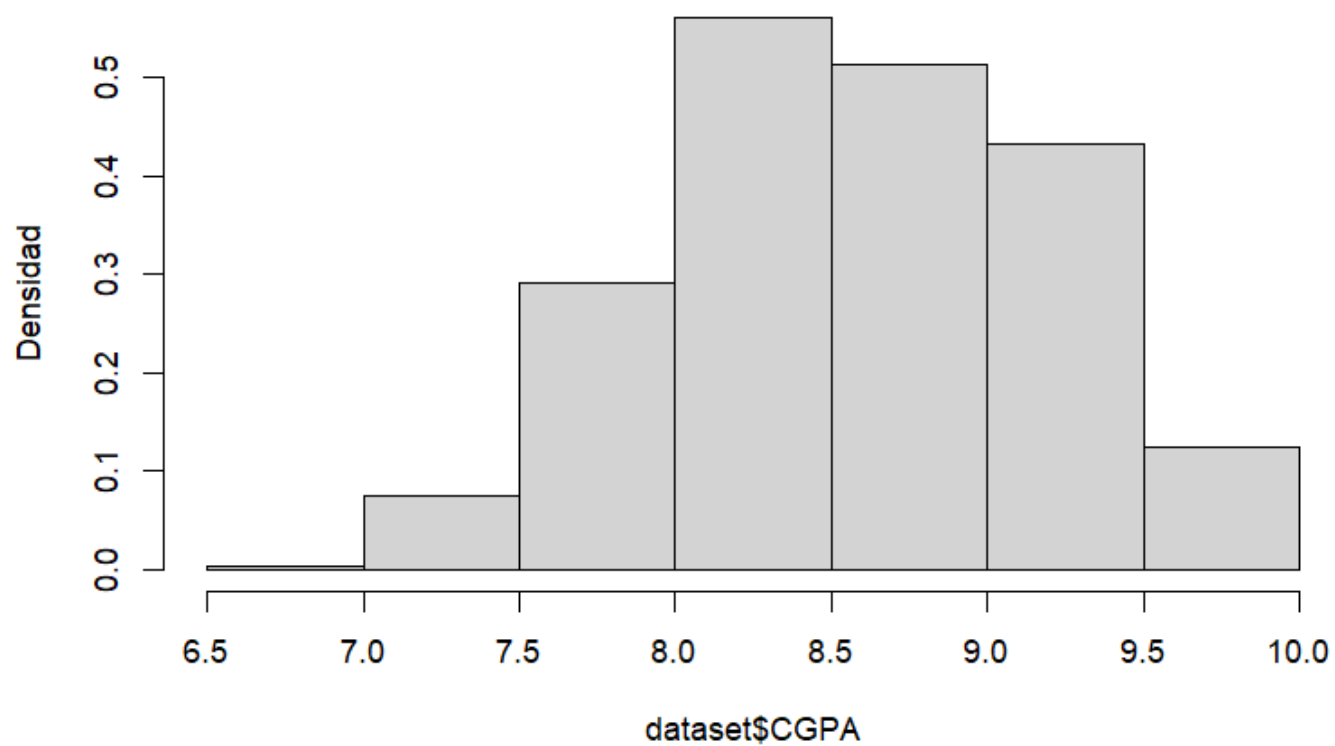
```
hist(dataset$TOEFL.Score, freq = FALSE, main = "Histograma y densidad",  
      ylab = "Densidad")
```


Histograma y densidad

[Hide](#)

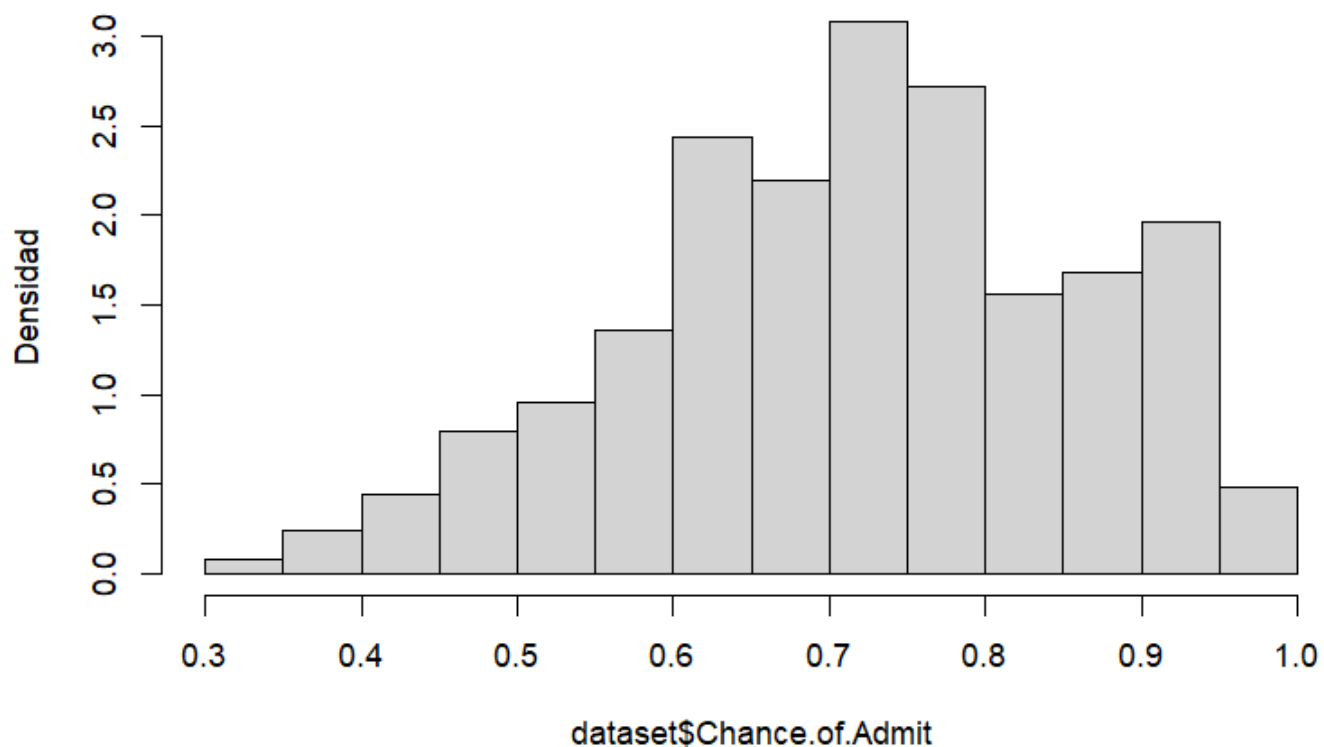
```
hist(dataset$CGPA, freq = FALSE, main = "Histograma y densidad",  
      ylab = "Densidad")
```

Histograma y densidad

[Hide](#)

```
hist(dataset$Chance.of.Admit, freq = FALSE, main = "Histograma y densidad",  
      ylab = "Densidad")
```

Histograma y densidad

[Hide](#)

NA
NA

EJERICICIO 2

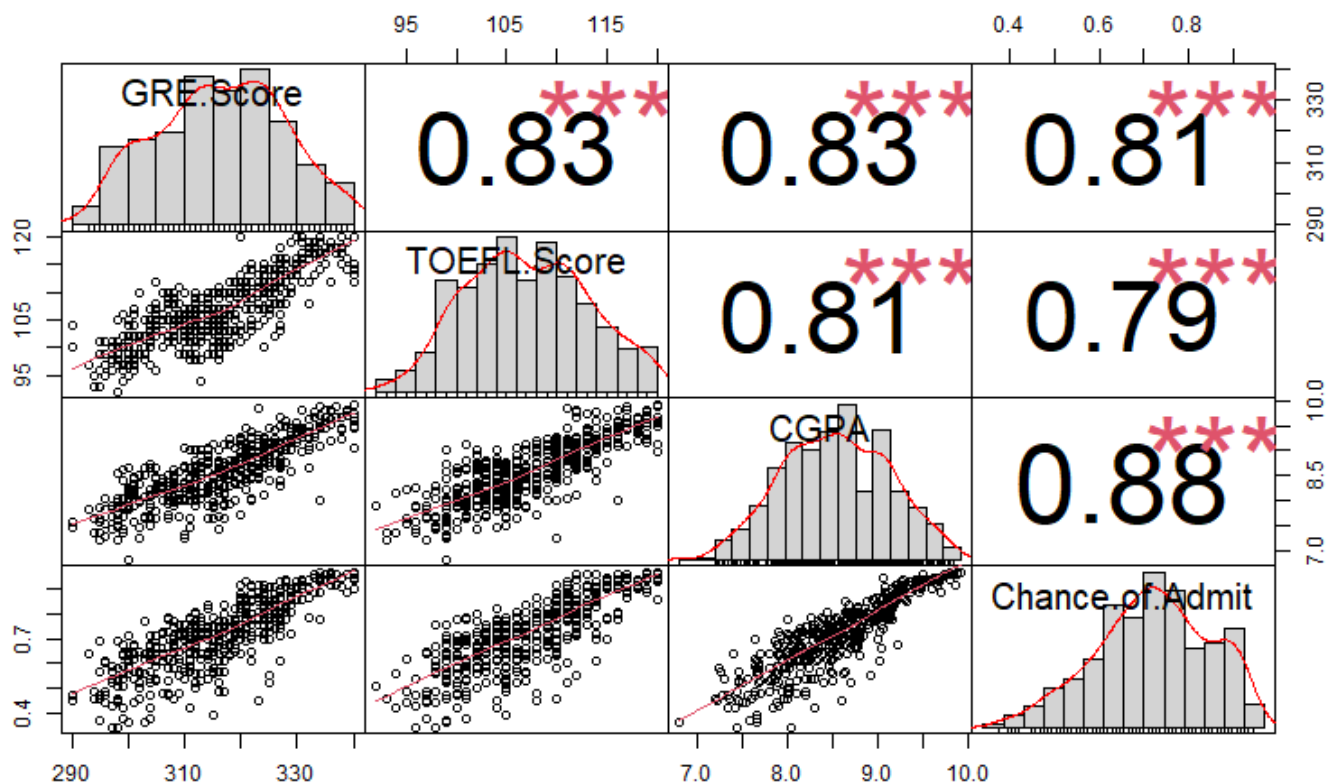
PREGUNTA 3

Realice una gráfica de correlación entre las variables del inciso anterior.

RESPUESTA 3

[Hide](#)

```
dataset_1<- dataset %>%  
  select(GRE.Score, TOEFL.Score, CGPA, Chance.of.Admit)  
  
chart.Correlation(dataset_1, histogram = TRUE, cex=1)
```



EJERICICIO 2

PREGUNTA 4

Realice comentarios sobre el análisis estadístico de las variables

numéricas y la gráfica de correlación.

RESPUESTA 4

En los graficos anteriores se puede observar que hay una fuerte correlacion entre

las variables GRE.Score, TOEFL.Score, CGPA y la variable Chance.of.Admit, por lo que

esta ultima si puede tener una alta dependencia de las variables anteriores.

EJERICICIO 2

PREGUNTA 5

Realice un scatter plot (nube de puntos) de todas las variables

numéricas contra la variable Chance of Admit.

RESPUESTA 5

Hide

```
# Crear un dataframe de ejemplo

# Establecer el diseño de la imagen
par(mfrow = c(3, 2)) # 2 filas y 2 columnas de paneles

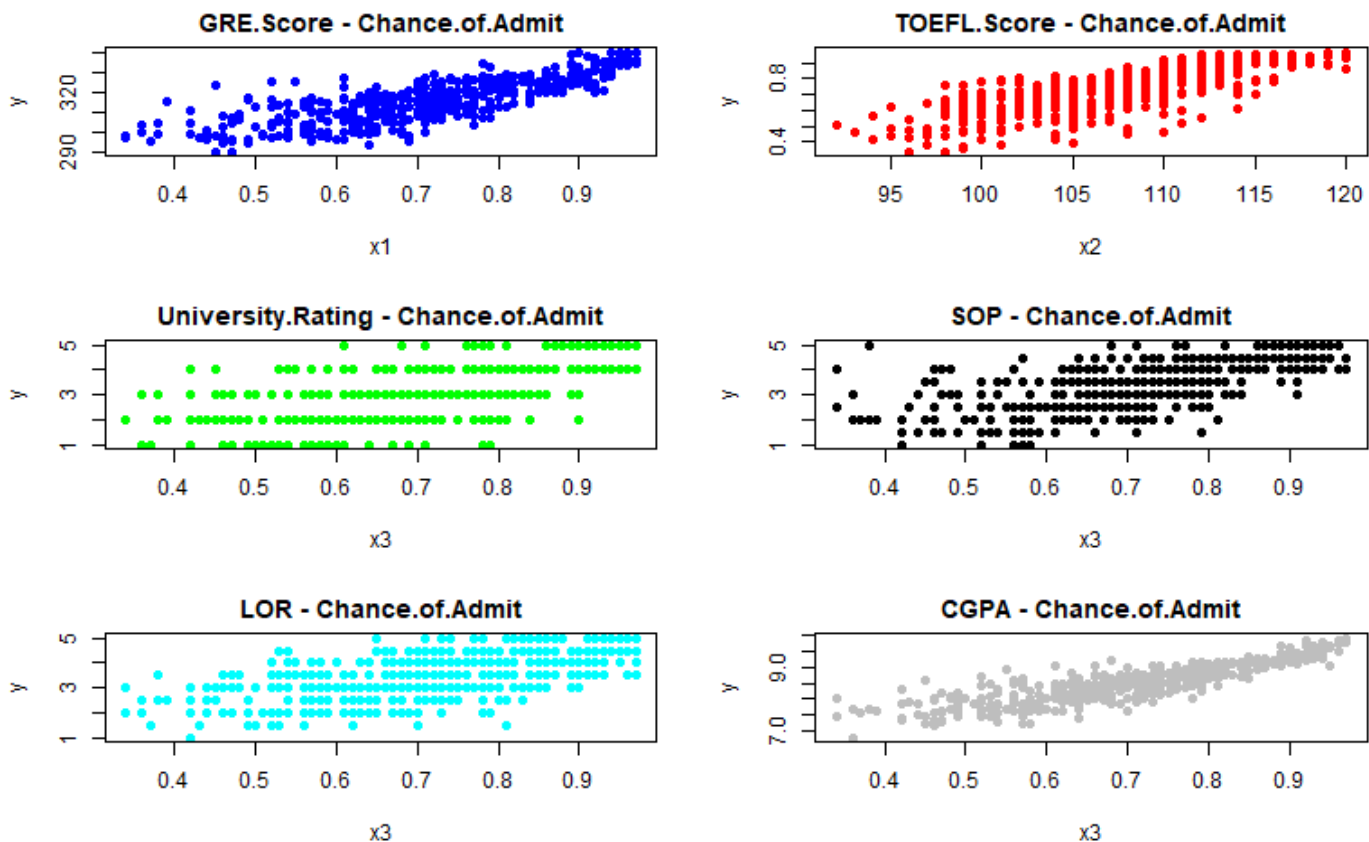
# Graficar cada scatterplot en un panel separado
plot(dataset$Chance.of.Admit, dataset$GRE.Score, pch = 16, col = "blue", xlab = "x1", ylab =
"y", main = "GRE.Score - Chance.of.Admit")
plot(dataset$TOEFL.Score, dataset$Chance.of.Admit, pch = 16, col = "red", xlab = "x2", ylab =
"y", main = "TOEFL.Score - Chance.of.Admit")
```

Hide

```
plot(dataset$Chance.of.Admit, dataset$University.Rating, pch = 16, col = "green", xlab = "x3", y
lab = "y", main = "University.Rating - Chance.of.Admit")
plot(dataset$Chance.of.Admit, dataset$SOP, pch = 16, col = "black", xlab = "x3", ylab = "y", mai
n = "SOP - Chance.of.Admit")
```

Hide

```
plot(dataset$Chance.of.Admit, dataset$LOR, pch = 16, col = "cyan", xlab = "x3", ylab = "y", main
= "LOR - Chance.of.Admit")
plot(dataset$Chance.of.Admit, dataset$CGPA, pch = 16, col = "gray", xlab = "x3", ylab = "y", mai
n = "CGPA - Chance.of.Admit")
```



EJERCICIO 2

PREGUNTA 6

Utilizando la función train y trainControl para crear un crossvalidation y le permita evaluar los ## siguientes modelos:

- $\text{Chance of Admit} \sim \text{TOEFEL.Score}$.
- $\text{Chance of Admit} \sim \text{CGPA}$.
- $\text{Chance of Admit} \sim \text{GRE.Score}$.
- $\text{Chance of Admit} \sim \text{TOEFEL.Score} + \text{CGPA}$.
- $\text{Chance of Admit} \sim \text{TOEFEL.Score} + \text{GRE.Score}$.
- $\text{Chance of Admit} \sim \text{GRE.Score} + \text{CGPA}$.
- $\text{Chance of Admit} \sim \text{TOEFEL.Score} + \text{CGPA} + \text{GRE.Score}$.

RESPUESTA 6
