HW_05_JAIRO_LEAL.R

jairo

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```
# Asignación 5: Correlación

# Maestría en Ciencias Forestales UANL
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# Ejercicio 1 -------------------------------------------------------------

# El cuadro 1 muestra los datos recopilados sobre efímeras de un arroyo y para cada muestra medi
mos la velocidad del arroyo y el número de efímeras.

speed <- c(2, 3, 5, 9, 14, 24, 29, 34)
abundance <- c(6, 3, 5, 23, 16, 12, 48, 43)

plot(abundance ~ speed)
```
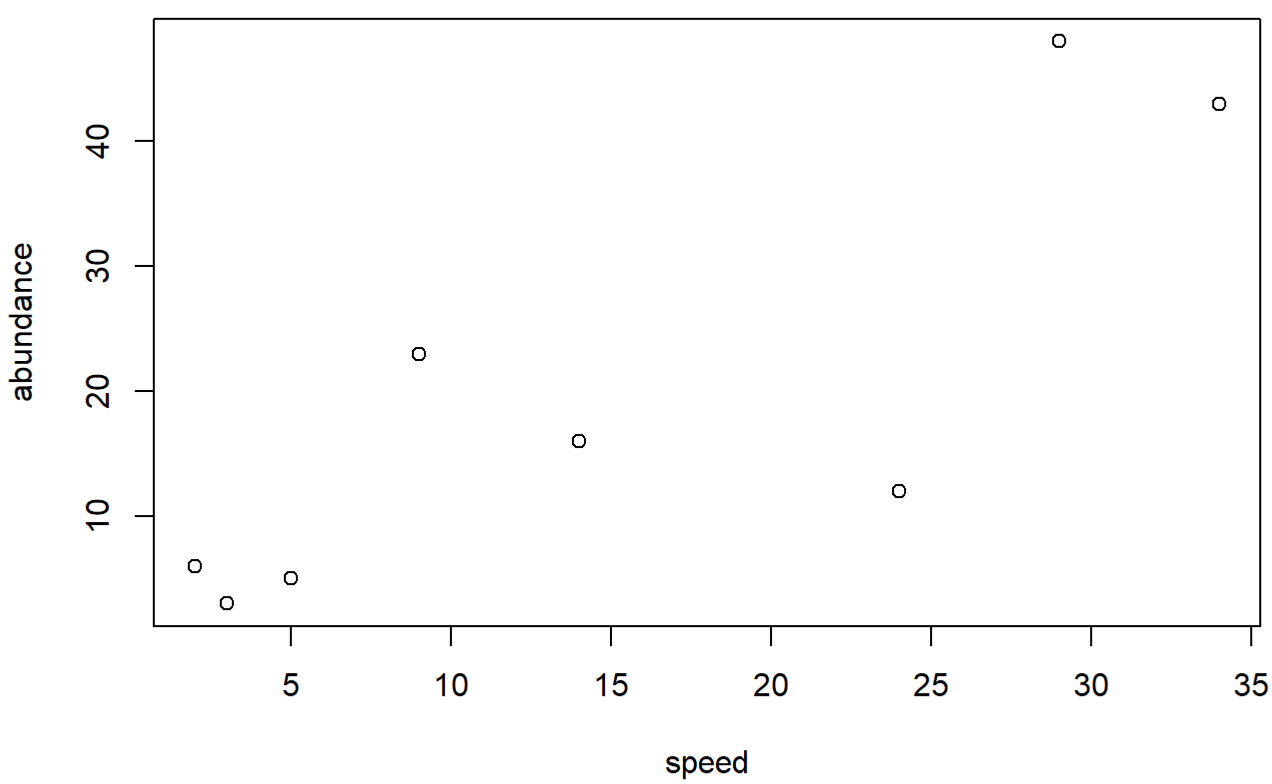
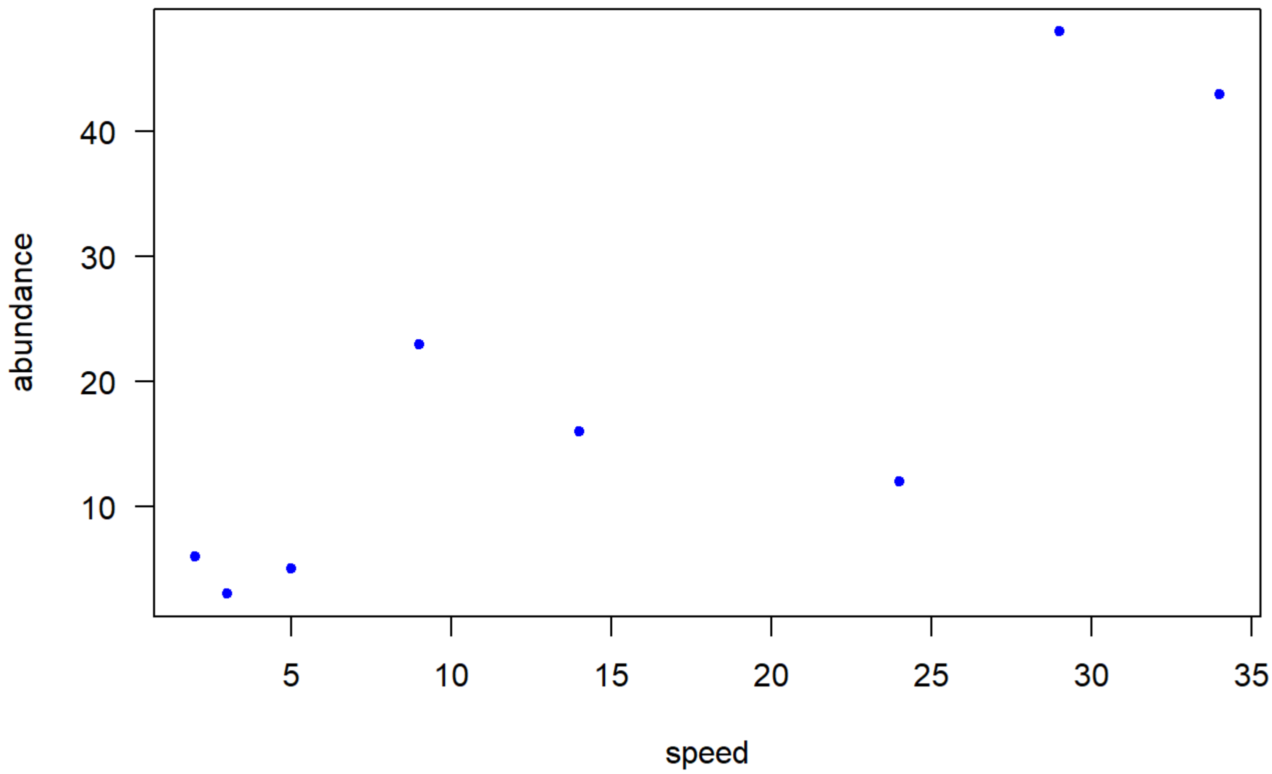




```
plot(x = speed, y = abundance, pch=20, col ="blue", las = 1)
```




```
# y = abundance; x = speed

# Parece que puede haber una relación entre la velocidad y la abundancia, pero hay varias incons
istencias, no es una correlación perfecta. Contestar las siguientes interrogantes:

# ¿Es estadísticamente significativa la correlación?

# Comenzamos con una hipótesis para probar. En este caso, esperamos una mayor abundancia de efím
eras a medida que aumenta la velocidad del arroyo. Escribiríamos esto formalmente (nuestrahipóte
sis alternativa H1) como:

# H1 (alternativa): “Existe una correlación positiva entre la velocidad de los arroyos y la abun
dancia de efímeras (Ecdyonurus dispar)”.
# H0 (nula: “No existe una correlación entre la velocidad del arroyo y la abundancia de efímera
s”.

cor(abundance, speed, method= 'pearson')
```

```
## [1] 0.8441408
```

```
cor.test(abundance, speed)
```

```
##
##  Pearson's product-moment correlation
##
## data:  abundance and speed
## t = 3.8568, df = 6, p-value = 0.008393
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.3442317 0.9711386
## sample estimates:
##       cor
## 0.8441408
```

```
    # r = 0.8441408
    # Grados libertad = 6
    # p-value = 0.008393

    0.8441408^2 # <--- R2
```

```
## [1] 0.7125737
```

```
# ¿Es estadísticamente significativa la correlación?
    # Si es estadisticamente significativa, se acepta la hipotesis alternativa


# Ejercicio 2 -------------------------------------------------------------

# Conjunto de datos:
# Composiciones del suelo, características físicas y químicas. Descripción: Las características
del suelo se midieron en muestras de tres áreas diferentes (cima,pendiente y depresión) y a cuat
ro profundidades (0-10 cm, 10-30 cm, 30-60 cm y 60-90 cm). El área se dividió en 4 bloques, en u
n diseño de bloques al azar (Cuadro 2).

# Cargar base de datos
suelo <- read.csv("C:/Users/jairo/OneDrive/Escritorio/MCF 2022-2023/PRIMER SEMESTRE/ANALISIS EST
ADISTICO/DR. MARCO/HW_5/suelo.csv")
head(suelo)
```

```
##   X Group Contour Depth Gp Block   pH     N Dens   P    Ca   Mg    K   Na
## 1 1     1     Top  0-10 T0     1 5.40 0.188 0.92 215 16.35 7.65 0.72 1.14
## 2 2     1     Top  0-10 T0     2 5.65 0.165 1.04 208 12.25 5.15 0.71 0.94
## 3 3     1     Top  0-10 T0     3 5.14 0.260 0.95 300 13.02 5.68 0.68 0.60
## 4 4     1     Top  0-10 T0     4 5.14 0.169 1.10 248 11.92 7.88 1.09 1.01
## 5 5     2     Top 10-30 T1     1 5.14 0.164 1.12 174 14.17 8.12 0.70 2.17
## 6 6     2     Top 10-30 T1     2 5.10 0.094 1.22 129  8.55 6.92 0.81 2.67
##   Conduc
## 1   1.09
## 2   1.35
## 3   1.41
## 4   1.64
## 5   1.85
## 6   3.18
```

```
# Realizar un análisis de correlación para las variables y reportar en un cuadro los valores de coeficientede correlación y su valor de significancia (p-value):

# Base de datos con solo las columnas que se necesita hacer correlacion
suelo.1 <- suelo[ , 7:15]
suelo.1
```

```
##      pH     N Dens   P    Ca    Mg    K    Na Conduc
## 1  5.40 0.188 0.92 215 16.35  7.65 0.72  1.14   1.09
## 2  5.65 0.165 1.04 208 12.25  5.15 0.71  0.94   1.35
## 3  5.14 0.260 0.95 300 13.02  5.68 0.68  0.60   1.41
## 4  5.14 0.169 1.10 248 11.92  7.88 1.09  1.01   1.64
## 5  5.14 0.164 1.12 174 14.17  8.12 0.70  2.17   1.85
## 6  5.10 0.094 1.22 129  8.55  6.92 0.81  2.67   3.18
## 7  4.70 0.100 1.52 117  8.74  8.16 0.39  3.32   4.16
## 8  4.46 0.112 1.47 170  9.49  9.16 0.70  3.76   5.14
## 9  4.37 0.112 1.07 121  8.85 10.35 0.74  5.74   5.73
## 10 4.39 0.058 1.54 115  4.73  6.91 0.77  5.85   6.45
## 11 4.17 0.078 1.26 112  6.29  7.95 0.26  5.30   8.37
## 12 3.89 0.070 1.42 117  6.61  9.76 0.41  8.30   9.21
## 13 3.88 0.077 1.25 127  6.41 10.96 0.56  9.67  10.64
## 14 4.07 0.046 1.54  91  3.82  6.61 0.50  7.67  10.07
## 15 3.88 0.055 1.53  91  4.98  8.00 0.23  8.78  11.26
## 16 3.74 0.053 1.40  79  5.86 10.14 0.41 11.04  12.15
## 17 5.11 0.247 0.94 261 13.25  7.55 0.61  1.86   2.61
## 18 5.46 0.298 0.96 300 12.30  7.50 0.68  2.00   1.98
## 19 5.61 0.145 1.10 242  9.66  6.76 0.63  1.01   0.76
## 20 5.85 0.186 1.20 229 13.78  7.12 0.62  3.09   2.85
## 21 4.57 0.102 1.37 156  8.58  9.92 0.63  3.67   3.24
## 22 5.11 0.097 1.30 139  8.58  8.69 0.42  4.70   4.63
## 23 4.78 0.122 1.30 214  8.22  7.75 0.32  3.07   3.67
## 24 6.67 0.083 1.42 132 12.68  9.56 0.55  8.30   8.10
## 25 3.96 0.059 1.53  98  4.80 10.00 0.36  6.52   7.72
## 26 4.00 0.050 1.50 115  5.06  8.91 0.28  7.91   9.78
## 27 4.12 0.086 1.55 148  6.16  7.58 0.16  6.39   9.07
## 28 4.99 0.048 1.46  97  7.49  9.38 0.40  9.70   9.13
## 29 3.80 0.049 1.48 108  3.82  8.80 0.24  9.57  11.57
## 30 3.96 0.036 1.28 103  4.78  7.29 0.24  9.67  11.42
## 31 3.93 0.048 1.42 109  4.93  7.47 0.14  9.65  13.32
## 32 4.02 0.039 1.51 100  5.66  8.84 0.37 10.54  11.57
## 33 5.24 0.194 1.00 445 12.27  6.27 0.72  1.02   0.75
## 34 5.20 0.256 0.78 380 11.39  7.55 0.78  1.63   2.20
## 35 5.30 0.136 1.00 259  9.96  8.08 0.45  1.97   2.27
## 36 5.67 0.127 1.13 248  9.12  7.04 0.55  1.43   0.67
## 37 4.46 0.087 1.24 276  7.24  9.40 0.43  4.17   5.08
## 38 4.91 0.092 1.47 158  7.37 10.57 0.59  5.07   6.37
## 39 4.79 0.047 1.46 121  6.99  9.91 0.30  5.15   6.82
## 40 5.36 0.095 1.26 195  8.59  8.66 0.48  4.17   3.65
## 41 3.94 0.054 1.60 148  4.85  9.62 0.18  7.20  10.14
## 42 4.52 0.051 1.53 115  6.34  9.78 0.34  8.52   9.74
## 43 4.35 0.032 1.55  82  5.99  9.73 0.22  7.02   8.60
## 44 4.64 0.065 1.46 152  4.43 10.54 0.22  7.61   9.09
## 45 3.82 0.038 1.40 105  4.65  9.85 0.18 10.15  12.26
## 46 4.24 0.035 1.47 100  4.56  8.95 0.33 10.51  11.29
## 47 4.22 0.030 1.56  97  5.29  8.37 0.14  8.27   9.51
## 48 4.41 0.058 1.58 130  4.58  9.46 0.14  9.28  12.69
```

```
# Correlacion de variables para obtener el p value
cor(suelo.1)
```

```
##                pH          N       Dens          P         Ca         Mg
## pH      1.0000000  0.6366540 -0.5890264  0.5910303  0.8086293 -0.3957821
## N       0.6366540  1.0000000 -0.8641559  0.8422007  0.8502155 -0.5215444
## Dens   -0.5890264 -0.8641559  1.0000000 -0.7936652 -0.7914376  0.4901171
## P       0.5910303  0.8422007 -0.7936652  1.0000000  0.6875874 -0.4889733
## Ca      0.8086293  0.8502155 -0.7914376  0.6875874  1.0000000 -0.4274958
## Mg     -0.3957821 -0.5215444  0.4901171 -0.4889733 -0.4274958  1.0000000
## K       0.5795727  0.6760033 -0.6670677  0.5557269  0.7209104 -0.3567182
## Na     -0.6932614 -0.8119353  0.7423018 -0.7728571 -0.7889082  0.5645363
## Conduc -0.7648104 -0.8037846  0.7625652 -0.7616939 -0.8320952  0.5082623
##                 K         Na     Conduc
## pH      0.5795727 -0.6932614 -0.7648104
## N       0.6760033 -0.8119353 -0.8037846
## Dens   -0.6670677  0.7423018  0.7625652
## P       0.5557269 -0.7728571 -0.7616939
## Ca      0.7209104 -0.7889082 -0.8320952
## Mg     -0.3567182  0.5645363  0.5082623
## K       1.0000000 -0.6932082 -0.7531033
## Na     -0.6932082  1.0000000  0.9724087
## Conduc -0.7531033  0.9724087  1.0000000
```

```
cor.test(suelo.1$pH, suelo.1$N)
```

```
## 
##  Pearson's product-moment correlation
## 
## data:  suelo.1$pH and suelo.1$N
## t = 5.5994, df = 46, p-value = 1.149e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.4303716 0.7797377
## sample estimates:
##      cor 
## 0.636654
```

```
cor.test(suelo.1$pH, suelo.1$Dens)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$Dens
## t = -4.9436, df = 46, p-value = 1.062e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.7479775 -0.3661760
## sample estimates:
##        cor
## -0.5890264
```

```
cor.test(suelo.1$pH, suelo.1$P)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$P
## t = 4.9694, df = 46, p-value = 9.74e-06
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.3688348 0.7493286
## sample estimates:
##       cor
## 0.5910303
```

```
cor.test(suelo.1$pH, suelo.1$Ca)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$Ca
## t = 9.3221, df = 46, p-value = 3.614e-12
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.6809493 0.8885997
## sample estimates:
##       cor
## 0.8086293
```

```
cor.test(suelo.1$pH, suelo.1$Mg)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$Mg
## t = -2.923, df = 46, p-value = 0.005361
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.6111857 -0.1257936
## sample estimates:
##        cor
## -0.3957821
```

```
cor.test(suelo.1$pH, suelo.1$K)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$K
## t = 4.8236, df = 46, p-value = 1.585e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.3536810 0.7415855
## sample estimates:
##       cor
## 0.5795727
```

```
cor.test(suelo.1$pH, suelo.1$Na)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$Na
## t = -6.5242, df = 46, p-value = 4.724e-08
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8165520 -0.5094849
## sample estimates:
##        cor
## -0.6932614
```

```
cor.test(suelo.1$pH, suelo.1$Conduc)
```

```
##
##  Pearson's product-moment correlation
##
## data:  suelo.1$pH and suelo.1$Conduc
## t = -8.0515, df = 46, p-value = 2.484e-10
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.8616916 -0.6141322
## sample estimates:
##        cor
## -0.7648104
```

```
# Correlación múltiple entre variables
suelo.cor <- round(cor(suelo.1), digits=4)
suelo.cor
```

```
##             pH       N    Dens       P      Ca      Mg       K      Na  Conduc
## pH      1.0000  0.6367 -0.5890  0.5910  0.8086 -0.3958  0.5796 -0.6933 -0.7648
## N       0.6367  1.0000 -0.8642  0.8422  0.8502 -0.5215  0.6760 -0.8119 -0.8038
## Dens   -0.5890 -0.8642  1.0000 -0.7937 -0.7914  0.4901 -0.6671  0.7423  0.7626
## P       0.5910  0.8422 -0.7937  1.0000  0.6876 -0.4890  0.5557 -0.7729 -0.7617
## Ca      0.8086  0.8502 -0.7914  0.6876  1.0000 -0.4275  0.7209 -0.7889 -0.8321
## Mg     -0.3958 -0.5215  0.4901 -0.4890 -0.4275  1.0000 -0.3567  0.5645  0.5083
## K       0.5796  0.6760 -0.6671  0.5557  0.7209 -0.3567  1.0000 -0.6932 -0.7531
## Na     -0.6933 -0.8119  0.7423 -0.7729 -0.7889  0.5645 -0.6932  1.0000  0.9724
## Conduc -0.7648 -0.8038  0.7626 -0.7617 -0.8321  0.5083 -0.7531  0.9724  1.0000
```

```
# Creación de tabla con valores de correlacion y pvalue
Conjunto <- c("ph-N", "ph-Dens", "ph-P", "ph-Ca", "ph-Mg", "ph-K", "ph-Na", "ph-conduc")
pH <- c(0.6367, -0.5890,  0.5910,  0.8086, -0.3958,  0.5796, -0.6933, -0.7648)
P.value <- c(1.149e-06, 1.062e-05, 9.74e-06, 3.614e-12, 0.005361, 1.585e-05, 4.724e-08, 2.484e-1
0)

Tabla.1 <- c(Conjunto, pH, P.value)
Tabla.1 <- data.frame(Conjunto, pH, P.value)
Tabla.1
```

```
##    Conjunto      pH   P.value
## 1      ph-N  0.6367 1.149e-06
## 2   ph-Dens -0.5890 1.062e-05
## 3      ph-P  0.5910 9.740e-06
## 4     ph-Ca  0.8086 3.614e-12
## 5     ph-Mg -0.3958 5.361e-03
## 6      ph-K  0.5796 1.585e-05
## 7     ph-Na -0.6933 4.724e-08
## 8 ph-conduc -0.7648 2.484e-10
```

```
is.factor(Tabla.1)
```

```
## [1] FALSE
```

```
# Grafico de correlación

library(corrplot)
```

```
## corrplot 0.92 loaded
```

```
corrplot(suelo.cor, tl.col = "black", bg = "white", tl.srt = 35,
         title = "Correlacion suelos",
         addCoef.col = "black", type = "upper")
```