Analisis de componentes principales

Omar Sanchez Hernandez

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PCA

El análisis de componentes principales o (PCA)

```
##     Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo    Especie
## 1            5.1          3.5          1.4          0.2     setosa
## 2            4.9          3.0          1.4          0.2     setosa
## 3            4.7          3.2          1.3          0.2     setosa
## 4            4.6          3.1          1.5          0.2     setosa
## 5            5.0          3.6          1.4          0.2     setosa
## 6            5.4          3.9          1.7          0.4     setosa
## 7            4.6          3.4          1.4          0.3     setosa
## 8            5.0          3.4          1.5          0.2     setosa
## 9            4.4          2.9          1.4          0.2     setosa
## 10           4.9          3.1          1.5          0.1     setosa
## 11           5.4          3.7          1.5          0.2     setosa
## 12           4.8          3.4          1.6          0.2     setosa
## 13           4.8          3.0          1.4          0.1     setosa
## 14           4.3          3.0          1.1          0.1     setosa
## 15           5.8          4.0          1.2          0.2     setosa
## 16           5.7          4.4          1.5          0.4     setosa
## 17           5.4          3.9          1.3          0.4     setosa
## 18           5.1          3.5          1.4          0.3     setosa
## 19           5.7          3.8          1.7          0.3     setosa
## 20           5.1          3.8          1.5          0.3     setosa
## 21           5.4          3.4          1.7          0.2     setosa
## 22           5.1          3.7          1.5          0.4     setosa
## 23           4.6          3.6          1.0          0.2     setosa
## 24           5.1          3.3          1.7          0.5     setosa
## 25           4.8          3.4          1.9          0.2     setosa
## 26           5.0          3.0          1.6          0.2     setosa
## 27           5.0          3.4          1.6          0.4     setosa
## 28           5.2          3.5          1.5          0.2     setosa
## 29           5.2          3.4          1.4          0.2     setosa
## 30           4.7          3.2          1.6          0.2     setosa
## 31           4.8          3.1          1.6          0.2     setosa
## 32           5.4          3.4          1.5          0.4     setosa
## 33           5.2          4.1          1.5          0.1     setosa
## 34           5.5          4.2          1.4          0.2     setosa
## 35           4.9          3.1          1.5          0.2     setosa
## 36           5.0          3.2          1.2          0.2     setosa
```

```
## 37          5.5         3.5          1.3         0.2     setosa
## 38          4.9         3.6          1.4         0.1     setosa
## 39          4.4         3.0          1.3         0.2     setosa
## 40          5.1         3.4          1.5         0.2     setosa
## 41          5.0         3.5          1.3         0.3     setosa
## 42          4.5         2.3          1.3         0.3     setosa
## 43          4.4         3.2          1.3         0.2     setosa
## 44          5.0         3.5          1.6         0.6     setosa
## 45          5.1         3.8          1.9         0.4     setosa
## 46          4.8         3.0          1.4         0.3     setosa
## 47          5.1         3.8          1.6         0.2     setosa
## 48          4.6         3.2          1.4         0.2     setosa
## 49          5.3         3.7          1.5         0.2     setosa
## 50          5.0         3.3          1.4         0.2     setosa
## 51          7.0         3.2          4.7         1.4 versicolor
## 52          6.4         3.2          4.5         1.5 versicolor
## 53          6.9         3.1          4.9         1.5 versicolor
## 54          5.5         2.3          4.0         1.3 versicolor
## 55          6.5         2.8          4.6         1.5 versicolor
## 56          5.7         2.8          4.5         1.3 versicolor
## 57          6.3         3.3          4.7         1.6 versicolor
## 58          4.9         2.4          3.3         1.0 versicolor
## 59          6.6         2.9          4.6         1.3 versicolor
## 60          5.2         2.7          3.9         1.4 versicolor
## 61          5.0         2.0          3.5         1.0 versicolor
## 62          5.9         3.0          4.2         1.5 versicolor
## 63          6.0         2.2          4.0         1.0 versicolor
## 64          6.1         2.9          4.7         1.4 versicolor
## 65          5.6         2.9          3.6         1.3 versicolor
## 66          6.7         3.1          4.4         1.4 versicolor
## 67          5.6         3.0          4.5         1.5 versicolor
## 68          5.8         2.7          4.1         1.0 versicolor
## 69          6.2         2.2          4.5         1.5 versicolor
## 70          5.6         2.5          3.9         1.1 versicolor
## 71          5.9         3.2          4.8         1.8 versicolor
## 72          6.1         2.8          4.0         1.3 versicolor
## 73          6.3         2.5          4.9         1.5 versicolor
## 74          6.1         2.8          4.7         1.2 versicolor
## 75          6.4         2.9          4.3         1.3 versicolor
## 76          6.6         3.0          4.4         1.4 versicolor
## 77          6.8         2.8          4.8         1.4 versicolor
## 78          6.7         3.0          5.0         1.7 versicolor
## 79          6.0         2.9          4.5         1.5 versicolor
## 80          5.7         2.6          3.5         1.0 versicolor
## 81          5.5         2.4          3.8         1.1 versicolor
## 82          5.5         2.4          3.7         1.0 versicolor
## 83          5.8         2.7          3.9         1.2 versicolor
## 84          6.0         2.7          5.1         1.6 versicolor
## 85          5.4         3.0          4.5         1.5 versicolor
## 86          6.0         3.4          4.5         1.6 versicolor
## 87          6.7         3.1          4.7         1.5 versicolor
## 88          6.3         2.3          4.4         1.3 versicolor
## 89          5.6         3.0          4.1         1.3 versicolor
## 90          5.5         2.5          4.0         1.3 versicolor
```

```
## 91          5.5         2.6          4.4         1.2 versicolor
## 92          6.1         3.0          4.6         1.4 versicolor
## 93          5.8         2.6          4.0         1.2 versicolor
## 94          5.0         2.3          3.3         1.0 versicolor
## 95          5.6         2.7          4.2         1.3 versicolor
## 96          5.7         3.0          4.2         1.2 versicolor
## 97          5.7         2.9          4.2         1.3 versicolor
## 98          6.2         2.9          4.3         1.3 versicolor
## 99          5.1         2.5          3.0         1.1 versicolor
## 100         5.7         2.8          4.1         1.3 versicolor
## 101         6.3         3.3          6.0         2.5  virginica
## 102         5.8         2.7          5.1         1.9  virginica
## 103         7.1         3.0          5.9         2.1  virginica
## 104         6.3         2.9          5.6         1.8  virginica
## 105         6.5         3.0          5.8         2.2  virginica
## 106         7.6         3.0          6.6         2.1  virginica
## 107         4.9         2.5          4.5         1.7  virginica
## 108         7.3         2.9          6.3         1.8  virginica
## 109         6.7         2.5          5.8         1.8  virginica
## 110         7.2         3.6          6.1         2.5  virginica
## 111         6.5         3.2          5.1         2.0  virginica
## 112         6.4         2.7          5.3         1.9  virginica
## 113         6.8         3.0          5.5         2.1  virginica
## 114         5.7         2.5          5.0         2.0  virginica
## 115         5.8         2.8          5.1         2.4  virginica
## 116         6.4         3.2          5.3         2.3  virginica
## 117         6.5         3.0          5.5         1.8  virginica
## 118         7.7         3.8          6.7         2.2  virginica
## 119         7.7         2.6          6.9         2.3  virginica
## 120         6.0         2.2          5.0         1.5  virginica
## 121         6.9         3.2          5.7         2.3  virginica
## 122         5.6         2.8          4.9         2.0  virginica
## 123         7.7         2.8          6.7         2.0  virginica
## 124         6.3         2.7          4.9         1.8  virginica
## 125         6.7         3.3          5.7         2.1  virginica
## 126         7.2         3.2          6.0         1.8  virginica
## 127         6.2         2.8          4.8         1.8  virginica
## 128         6.1         3.0          4.9         1.8  virginica
## 129         6.4         2.8          5.6         2.1  virginica
## 130         7.2         3.0          5.8         1.6  virginica
## 131         7.4         2.8          6.1         1.9  virginica
## 132         7.9         3.8          6.4         2.0  virginica
## 133         6.4         2.8          5.6         2.2  virginica
## 134         6.3         2.8          5.1         1.5  virginica
## 135         6.1         2.6          5.6         1.4  virginica
## 136         7.7         3.0          6.1         2.3  virginica
## 137         6.3         3.4          5.6         2.4  virginica
## 138         6.4         3.1          5.5         1.8  virginica
## 139         6.0         3.0          4.8         1.8  virginica
## 140         6.9         3.1          5.4         2.1  virginica
## 141         6.7         3.1          5.6         2.4  virginica
## 142         6.9         3.1          5.1         2.3  virginica
## 143         5.8         2.7          5.1         1.9  virginica
## 144         6.8         3.2          5.9         2.3  virginica
```

```
## 145          6.7          3.3          5.7          2.5  virginica
## 146          6.7          3.0          5.2          2.3  virginica
## 147          6.3          2.5          5.0          1.9  virginica
## 148          6.5          3.0          5.2          2.0  virginica
## 149          6.2          3.4          5.4          2.3  virginica
## 150          5.9          3.0          5.1          1.8  virginica
```

```
## 'data.frame':    150 obs. of  5 variables:
##  $ Largo.Sepalo: num  5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...
##  $ Ancho.Sepalo: num  3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...
##  $ Largo.Petalo: num  1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...
##  $ Ancho.Petalo: num  0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...
##  $ Especie     : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 1 ...
```

```
##
## 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.- Se crea un nuevo data frame solo con las variables cuantitativas.

```
##     Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
## 1            5.1          3.5          1.4          0.2
## 2            4.9          3.0          1.4          0.2
## 3            4.7          3.2          1.3          0.2
## 4            4.6          3.1          1.5          0.2
## 5            5.0          3.6          1.4          0.2
## 6            5.4          3.9          1.7          0.4
## 7            4.6          3.4          1.4          0.3
## 8            5.0          3.4          1.5          0.2
## 9            4.4          2.9          1.4          0.2
## 10           4.9          3.1          1.5          0.1
## 11           5.4          3.7          1.5          0.2
## 12           4.8          3.4          1.6          0.2
## 13           4.8          3.0          1.4          0.1
## 14           4.3          3.0          1.1          0.1
## 15           5.8          4.0          1.2          0.2
## 16           5.7          4.4          1.5          0.4
## 17           5.4          3.9          1.3          0.4
## 18           5.1          3.5          1.4          0.3
## 19           5.7          3.8          1.7          0.3
## 20           5.1          3.8          1.5          0.3
## 21           5.4          3.4          1.7          0.2
## 22           5.1          3.7          1.5          0.4
## 23           4.6          3.6          1.0          0.2
## 24           5.1          3.3          1.7          0.5
```

```
## 25          4.8         3.4         1.9         0.2
## 26          5.0         3.0         1.6         0.2
## 27          5.0         3.4         1.6         0.4
## 28          5.2         3.5         1.5         0.2
## 29          5.2         3.4         1.4         0.2
## 30          4.7         3.2         1.6         0.2
## 31          4.8         3.1         1.6         0.2
## 32          5.4         3.4         1.5         0.4
## 33          5.2         4.1         1.5         0.1
## 34          5.5         4.2         1.4         0.2
## 35          4.9         3.1         1.5         0.2
## 36          5.0         3.2         1.2         0.2
## 37          5.5         3.5         1.3         0.2
## 38          4.9         3.6         1.4         0.1
## 39          4.4         3.0         1.3         0.2
## 40          5.1         3.4         1.5         0.2
## 41          5.0         3.5         1.3         0.3
## 42          4.5         2.3         1.3         0.3
## 43          4.4         3.2         1.3         0.2
## 44          5.0         3.5         1.6         0.6
## 45          5.1         3.8         1.9         0.4
## 46          4.8         3.0         1.4         0.3
## 47          5.1         3.8         1.6         0.2
## 48          4.6         3.2         1.4         0.2
## 49          5.3         3.7         1.5         0.2
## 50          5.0         3.3         1.4         0.2
## 51          7.0         3.2         4.7         1.4
## 52          6.4         3.2         4.5         1.5
## 53          6.9         3.1         4.9         1.5
## 54          5.5         2.3         4.0         1.3
## 55          6.5         2.8         4.6         1.5
## 56          5.7         2.8         4.5         1.3
## 57          6.3         3.3         4.7         1.6
## 58          4.9         2.4         3.3         1.0
## 59          6.6         2.9         4.6         1.3
## 60          5.2         2.7         3.9         1.4
## 61          5.0         2.0         3.5         1.0
## 62          5.9         3.0         4.2         1.5
## 63          6.0         2.2         4.0         1.0
## 64          6.1         2.9         4.7         1.4
## 65          5.6         2.9         3.6         1.3
## 66          6.7         3.1         4.4         1.4
## 67          5.6         3.0         4.5         1.5
## 68          5.8         2.7         4.1         1.0
## 69          6.2         2.2         4.5         1.5
## 70          5.6         2.5         3.9         1.1
## 71          5.9         3.2         4.8         1.8
## 72          6.1         2.8         4.0         1.3
## 73          6.3         2.5         4.9         1.5
## 74          6.1         2.8         4.7         1.2
## 75          6.4         2.9         4.3         1.3
## 76          6.6         3.0         4.4         1.4
## 77          6.8         2.8         4.8         1.4
## 78          6.7         3.0         5.0         1.7
```

```
## 79          6.0         2.9         4.5         1.5
## 80          5.7         2.6         3.5         1.0
## 81          5.5         2.4         3.8         1.1
## 82          5.5         2.4         3.7         1.0
## 83          5.8         2.7         3.9         1.2
## 84          6.0         2.7         5.1         1.6
## 85          5.4         3.0         4.5         1.5
## 86          6.0         3.4         4.5         1.6
## 87          6.7         3.1         4.7         1.5
## 88          6.3         2.3         4.4         1.3
## 89          5.6         3.0         4.1         1.3
## 90          5.5         2.5         4.0         1.3
## 91          5.5         2.6         4.4         1.2
## 92          6.1         3.0         4.6         1.4
## 93          5.8         2.6         4.0         1.2
## 94          5.0         2.3         3.3         1.0
## 95          5.6         2.7         4.2         1.3
## 96          5.7         3.0         4.2         1.2
## 97          5.7         2.9         4.2         1.3
## 98          6.2         2.9         4.3         1.3
## 99          5.1         2.5         3.0         1.1
## 100         5.7         2.8         4.1         1.3
## 101         6.3         3.3         6.0         2.5
## 102         5.8         2.7         5.1         1.9
## 103         7.1         3.0         5.9         2.1
## 104         6.3         2.9         5.6         1.8
## 105         6.5         3.0         5.8         2.2
## 106         7.6         3.0         6.6         2.1
## 107         4.9         2.5         4.5         1.7
## 108         7.3         2.9         6.3         1.8
## 109         6.7         2.5         5.8         1.8
## 110         7.2         3.6         6.1         2.5
## 111         6.5         3.2         5.1         2.0
## 112         6.4         2.7         5.3         1.9
## 113         6.8         3.0         5.5         2.1
## 114         5.7         2.5         5.0         2.0
## 115         5.8         2.8         5.1         2.4
## 116         6.4         3.2         5.3         2.3
## 117         6.5         3.0         5.5         1.8
## 118         7.7         3.8         6.7         2.2
## 119         7.7         2.6         6.9         2.3
## 120         6.0         2.2         5.0         1.5
## 121         6.9         3.2         5.7         2.3
## 122         5.6         2.8         4.9         2.0
## 123         7.7         2.8         6.7         2.0
## 124         6.3         2.7         4.9         1.8
## 125         6.7         3.3         5.7         2.1
## 126         7.2         3.2         6.0         1.8
## 127         6.2         2.8         4.8         1.8
## 128         6.1         3.0         4.9         1.8
## 129         6.4         2.8         5.6         2.1
## 130         7.2         3.0         5.8         1.6
## 131         7.4         2.8         6.1         1.9
## 132         7.9         3.8         6.4         2.0
```

```
## 133          6.4           2.8          5.6          2.2
## 134          6.3           2.8          5.1          1.5
## 135          6.1           2.6          5.6          1.4
## 136          7.7           3.0          6.1          2.3
## 137          6.3           3.4          5.6          2.4
## 138          6.4           3.1          5.5          1.8
## 139          6.0           3.0          4.8          1.8
## 140          6.9           3.1          5.4          2.1
## 141          6.7           3.1          5.6          2.4
## 142          6.9           3.1          5.1          2.3
## 143          5.8           2.7          5.1          1.9
## 144          6.8           3.2          5.9          2.3
## 145          6.7           3.3          5.7          2.5
## 146          6.7           3.0          5.2          2.3
## 147          6.3           2.5          5.0          1.9
## 148          6.5           3.0          5.2          2.0
## 149          6.2           3.4          5.4          2.3
## 150          5.9           3.0          5.1          1.8

##     Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
## 1            5.1           3.5          1.4          0.2
## 2            4.9           3.0          1.4          0.2
## 3            4.7           3.2          1.3          0.2
## 4            4.6           3.1          1.5          0.2
## 5            5.0           3.6          1.4          0.2
## 6            5.4           3.9          1.7          0.4
## 7            4.6           3.4          1.4          0.3
## 8            5.0           3.4          1.5          0.2
## 9            4.4           2.9          1.4          0.2
## 10           4.9           3.1          1.5          0.1
## 11           5.4           3.7          1.5          0.2
## 12           4.8           3.4          1.6          0.2
## 13           4.8           3.0          1.4          0.1
## 14           4.3           3.0          1.1          0.1
## 15           5.8           4.0          1.2          0.2
## 16           5.7           4.4          1.5          0.4
## 17           5.4           3.9          1.3          0.4
## 18           5.1           3.5          1.4          0.3
## 19           5.7           3.8          1.7          0.3
## 20           5.1           3.8          1.5          0.3
## 21           5.4           3.4          1.7          0.2
## 22           5.1           3.7          1.5          0.4
## 23           4.6           3.6          1.0          0.2
## 24           5.1           3.3          1.7          0.5
## 25           4.8           3.4          1.9          0.2
## 26           5.0           3.0          1.6          0.2
## 27           5.0           3.4          1.6          0.4
## 28           5.2           3.5          1.5          0.2
## 29           5.2           3.4          1.4          0.2
## 30           4.7           3.2          1.6          0.2
## 31           4.8           3.1          1.6          0.2
## 32           5.4           3.4          1.5          0.4
## 33           5.2           4.1          1.5          0.1
## 34           5.5           4.2          1.4          0.2
```

```
## 35          4.9         3.1          1.5          0.2
## 36          5.0         3.2          1.2          0.2
## 37          5.5         3.5          1.3          0.2
## 38          4.9         3.6          1.4          0.1
## 39          4.4         3.0          1.3          0.2
## 40          5.1         3.4          1.5          0.2
## 41          5.0         3.5          1.3          0.3
## 42          4.5         2.3          1.3          0.3
## 43          4.4         3.2          1.3          0.2
## 44          5.0         3.5          1.6          0.6
## 45          5.1         3.8          1.9          0.4
## 46          4.8         3.0          1.4          0.3
## 47          5.1         3.8          1.6          0.2
## 48          4.6         3.2          1.4          0.2
## 49          5.3         3.7          1.5          0.2
## 50          5.0         3.3          1.4          0.2
## 51          7.0         3.2          4.7          1.4
## 52          6.4         3.2          4.5          1.5
## 53          6.9         3.1          4.9          1.5
## 54          5.5         2.3          4.0          1.3
## 55          6.5         2.8          4.6          1.5
## 56          5.7         2.8          4.5          1.3
## 57          6.3         3.3          4.7          1.6
## 58          4.9         2.4          3.3          1.0
## 59          6.6         2.9          4.6          1.3
## 60          5.2         2.7          3.9          1.4
## 61          5.0         2.0          3.5          1.0
## 62          5.9         3.0          4.2          1.5
## 63          6.0         2.2          4.0          1.0
## 64          6.1         2.9          4.7          1.4
## 65          5.6         2.9          3.6          1.3
## 66          6.7         3.1          4.4          1.4
## 67          5.6         3.0          4.5          1.5
## 68          5.8         2.7          4.1          1.0
## 69          6.2         2.2          4.5          1.5
## 70          5.6         2.5          3.9          1.1
## 71          5.9         3.2          4.8          1.8
## 72          6.1         2.8          4.0          1.3
## 73          6.3         2.5          4.9          1.5
## 74          6.1         2.8          4.7          1.2
## 75          6.4         2.9          4.3          1.3
## 76          6.6         3.0          4.4          1.4
## 77          6.8         2.8          4.8          1.4
## 78          6.7         3.0          5.0          1.7
## 79          6.0         2.9          4.5          1.5
## 80          5.7         2.6          3.5          1.0
## 81          5.5         2.4          3.8          1.1
## 82          5.5         2.4          3.7          1.0
## 83          5.8         2.7          3.9          1.2
## 84          6.0         2.7          5.1          1.6
## 85          5.4         3.0          4.5          1.5
## 86          6.0         3.4          4.5          1.6
## 87          6.7         3.1          4.7          1.5
## 88          6.3         2.3          4.4          1.3
```

```
## 89          5.6         3.0         4.1         1.3
## 90          5.5         2.5         4.0         1.3
## 91          5.5         2.6         4.4         1.2
## 92          6.1         3.0         4.6         1.4
## 93          5.8         2.6         4.0         1.2
## 94          5.0         2.3         3.3         1.0
## 95          5.6         2.7         4.2         1.3
## 96          5.7         3.0         4.2         1.2
## 97          5.7         2.9         4.2         1.3
## 98          6.2         2.9         4.3         1.3
## 99          5.1         2.5         3.0         1.1
## 100         5.7         2.8         4.1         1.3
## 101         6.3         3.3         6.0         2.5
## 102         5.8         2.7         5.1         1.9
## 103         7.1         3.0         5.9         2.1
## 104         6.3         2.9         5.6         1.8
## 105         6.5         3.0         5.8         2.2
## 106         7.6         3.0         6.6         2.1
## 107         4.9         2.5         4.5         1.7
## 108         7.3         2.9         6.3         1.8
## 109         6.7         2.5         5.8         1.8
## 110         7.2         3.6         6.1         2.5
## 111         6.5         3.2         5.1         2.0
## 112         6.4         2.7         5.3         1.9
## 113         6.8         3.0         5.5         2.1
## 114         5.7         2.5         5.0         2.0
## 115         5.8         2.8         5.1         2.4
## 116         6.4         3.2         5.3         2.3
## 117         6.5         3.0         5.5         1.8
## 118         7.7         3.8         6.7         2.2
## 119         7.7         2.6         6.9         2.3
## 120         6.0         2.2         5.0         1.5
## 121         6.9         3.2         5.7         2.3
## 122         5.6         2.8         4.9         2.0
## 123         7.7         2.8         6.7         2.0
## 124         6.3         2.7         4.9         1.8
## 125         6.7         3.3         5.7         2.1
## 126         7.2         3.2         6.0         1.8
## 127         6.2         2.8         4.8         1.8
## 128         6.1         3.0         4.9         1.8
## 129         6.4         2.8         5.6         2.1
## 130         7.2         3.0         5.8         1.6
## 131         7.4         2.8         6.1         1.9
## 132         7.9         3.8         6.4         2.0
## 133         6.4         2.8         5.6         2.2
## 134         6.3         2.8         5.1         1.5
## 135         6.1         2.6         5.6         1.4
## 136         7.7         3.0         6.1         2.3
## 137         6.3         3.4         5.6         2.4
## 138         6.4         3.1         5.5         1.8
## 139         6.0         3.0         4.8         1.8
## 140         6.9         3.1         5.4         2.1
## 141         6.7         3.1         5.6         2.4
## 142         6.9         3.1         5.1         2.3
```

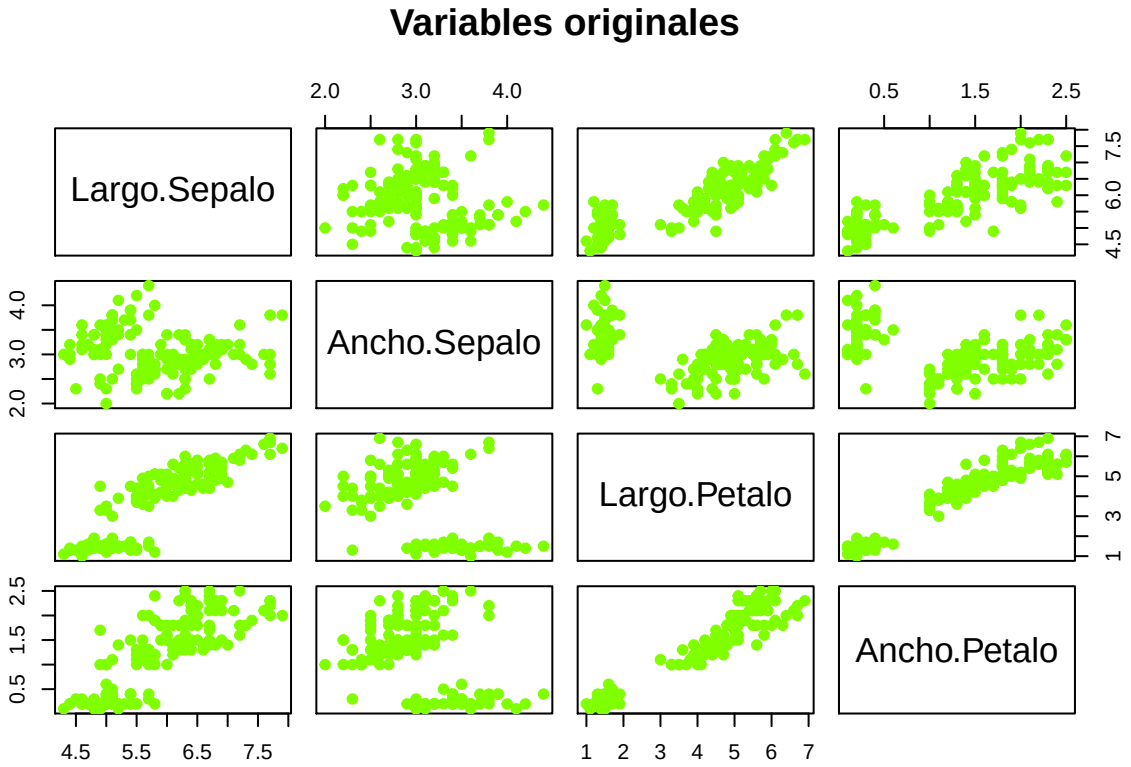
```
## 143          5.8          2.7          5.1          1.9
## 144          6.8          3.2          5.9          2.3
## 145          6.7          3.3          5.7          2.5
## 146          6.7          3.0          5.2          2.3
## 147          6.3          2.5          5.0          1.9
## 148          6.5          3.0          5.2          2.0
## 149          6.2          3.4          5.4          2.3
## 150          5.9          3.0          5.1          1.8
```

2.- Selección de las variables cuantitativas, solo una especie.

3.- Se definen n (numero de estados) y p (variables).

```
## [1] 150   4
```

4.- Generación de un scatterplot de las variables originales.



Observando el gráfico es posible apreciar que algunas variables como “ancho de sépalo” esta ligeramente correlaciona con la variables “largo pétalo” de igual manera el ancho de pétalo tiene una correlación positiva en base a el largo del pétalo en general la mayoría de las variables presenta una correlación positiva.

5.- Obtención de los componentes principales con base en la matriz de covarianza muestral.

```
## Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
##     5.843333     3.057333     3.758000     1.199333
```

```
##              Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
## Largo.Sepalo    0.6856935   -0.0424340    1.2743154    0.5162707
## Ancho.Sepalo   -0.0424340    0.1899794   -0.3296564   -0.1216394
## Largo.Petalo    1.2743154   -0.3296564    3.1162779    1.2956094
## Ancho.Petalo    0.5162707   -0.1216394    1.2956094    0.5810063
```

6.- Obtención de los componentes principales con base a la matriz de covarianza muestral.

```
## eigen() decomposition
## $values
## [1] 4.22824171 0.24267075 0.07820950 0.02383509
##
## $vectors
##             [,1]        [,2]        [,3]       [,4]
## [1,]  0.36138659 -0.65658877 -0.58202985  0.3154872
## [2,] -0.08452251 -0.73016143  0.59791083 -0.3197231
## [3,]  0.85667061  0.17337266  0.07623608 -0.4798390
## [4,]  0.35828920  0.07548102  0.54583143  0.7536574
```

7.- Matriz de auto-valores.

8.- Matriz de auto-vectores

Criterio #2 de la selección de componentes principales. Proporción de variabilidad para cada vector. Se busca encontrar la varianza acumulada para la selección de componentes.

```
## [1] 0.924618723 0.053066483 0.017102610 0.005212184
```

mus de variabilidad acumulada.

```
## [1] 0.9246187 0.9776852 0.9947878 1.0000000
```

Los valores obtenidos fueron: 0.9246187,0.9776852,0.9947878,1.0000000 por lo que escogeremos 0.9246187 para reducir la dimensión, aun así, este valor representa muy buena varianza.

Obtención de los componentes principales con base en la matriz de correlaciones muestrales

Matriz de correlaciones

```
## eigen() decomposition
## $values
```

```
## [1] 2.91849782 0.91403047 0.14675688 0.02071484
##
## $vectors
##            [,1]        [,2]       [,3]       [,4]
## [1,]  0.5210659 -0.37741762  0.7195664  0.2612863
## [2,] -0.2693474 -0.92329566 -0.2443818 -0.1235096
## [3,]  0.5804131 -0.02449161 -0.1421264 -0.8014492
## [4,]  0.5648565 -0.06694199 -0.6342727  0.5235971
```

Obtención de auto-valores

```
## [1] 2.91849782 0.91403047 0.14675688 0.02071484
```

Obtención de auto-vectores

```
##            [,1]        [,2]       [,3]       [,4]
## [1,]  0.5210659 -0.37741762  0.7195664  0.2612863
## [2,] -0.2693474 -0.92329566 -0.2443818 -0.1235096
## [3,]  0.5804131 -0.02449161 -0.1421264 -0.8014492
## [4,]  0.5648565 -0.06694199 -0.6342727  0.5235971
```

Proporción de variabilidad

```
## [1] 0.729624454 0.228507618 0.036689219 0.005178709
```

Proporción de variabilidad acumulada

```
## [1] 0.7296245 0.9581321 0.9948213 1.0000000
```

Los valores obtenidos fueron: 0.7296245,0.9581321,0.9948213,1.0000000. Lo que sugiere que solo se seleccione 0.7296245 con el fin de reducir la dimensión #2do criterio de selccion de componentes principales.

Media de los auto-valores

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

#La media obtenida es 1 lo cual significa que se cumple el 3er criterio

Obtención de los coeficientes (nuevas variables)

1.- Centrar los datos con respecto a la media

```
##       [,1]
```

```
##   [1,]    1
##   [2,]    1
##   [3,]    1
##   [4,]    1
##   [5,]    1
##   [6,]    1
##   [7,]    1
##   [8,]    1
##   [9,]    1
##  [10,]    1
##  [11,]    1
##  [12,]    1
##  [13,]    1
##  [14,]    1
##  [15,]    1
##  [16,]    1
##  [17,]    1
##  [18,]    1
##  [19,]    1
##  [20,]    1
##  [21,]    1
##  [22,]    1
##  [23,]    1
##  [24,]    1
##  [25,]    1
##  [26,]    1
##  [27,]    1
##  [28,]    1
##  [29,]    1
##  [30,]    1
##  [31,]    1
##  [32,]    1
##  [33,]    1
##  [34,]    1
##  [35,]    1
##  [36,]    1
##  [37,]    1
##  [38,]    1
##  [39,]    1
##  [40,]    1
##  [41,]    1
##  [42,]    1
##  [43,]    1
##  [44,]    1
##  [45,]    1
##  [46,]    1
##  [47,]    1
##  [48,]    1
##  [49,]    1
##  [50,]    1
##  [51,]    1
##  [52,]    1
##  [53,]    1
##  [54,]    1
```

```
##  [55,]    1
##  [56,]    1
##  [57,]    1
##  [58,]    1
##  [59,]    1
##  [60,]    1
##  [61,]    1
##  [62,]    1
##  [63,]    1
##  [64,]    1
##  [65,]    1
##  [66,]    1
##  [67,]    1
##  [68,]    1
##  [69,]    1
##  [70,]    1
##  [71,]    1
##  [72,]    1
##  [73,]    1
##  [74,]    1
##  [75,]    1
##  [76,]    1
##  [77,]    1
##  [78,]    1
##  [79,]    1
##  [80,]    1
##  [81,]    1
##  [82,]    1
##  [83,]    1
##  [84,]    1
##  [85,]    1
##  [86,]    1
##  [87,]    1
##  [88,]    1
##  [89,]    1
##  [90,]    1
##  [91,]    1
##  [92,]    1
##  [93,]    1
##  [94,]    1
##  [95,]    1
##  [96,]    1
##  [97,]    1
##  [98,]    1
##  [99,]    1
## [100,]    1
## [101,]    1
## [102,]    1
## [103,]    1
## [104,]    1
## [105,]    1
## [106,]    1
## [107,]    1
## [108,]    1
```

```
## [109,]    1
## [110,]    1
## [111,]    1
## [112,]    1
## [113,]    1
## [114,]    1
## [115,]    1
## [116,]    1
## [117,]    1
## [118,]    1
## [119,]    1
## [120,]    1
## [121,]    1
## [122,]    1
## [123,]    1
## [124,]    1
## [125,]    1
## [126,]    1
## [127,]    1
## [128,]    1
## [129,]    1
## [130,]    1
## [131,]    1
## [132,]    1
## [133,]    1
## [134,]    1
## [135,]    1
## [136,]    1
## [137,]    1
## [138,]    1
## [139,]    1
## [140,]    1
## [141,]    1
## [142,]    1
## [143,]    1
## [144,]    1
## [145,]    1
## [146,]    1
## [147,]    1
## [148,]    1
## [149,]    1
## [150,]    1
```

```
##     Largo.Sepalo Ancho.Sepalo Largo.Petalo  Ancho.Petalo
## 1    -0.74333333   0.44266667       -2.358 -0.9993333333
## 2    -0.94333333  -0.05733333       -2.358 -0.9993333333
## 3    -1.14333333   0.14266667       -2.458 -0.9993333333
## 4    -1.24333333   0.04266667       -2.258 -0.9993333333
## 5    -0.84333333   0.54266667       -2.358 -0.9993333333
## 6    -0.44333333   0.84266667       -2.058 -0.7993333333
## 7    -1.24333333   0.34266667       -2.358 -0.8993333333
## 8    -0.84333333   0.34266667       -2.258 -0.9993333333
## 9    -1.44333333  -0.15733333       -2.358 -0.9993333333
## 10   -0.94333333   0.04266667       -2.258 -1.0993333333
```

```
## 11   -0.44333333   0.64266667       -2.258 -0.9993333333
## 12   -1.04333333   0.34266667       -2.158 -0.9993333333
## 13   -1.04333333  -0.05733333       -2.358 -1.0993333333
## 14   -1.54333333  -0.05733333       -2.658 -1.0993333333
## 15   -0.04333333   0.94266667       -2.558 -0.9993333333
## 16   -0.14333333   1.34266667       -2.258 -0.7993333333
## 17   -0.44333333   0.84266667       -2.458 -0.7993333333
## 18   -0.74333333   0.44266667       -2.358 -0.8993333333
## 19   -0.14333333   0.74266667       -2.058 -0.8993333333
## 20   -0.74333333   0.74266667       -2.258 -0.8993333333
## 21   -0.44333333   0.34266667       -2.058 -0.9993333333
## 22   -0.74333333   0.64266667       -2.258 -0.7993333333
## 23   -1.24333333   0.54266667       -2.758 -0.9993333333
## 24   -0.74333333   0.24266667       -2.058 -0.6993333333
## 25   -1.04333333   0.34266667       -1.858 -0.9993333333
## 26   -0.84333333  -0.05733333       -2.158 -0.9993333333
## 27   -0.84333333   0.34266667       -2.158 -0.7993333333
## 28   -0.64333333   0.44266667       -2.258 -0.9993333333
## 29   -0.64333333   0.34266667       -2.358 -0.9993333333
## 30   -1.14333333   0.14266667       -2.158 -0.9993333333
## 31   -1.04333333   0.04266667       -2.158 -0.9993333333
## 32   -0.44333333   0.34266667       -2.258 -0.7993333333
## 33   -0.64333333   1.04266667       -2.258 -1.0993333333
## 34   -0.34333333   1.14266667       -2.358 -0.9993333333
## 35   -0.94333333   0.04266667       -2.258 -0.9993333333
## 36   -0.84333333   0.14266667       -2.558 -0.9993333333
## 37   -0.34333333   0.44266667       -2.458 -0.9993333333
## 38   -0.94333333   0.54266667       -2.358 -1.0993333333
## 39   -1.44333333  -0.05733333       -2.458 -0.9993333333
## 40   -0.74333333   0.34266667       -2.258 -0.9993333333
## 41   -0.84333333   0.44266667       -2.458 -0.8993333333
## 42   -1.34333333  -0.75733333       -2.458 -0.8993333333
## 43   -1.44333333   0.14266667       -2.458 -0.9993333333
## 44   -0.84333333   0.44266667       -2.158 -0.5993333333
## 45   -0.74333333   0.74266667       -1.858 -0.7993333333
## 46   -1.04333333  -0.05733333       -2.358 -0.8993333333
## 47   -0.74333333   0.74266667       -2.158 -0.9993333333
## 48   -1.24333333   0.14266667       -2.358 -0.9993333333
## 49   -0.54333333   0.64266667       -2.258 -0.9993333333
## 50   -0.84333333   0.24266667       -2.358 -0.9993333333
## 51    1.15666667   0.14266667        0.942  0.2006666667
## 52    0.55666667   0.14266667        0.742  0.3006666667
## 53    1.05666667   0.04266667        1.142  0.3006666667
## 54   -0.34333333  -0.75733333        0.242  0.1006666667
## 55    0.65666667  -0.25733333        0.842  0.3006666667
## 56   -0.14333333  -0.25733333        0.742  0.1006666667
## 57    0.45666667   0.24266667        0.942  0.4006666667
## 58   -0.94333333  -0.65733333       -0.458 -0.1993333333
## 59    0.75666667  -0.15733333        0.842  0.1006666667
## 60   -0.64333333  -0.35733333        0.142  0.2006666667
## 61   -0.84333333  -1.05733333       -0.258 -0.1993333333
## 62    0.05666667  -0.05733333        0.442  0.3006666667
## 63    0.15666667  -0.85733333        0.242 -0.1993333333
## 64    0.25666667  -0.15733333        0.942  0.2006666667
```

```
## 65   -0.24333333  -0.15733333       -0.158  0.1006666667
## 66    0.85666667   0.04266667        0.642  0.2006666667
## 67   -0.24333333  -0.05733333        0.742  0.3006666667
## 68   -0.04333333  -0.35733333        0.342 -0.1993333333
## 69    0.35666667  -0.85733333        0.742  0.3006666667
## 70   -0.24333333  -0.55733333        0.142 -0.0993333333
## 71    0.05666667   0.14266667        1.042  0.6006666667
## 72    0.25666667  -0.25733333        0.242  0.1006666667
## 73    0.45666667  -0.55733333        1.142  0.3006666667
## 74    0.25666667  -0.25733333        0.942  0.0006666667
## 75    0.55666667  -0.15733333        0.542  0.1006666667
## 76    0.75666667  -0.05733333        0.642  0.2006666667
## 77    0.95666667  -0.25733333        1.042  0.2006666667
## 78    0.85666667  -0.05733333        1.242  0.5006666667
## 79    0.15666667  -0.15733333        0.742  0.3006666667
## 80   -0.14333333  -0.45733333       -0.258 -0.1993333333
## 81   -0.34333333  -0.65733333        0.042 -0.0993333333
## 82   -0.34333333  -0.65733333       -0.058 -0.1993333333
## 83   -0.04333333  -0.35733333        0.142  0.0006666667
## 84    0.15666667  -0.35733333        1.342  0.4006666667
## 85   -0.44333333  -0.05733333        0.742  0.3006666667
## 86    0.15666667   0.34266667        0.742  0.4006666667
## 87    0.85666667   0.04266667        0.942  0.3006666667
## 88    0.45666667  -0.75733333        0.642  0.1006666667
## 89   -0.24333333  -0.05733333        0.342  0.1006666667
## 90   -0.34333333  -0.55733333        0.242  0.1006666667
## 91   -0.34333333  -0.45733333        0.642  0.0006666667
## 92    0.25666667  -0.05733333        0.842  0.2006666667
## 93   -0.04333333  -0.45733333        0.242  0.0006666667
## 94   -0.84333333  -0.75733333       -0.458 -0.1993333333
## 95   -0.24333333  -0.35733333        0.442  0.1006666667
## 96   -0.14333333  -0.05733333        0.442  0.0006666667
## 97   -0.14333333  -0.15733333        0.442  0.1006666667
## 98    0.35666667  -0.15733333        0.542  0.1006666667
## 99   -0.74333333  -0.55733333       -0.758 -0.0993333333
## 100  -0.14333333  -0.25733333        0.342  0.1006666667
## 101   0.45666667   0.24266667        2.242  1.3006666667
## 102  -0.04333333  -0.35733333        1.342  0.7006666667
## 103   1.25666667  -0.05733333        2.142  0.9006666667
## 104   0.45666667  -0.15733333        1.842  0.6006666667
## 105   0.65666667  -0.05733333        2.042  1.0006666667
## 106   1.75666667  -0.05733333        2.842  0.9006666667
## 107  -0.94333333  -0.55733333        0.742  0.5006666667
## 108   1.45666667  -0.15733333        2.542  0.6006666667
## 109   0.85666667  -0.55733333        2.042  0.6006666667
## 110   1.35666667   0.54266667        2.342  1.3006666667
## 111   0.65666667   0.14266667        1.342  0.8006666667
## 112   0.55666667  -0.35733333        1.542  0.7006666667
## 113   0.95666667  -0.05733333        1.742  0.9006666667
## 114  -0.14333333  -0.55733333        1.242  0.8006666667
## 115  -0.04333333  -0.25733333        1.342  1.2006666667
## 116   0.55666667   0.14266667        1.542  1.1006666667
## 117   0.65666667  -0.05733333        1.742  0.6006666667
## 118   1.85666667   0.74266667        2.942  1.0006666667
```

```
## 119   1.85666667  -0.45733333        3.142  1.1006666667
## 120   0.15666667  -0.85733333        1.242  0.3006666667
## 121   1.05666667   0.14266667        1.942  1.1006666667
## 122  -0.24333333  -0.25733333        1.142  0.8006666667
## 123   1.85666667  -0.25733333        2.942  0.8006666667
## 124   0.45666667  -0.35733333        1.142  0.6006666667
## 125   0.85666667   0.24266667        1.942  0.9006666667
## 126   1.35666667   0.14266667        2.242  0.6006666667
## 127   0.35666667  -0.25733333        1.042  0.6006666667
## 128   0.25666667  -0.05733333        1.142  0.6006666667
## 129   0.55666667  -0.25733333        1.842  0.9006666667
## 130   1.35666667  -0.05733333        2.042  0.4006666667
## 131   1.55666667  -0.25733333        2.342  0.7006666667
## 132   2.05666667   0.74266667        2.642  0.8006666667
## 133   0.55666667  -0.25733333        1.842  1.0006666667
## 134   0.45666667  -0.25733333        1.342  0.3006666667
## 135   0.25666667  -0.45733333        1.842  0.2006666667
## 136   1.85666667  -0.05733333        2.342  1.1006666667
## 137   0.45666667   0.34266667        1.842  1.2006666667
## 138   0.55666667   0.04266667        1.742  0.6006666667
## 139   0.15666667  -0.05733333        1.042  0.6006666667
## 140   1.05666667   0.04266667        1.642  0.9006666667
## 141   0.85666667   0.04266667        1.842  1.2006666667
## 142   1.05666667   0.04266667        1.342  1.1006666667
## 143  -0.04333333  -0.35733333        1.342  0.7006666667
## 144   0.95666667   0.14266667        2.142  1.1006666667
## 145   0.85666667   0.24266667        1.942  1.3006666667
## 146   0.85666667  -0.05733333        1.442  1.1006666667
## 147   0.45666667  -0.55733333        1.242  0.7006666667
## 148   0.65666667  -0.05733333        1.442  0.8006666667
## 149   0.35666667   0.34266667        1.642  1.1006666667
## 150   0.05666667  -0.05733333        1.342  0.6006666667
```

3.- Construcción de la matriz diagonal de las varianzas

```
##           [,1]      [,2]     [,3]      [,4]
## [1,] 0.6856935 0.0000000 0.000000 0.0000000
## [2,] 0.0000000 0.1899794 0.000000 0.0000000
## [3,] 0.0000000 0.0000000 3.116278 0.0000000
## [4,] 0.0000000 0.0000000 0.000000 0.5810063
```

4.- Construcción de la matriz centrada multiplicada por $Dx^{\frac{1}{2}}$

```
##            [,1]        [,2]        [,3]          [,4]
## 1   -0.89767388  1.01560199 -1.33575163 -1.3110521482
## 2   -1.13920048 -0.13153881 -1.33575163 -1.3110521482
## 3   -1.38072709  0.32731751 -1.39239929 -1.3110521482
## 4   -1.50149039  0.09788935 -1.27910398 -1.3110521482
## 5   -1.01843718  1.24503015 -1.33575163 -1.3110521482
## 6   -0.53538397  1.93331463 -1.16580868 -1.0486667950
## 7   -1.50149039  0.78617383 -1.33575163 -1.1798594716
```

```
## 8   -1.01843718  0.78617383 -1.27910398 -1.3110521482
## 9   -1.74301699 -0.36096697 -1.33575163 -1.3110521482
## 10  -1.13920048  0.09788935 -1.27910398 -1.4422448248
## 11  -0.53538397  1.47445831 -1.27910398 -1.3110521482
## 12  -1.25996379  0.78617383 -1.22245633 -1.3110521482
## 13  -1.25996379 -0.13153881 -1.33575163 -1.4422448248
## 14  -1.86378030 -0.13153881 -1.50569459 -1.4422448248
## 15  -0.05233076  2.16274279 -1.44904694 -1.3110521482
## 16  -0.17309407  3.08045544 -1.27910398 -1.0486667950
## 17  -0.53538397  1.93331463 -1.39239929 -1.0486667950
## 18  -0.89767388  1.01560199 -1.33575163 -1.1798594716
## 19  -0.17309407  1.70388647 -1.16580868 -1.1798594716
## 20  -0.89767388  1.70388647 -1.27910398 -1.1798594716
## 21  -0.53538397  0.78617383 -1.16580868 -1.3110521482
## 22  -0.89767388  1.47445831 -1.27910398 -1.0486667950
## 23  -1.50149039  1.24503015 -1.56234224 -1.3110521482
## 24  -0.89767388  0.55674567 -1.16580868 -0.9174741184
## 25  -1.25996379  0.78617383 -1.05251337 -1.3110521482
## 26  -1.01843718 -0.13153881 -1.22245633 -1.3110521482
## 27  -1.01843718  0.78617383 -1.22245633 -1.0486667950
## 28  -0.77691058  1.01560199 -1.27910398 -1.3110521482
## 29  -0.77691058  0.78617383 -1.33575163 -1.3110521482
## 30  -1.38072709  0.32731751 -1.22245633 -1.3110521482
## 31  -1.25996379  0.09788935 -1.22245633 -1.3110521482
## 32  -0.53538397  0.78617383 -1.27910398 -1.0486667950
## 33  -0.77691058  2.39217095 -1.27910398 -1.4422448248
## 34  -0.41462067  2.62159911 -1.33575163 -1.3110521482
## 35  -1.13920048  0.09788935 -1.27910398 -1.3110521482
## 36  -1.01843718  0.32731751 -1.44904694 -1.3110521482
## 37  -0.41462067  1.01560199 -1.39239929 -1.3110521482
## 38  -1.13920048  1.24503015 -1.33575163 -1.4422448248
## 39  -1.74301699 -0.13153881 -1.39239929 -1.3110521482
## 40  -0.89767388  0.78617383 -1.27910398 -1.3110521482
## 41  -1.01843718  1.01560199 -1.39239929 -1.1798594716
## 42  -1.62225369 -1.73753594 -1.39239929 -1.1798594716
## 43  -1.74301699  0.32731751 -1.39239929 -1.3110521482
## 44  -1.01843718  1.01560199 -1.22245633 -0.7862814418
## 45  -0.89767388  1.70388647 -1.05251337 -1.0486667950
## 46  -1.25996379 -0.13153881 -1.33575163 -1.1798594716
## 47  -0.89767388  1.70388647 -1.22245633 -1.3110521482
## 48  -1.50149039  0.32731751 -1.33575163 -1.3110521482
## 49  -0.65614727  1.47445831 -1.27910398 -1.3110521482
## 50  -1.01843718  0.55674567 -1.33575163 -1.3110521482
## 51   1.39682886  0.32731751  0.53362088  0.2632599711
## 52   0.67224905  0.32731751  0.42032558  0.3944526477
## 53   1.27606556  0.09788935  0.64691619  0.3944526477
## 54  -0.41462067 -1.73753594  0.13708732  0.1320672944
## 55   0.79301235 -0.59039513  0.47697323  0.3944526477
## 56  -0.17309407 -0.59039513  0.42032558  0.1320672944
## 57   0.55148575  0.55674567  0.53362088  0.5256453243
## 58  -1.13920048 -1.50810778 -0.25944625 -0.2615107354
## 59   0.91377565 -0.36096697  0.47697323  0.1320672944
## 60  -0.77691058 -0.81982329  0.08043967  0.2632599711
## 61  -1.01843718 -2.42582042 -0.14615094 -0.2615107354
```

```
## 62   0.06843254 -0.13153881  0.25038262  0.3944526477
## 63   0.18919584 -1.96696410  0.13708732 -0.2615107354
## 64   0.30995914 -0.36096697  0.53362088  0.2632599711
## 65  -0.29385737 -0.36096697 -0.08950329  0.1320672944
## 66   1.03453895  0.09788935  0.36367793  0.2632599711
## 67  -0.29385737 -0.13153881  0.42032558  0.3944526477
## 68  -0.05233076 -0.81982329  0.19373497 -0.2615107354
## 69   0.43072244 -1.96696410  0.42032558  0.3944526477
## 70  -0.29385737 -1.27867961  0.08043967 -0.1303180588
## 71   0.06843254  0.32731751  0.59026853  0.7880306775
## 72   0.30995914 -0.59039513  0.13708732  0.1320672944
## 73   0.55148575 -1.27867961  0.64691619  0.3944526477
## 74   0.30995914 -0.59039513  0.53362088  0.0008746178
## 75   0.67224905 -0.36096697  0.30703027  0.1320672944
## 76   0.91377565 -0.13153881  0.36367793  0.2632599711
## 77   1.15530226 -0.59039513  0.59026853  0.2632599711
## 78   1.03453895 -0.13153881  0.70356384  0.6568380009
## 79   0.18919584 -0.36096697  0.42032558  0.3944526477
## 80  -0.17309407 -1.04925145 -0.14615094 -0.2615107354
## 81  -0.41462067 -1.50810778  0.02379201 -0.1303180588
## 82  -0.41462067 -1.50810778 -0.03285564 -0.2615107354
## 83  -0.05233076 -0.81982329  0.08043967  0.0008746178
## 84   0.18919584 -0.81982329  0.76021149  0.5256453243
## 85  -0.53538397 -0.13153881  0.42032558  0.3944526477
## 86   0.18919584  0.78617383  0.42032558  0.5256453243
## 87   1.03453895  0.09788935  0.53362088  0.3944526477
## 88   0.55148575 -1.73753594  0.36367793  0.1320672944
## 89  -0.29385737 -0.13153881  0.19373497  0.1320672944
## 90  -0.41462067 -1.27867961  0.13708732  0.1320672944
## 91  -0.41462067 -1.04925145  0.36367793  0.0008746178
## 92   0.30995914 -0.13153881  0.47697323  0.2632599711
## 93  -0.05233076 -1.04925145  0.13708732  0.0008746178
## 94  -1.01843718 -1.73753594 -0.25944625 -0.2615107354
## 95  -0.29385737 -0.81982329  0.25038262  0.1320672944
## 96  -0.17309407 -0.13153881  0.25038262  0.0008746178
## 97  -0.17309407 -0.36096697  0.25038262  0.1320672944
## 98   0.43072244 -0.36096697  0.30703027  0.1320672944
## 99  -0.89767388 -1.27867961 -0.42938920 -0.1303180588
## 100 -0.17309407 -0.59039513  0.19373497  0.1320672944
## 101  0.55148575  0.55674567  1.27004036  1.7063794137
## 102 -0.05233076 -0.81982329  0.76021149  0.9192233541
## 103  1.51759216 -0.13153881  1.21339271  1.1816087073
## 104  0.55148575 -0.36096697  1.04344975  0.7880306775
## 105  0.79301235 -0.13153881  1.15674505  1.3128013839
## 106  2.12140867 -0.13153881  1.60992627  1.1816087073
## 107 -1.13920048 -1.27867961  0.42032558  0.6568380009
## 108  1.75911877 -0.36096697  1.43998331  0.7880306775
## 109  1.03453895 -1.27867961  1.15674505  0.7880306775
## 110  1.63835547  1.24503015  1.32668801  1.7063794137
## 111  0.79301235  0.32731751  0.76021149  1.0504160307
## 112  0.67224905 -0.81982329  0.87350679  0.9192233541
## 113  1.15530226 -0.13153881  0.98680210  1.1816087073
## 114 -0.17309407 -1.27867961  0.70356384  1.0504160307
## 115 -0.05233076 -0.59039513  0.76021149  1.5751867371
```

```
## 116  0.67224905  0.32731751  0.87350679  1.4439940605
## 117  0.79301235 -0.13153881  0.98680210  0.7880306775
## 118  2.24217198  1.70388647  1.66657392  1.3128013839
## 119  2.24217198 -1.04925145  1.77986923  1.4439940605
## 120  0.18919584 -1.96696410  0.70356384  0.3944526477
## 121  1.27606556  0.32731751  1.10009740  1.4439940605
## 122 -0.29385737 -0.59039513  0.64691619  1.0504160307
## 123  2.24217198 -0.59039513  1.66657392  1.0504160307
## 124  0.55148575 -0.81982329  0.64691619  0.7880306775
## 125  1.03453895  0.55674567  1.10009740  1.1816087073
## 126  1.63835547  0.32731751  1.27004036  0.7880306775
## 127  0.43072244 -0.59039513  0.59026853  0.7880306775
## 128  0.30995914 -0.13153881  0.64691619  0.7880306775
## 129  0.67224905 -0.59039513  1.04344975  1.1816087073
## 130  1.63835547 -0.13153881  1.15674505  0.5256453243
## 131  1.87988207 -0.59039513  1.32668801  0.9192233541
## 132  2.48369858  1.70388647  1.49663097  1.0504160307
## 133  0.67224905 -0.59039513  1.04344975  1.3128013839
## 134  0.55148575 -0.59039513  0.76021149  0.3944526477
## 135  0.30995914 -1.04925145  1.04344975  0.2632599711
## 136  2.24217198 -0.13153881  1.32668801  1.4439940605
## 137  0.55148575  0.78617383  1.04344975  1.5751867371
## 138  0.67224905  0.09788935  0.98680210  0.7880306775
## 139  0.18919584 -0.13153881  0.59026853  0.7880306775
## 140  1.27606556  0.09788935  0.93015445  1.1816087073
## 141  1.03453895  0.09788935  1.04344975  1.5751867371
## 142  1.27606556  0.09788935  0.76021149  1.4439940605
## 143 -0.05233076 -0.81982329  0.76021149  0.9192233541
## 144  1.15530226  0.32731751  1.21339271  1.4439940605
## 145  1.03453895  0.55674567  1.10009740  1.7063794137
## 146  1.03453895 -0.13153881  0.81685914  1.4439940605
## 147  0.55148575 -1.27867961  0.70356384  0.9192233541
## 148  0.79301235 -0.13153881  0.81685914  1.0504160307
## 149  0.43072244  0.78617383  0.93015445  1.4439940605
## 150  0.06843254 -0.13153881  0.76021149  0.7880306775
```

5.- Construcción de los coeficientes o scores.

```
##            [,1]         [,2]         [,3]         [,4]
## 1   -2.25714118 -0.478423832  0.127279624  0.024087508
## 2   -2.07401302  0.671882687  0.233825517  0.102662845
## 3   -2.35633511  0.340766425 -0.044053900  0.028282305
## 4   -2.29170679  0.595399863 -0.090985297 -0.065735340
## 5   -2.38186270 -0.644675659 -0.015685647 -0.035802870
## 6   -2.06870061 -1.484205297 -0.026878250  0.006586116
## 7   -2.43586845 -0.047485118 -0.334350297 -0.036652767
## 8   -2.22539189 -0.222403002  0.088399352 -0.024529919
## 9   -2.32684533  1.111603700 -0.144592465 -0.026769540
## 10  -2.17703491  0.467447569  0.252918268 -0.039766068
## 11  -2.15907699 -1.040205867  0.267784001  0.016675503
## 12  -2.31836413 -0.132633999 -0.093446191 -0.133037725
## 13  -2.21104370  0.726243183  0.230140246  0.002416941
## 14  -2.62430902  0.958296347 -0.180192423 -0.019151375
```

```
## 15  -2.19139921 -1.853846555  0.471322025  0.194081578
## 16  -2.25466121 -2.677315230 -0.030424684  0.050365010
## 17  -2.20021676 -1.478655729  0.005326251  0.188186988
## 18  -2.18303613 -0.487206131  0.044067686  0.092779618
## 19  -1.89223284 -1.400327567  0.373093377  0.060891973
## 20  -2.33554476 -1.124083597 -0.132187626 -0.037630354
## 21  -1.90793125 -0.407490576  0.419885937  0.010884821
## 22  -2.19964383 -0.921035871 -0.159331502  0.059398340
## 23  -2.76508142 -0.456813301 -0.331069982  0.019582826
## 24  -1.81259716 -0.085272854 -0.034373442  0.150636353
## 25  -2.21972701 -0.136796175 -0.117599566 -0.269238379
## 26  -1.94532930  0.623529705  0.304620475  0.043416203
## 27  -2.04430277 -0.241354991 -0.086075649  0.067454082
## 28  -2.16133650 -0.525389422  0.206125707  0.010241084
## 29  -2.13241965 -0.312172005  0.270244895  0.083977887
## 30  -2.25769799  0.336604248 -0.068207276 -0.107918349
## 31  -2.13297647  0.502856075  0.074757996 -0.048027970
## 32  -1.82547925 -0.422280389  0.269564311  0.239069476
## 33  -2.60621687 -1.787587272 -0.047070727 -0.228470534
## 34  -2.43800983 -2.143546796  0.082392024 -0.048053409
## 35  -2.10292986  0.458665270  0.169706329  0.028926042
## 36  -2.20043723  0.205419224  0.224688852  0.168343905
## 37  -2.03831765 -0.659349230  0.482919584  0.195702902
## 38  -2.51889339 -0.590315163 -0.019370918 -0.136048774
## 39  -2.42152026  0.901161067 -0.192609402 -0.009705907
## 40  -2.16246625 -0.267981199  0.175296561  0.007023875
## 41  -2.27884081 -0.440240541 -0.034778398  0.106626042
## 42  -1.85191836  2.329610745  0.203552303  0.288896090
## 43  -2.54511203  0.477501017 -0.304745527 -0.066379077
## 44  -1.95788857 -0.470749613 -0.308567588  0.176501717
## 45  -2.12992356 -1.138415464 -0.247604064 -0.150539117
## 46  -2.06283361  0.708678586  0.063716370  0.139801160
## 47  -2.37677076 -1.116688691 -0.057026813 -0.151722682
## 48  -2.38638171  0.384957230 -0.139002234 -0.048671707
## 49  -2.22200263 -0.994627669  0.180886792 -0.014878291
## 50  -2.19647504 -0.009185585  0.152518539  0.049206884
## 51   1.09810244 -0.860091033  0.682300393  0.034717469
## 52   0.72889556 -0.592629362  0.093807452  0.004887251
## 53   1.23683580 -0.614239894  0.552157058  0.009391933
## 54   0.40612251  1.748546197  0.023024633  0.065549239
## 55   1.07188379  0.207725147  0.396925784  0.104387166
## 56   0.38738955  0.591302717 -0.123776885 -0.240027187
## 57   0.74403715 -0.770438272 -0.148472007 -0.077111455
## 58  -0.48569562  1.846243998 -0.248432992 -0.040384912
## 59   0.92480346 -0.032118478  0.594178807 -0.029779844
## 60   0.01138804  1.030565784 -0.537100055 -0.028366154
## 61  -0.10982834  2.645211115  0.046634215  0.013714785
## 62   0.43922201  0.063083852 -0.204389093  0.039992104
## 63   0.56023148  1.758832129  0.763214554  0.045578465
## 64   0.71715934  0.185602819  0.068429700 -0.164256922
## 65  -0.03324333  0.437537419 -0.194282030  0.108684396
## 66   0.87248429 -0.507364239  0.501830204  0.104593326
## 67   0.34908221  0.195656268 -0.489234095 -0.190869932
## 68   0.15827980  0.789451008  0.301028700 -0.204612265
```

```
## 69   1.22100316  1.616827281  0.480693656  0.225145511
## 70   0.16436725  1.298259939  0.172260719 -0.051554138
## 71   0.73521959 -0.395247446 -0.614467782 -0.083006045
## 72   0.47469691  0.415926887  0.264067576  0.113189079
## 73   1.23005729  0.930209441  0.367182178 -0.009911322
## 74   0.63074514  0.414997441  0.290921638 -0.273304557
## 75   0.70031506  0.063200094  0.444537765  0.043313222
## 76   0.87135454 -0.249956017  0.471001057  0.101376117
## 77   1.25231375  0.076998069  0.724727099  0.039556002
## 78   1.35386953 -0.330205463  0.259955701  0.066604931
## 79   0.66258066  0.225173502 -0.085577197 -0.036318171
## 80  -0.04012419  1.055183583  0.318506304  0.064571834
## 81   0.13035846  1.557055553  0.149482697 -0.009371129
## 82   0.02337438  1.567225244  0.240745761 -0.032663020
## 83   0.24073180  0.774661195  0.150707074  0.023572390
## 84   1.05755171  0.631726901 -0.104959762 -0.183354200
## 85   0.22323093  0.286812663 -0.663028512 -0.253977520
## 86   0.42770626 -0.842758920 -0.449129446 -0.109308985
## 87   1.04522645 -0.520308714  0.394464890  0.037084781
## 88   1.04104379  1.378371048  0.685997804  0.136378719
## 89   0.06935597  0.218770433 -0.290605718 -0.146653279
## 90   0.28253073  1.324886147 -0.089111491  0.008876070
## 91   0.27814596  1.116288852 -0.094172116 -0.269753497
## 92   0.62248441 -0.024839814  0.020412763 -0.147193289
## 93   0.33540673  0.985103828  0.198724011  0.006508757
## 94  -0.36097409  2.012495825 -0.105467721  0.019505467
## 95   0.28762268  0.852873116 -0.130452657 -0.107043742
## 96   0.09105561  0.180587142 -0.128547696 -0.229191812
## 97   0.22695654  0.383634868 -0.155691572 -0.132163118
## 98   0.57446378  0.154356489  0.270743347 -0.019794366
## 99  -0.44617230  1.538637456 -0.189765199  0.199278855
## 100  0.25587339  0.596852285 -0.091572385 -0.058426315
## 101  1.83841002 -0.867515056 -1.002044077 -0.049085303
## 102  1.15401555  0.696536401 -0.528389994 -0.040385459
## 103  2.19790361 -0.560133976  0.202236658  0.058986583
## 104  1.43534213  0.046830701 -0.163083761 -0.234982858
## 105  1.86157577 -0.294059697 -0.394307408 -0.016243853
## 106  2.74268509 -0.797736709  0.580364827 -0.101045973
## 107  0.36579225  1.556289178 -0.983598122 -0.132679346
## 108  2.29475181 -0.418663020  0.649530452 -0.237246445
## 109  1.99998633  0.709063226  0.392675073 -0.086221779
## 110  2.25223216 -1.914596301 -0.396224508  0.104488870
## 111  1.35962064 -0.690443405 -0.283661780  0.107500284
## 112  1.59732747  0.420292431 -0.023108991  0.058136869
## 113  1.87761053 -0.417849815 -0.026250468  0.145926073
## 114  1.25590769  1.158379741 -0.578311891  0.098826244
## 115  1.46274487  0.440794883 -1.000517746  0.274738504
## 116  1.58476820 -0.673986887 -0.636297054  0.191222383
## 117  1.46651849 -0.254768327 -0.037306280 -0.154811637
## 118  2.41822770 -2.548124795  0.127454475 -0.272892966
## 119  3.29964148 -0.017721580  0.700957033  0.045037725
## 120  1.25954707  1.701046715  0.266643612 -0.064963167
## 121  2.03091256 -0.907427443 -0.234015510  0.167390481
## 122  0.97471535  0.569855257 -0.825362161  0.027662914
```

```
## 123  2.88797650 -0.412259950  0.854558973 -0.126911337
## 124  1.32878064  0.480202496  0.005410239  0.139491837
## 125  1.69505530 -1.010536476 -0.297454114 -0.061437911
## 126  1.94780139 -1.004412720  0.418582432 -0.217609339
## 127  1.17118007  0.315338060 -0.129503907  0.125001677
## 128  1.01754169 -0.064131184 -0.336588365 -0.008625505
## 129  1.78237879  0.186735633 -0.269754304  0.030983849
## 130  1.85742501 -0.560413289  0.713244682 -0.207519953
## 131  2.42782030 -0.258418706  0.725386035 -0.017863520
## 132  2.29723178 -2.617554417  0.491826144 -0.210968943
## 133  1.85648383  0.177953334 -0.352966242  0.099675959
## 134  1.11042770  0.291944582  0.182875741 -0.185721512
## 135  1.19845835  0.808606364  0.164173760 -0.487849130
## 136  2.78942561 -0.853942542  0.541093785  0.294893130
## 137  1.57099294 -1.065013214 -0.942695700  0.035486875
## 138  1.34179696 -0.421020154 -0.180271551 -0.214702016
## 139  0.92173701 -0.017165594 -0.415434449  0.005220919
## 140  1.84586124 -0.673870645  0.012629804  0.194543500
## 141  2.00808316 -0.611835930 -0.426902678  0.246711805
## 142  1.89543421 -0.687273065 -0.129640697  0.468128374
## 143  1.15401555  0.696536401 -0.528389994 -0.040385459
## 144  2.03374499 -0.864624030 -0.337014969  0.045036251
## 145  1.99147547 -1.045665670 -0.630301866  0.213330527
## 146  1.86425786 -0.385674038 -0.255418178  0.387957152
## 147  1.55935649  0.893692855  0.026283300  0.219456899
## 148  1.51609145 -0.268170747 -0.179576781  0.118773236
## 149  1.36820418 -1.007877934 -0.930278721  0.026041407
## 150  0.95744849  0.024250427 -0.526485033 -0.162533529
```

eigen.vec matriz de autovectores

```
##     Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
## 1            5.1          3.5          1.4          0.2
## 2            4.9          3.0          1.4          0.2
## 3            4.7          3.2          1.3          0.2
## 4            4.6          3.1          1.5          0.2
## 5            5.0          3.6          1.4          0.2
## 6            5.4          3.9          1.7          0.4
## 7            4.6          3.4          1.4          0.3
## 8            5.0          3.4          1.5          0.2
## 9            4.4          2.9          1.4          0.2
## 10           4.9          3.1          1.5          0.1
## 11           5.4          3.7          1.5          0.2
## 12           4.8          3.4          1.6          0.2
## 13           4.8          3.0          1.4          0.1
## 14           4.3          3.0          1.1          0.1
## 15           5.8          4.0          1.2          0.2
## 16           5.7          4.4          1.5          0.4
## 17           5.4          3.9          1.3          0.4
## 18           5.1          3.5          1.4          0.3
## 19           5.7          3.8          1.7          0.3
## 20           5.1          3.8          1.5          0.3
## 21           5.4          3.4          1.7          0.2
```

```
## 22          5.1         3.7          1.5         0.4
## 23          4.6         3.6          1.0         0.2
## 24          5.1         3.3          1.7         0.5
## 25          4.8         3.4          1.9         0.2
## 26          5.0         3.0          1.6         0.2
## 27          5.0         3.4          1.6         0.4
## 28          5.2         3.5          1.5         0.2
## 29          5.2         3.4          1.4         0.2
## 30          4.7         3.2          1.6         0.2
## 31          4.8         3.1          1.6         0.2
## 32          5.4         3.4          1.5         0.4
## 33          5.2         4.1          1.5         0.1
## 34          5.5         4.2          1.4         0.2
## 35          4.9         3.1          1.5         0.2
## 36          5.0         3.2          1.2         0.2
## 37          5.5         3.5          1.3         0.2
## 38          4.9         3.6          1.4         0.1
## 39          4.4         3.0          1.3         0.2
## 40          5.1         3.4          1.5         0.2
## 41          5.0         3.5          1.3         0.3
## 42          4.5         2.3          1.3         0.3
## 43          4.4         3.2          1.3         0.2
## 44          5.0         3.5          1.6         0.6
## 45          5.1         3.8          1.9         0.4
## 46          4.8         3.0          1.4         0.3
## 47          5.1         3.8          1.6         0.2
## 48          4.6         3.2          1.4         0.2
## 49          5.3         3.7          1.5         0.2
## 50          5.0         3.3          1.4         0.2
## 51          7.0         3.2          4.7         1.4
## 52          6.4         3.2          4.5         1.5
## 53          6.9         3.1          4.9         1.5
## 54          5.5         2.3          4.0         1.3
## 55          6.5         2.8          4.6         1.5
## 56          5.7         2.8          4.5         1.3
## 57          6.3         3.3          4.7         1.6
## 58          4.9         2.4          3.3         1.0
## 59          6.6         2.9          4.6         1.3
## 60          5.2         2.7          3.9         1.4
## 61          5.0         2.0          3.5         1.0
## 62          5.9         3.0          4.2         1.5
## 63          6.0         2.2          4.0         1.0
## 64          6.1         2.9          4.7         1.4
## 65          5.6         2.9          3.6         1.3
## 66          6.7         3.1          4.4         1.4
## 67          5.6         3.0          4.5         1.5
## 68          5.8         2.7          4.1         1.0
## 69          6.2         2.2          4.5         1.5
## 70          5.6         2.5          3.9         1.1
## 71          5.9         3.2          4.8         1.8
## 72          6.1         2.8          4.0         1.3
## 73          6.3         2.5          4.9         1.5
## 74          6.1         2.8          4.7         1.2
## 75          6.4         2.9          4.3         1.3
```

```
## 76          6.6         3.0         4.4         1.4
## 77          6.8         2.8         4.8         1.4
## 78          6.7         3.0         5.0         1.7
## 79          6.0         2.9         4.5         1.5
## 80          5.7         2.6         3.5         1.0
## 81          5.5         2.4         3.8         1.1
## 82          5.5         2.4         3.7         1.0
## 83          5.8         2.7         3.9         1.2
## 84          6.0         2.7         5.1         1.6
## 85          5.4         3.0         4.5         1.5
## 86          6.0         3.4         4.5         1.6
## 87          6.7         3.1         4.7         1.5
## 88          6.3         2.3         4.4         1.3
## 89          5.6         3.0         4.1         1.3
## 90          5.5         2.5         4.0         1.3
## 91          5.5         2.6         4.4         1.2
## 92          6.1         3.0         4.6         1.4
## 93          5.8         2.6         4.0         1.2
## 94          5.0         2.3         3.3         1.0
## 95          5.6         2.7         4.2         1.3
## 96          5.7         3.0         4.2         1.2
## 97          5.7         2.9         4.2         1.3
## 98          6.2         2.9         4.3         1.3
## 99          5.1         2.5         3.0         1.1
## 100         5.7         2.8         4.1         1.3
## 101         6.3         3.3         6.0         2.5
## 102         5.8         2.7         5.1         1.9
## 103         7.1         3.0         5.9         2.1
## 104         6.3         2.9         5.6         1.8
## 105         6.5         3.0         5.8         2.2
## 106         7.6         3.0         6.6         2.1
## 107         4.9         2.5         4.5         1.7
## 108         7.3         2.9         6.3         1.8
## 109         6.7         2.5         5.8         1.8
## 110         7.2         3.6         6.1         2.5
## 111         6.5         3.2         5.1         2.0
## 112         6.4         2.7         5.3         1.9
## 113         6.8         3.0         5.5         2.1
## 114         5.7         2.5         5.0         2.0
## 115         5.8         2.8         5.1         2.4
## 116         6.4         3.2         5.3         2.3
## 117         6.5         3.0         5.5         1.8
## 118         7.7         3.8         6.7         2.2
## 119         7.7         2.6         6.9         2.3
## 120         6.0         2.2         5.0         1.5
## 121         6.9         3.2         5.7         2.3
## 122         5.6         2.8         4.9         2.0
## 123         7.7         2.8         6.7         2.0
## 124         6.3         2.7         4.9         1.8
## 125         6.7         3.3         5.7         2.1
## 126         7.2         3.2         6.0         1.8
## 127         6.2         2.8         4.8         1.8
## 128         6.1         3.0         4.9         1.8
## 129         6.4         2.8         5.6         2.1
```

```
## 130          7.2          3.0          5.8          1.6
## 131          7.4          2.8          6.1          1.9
## 132          7.9          3.8          6.4          2.0
## 133          6.4          2.8          5.6          2.2
## 134          6.3          2.8          5.1          1.5
## 135          6.1          2.6          5.6          1.4
## 136          7.7          3.0          6.1          2.3
## 137          6.3          3.4          5.6          2.4
## 138          6.4          3.1          5.5          1.8
## 139          6.0          3.0          4.8          1.8
## 140          6.9          3.1          5.4          2.1
## 141          6.7          3.1          5.6          2.4
## 142          6.9          3.1          5.1          2.3
## 143          5.8          2.7          5.1          1.9
## 144          6.8          3.2          5.9          2.3
## 145          6.7          3.3          5.7          2.5
## 146          6.7          3.0          5.2          2.3
## 147          6.3          2.5          5.0          1.9
## 148          6.5          3.0          5.2          2.0
## 149          6.2          3.4          5.4          2.3
## 150          5.9          3.0          5.1          1.8
```

visualizamos

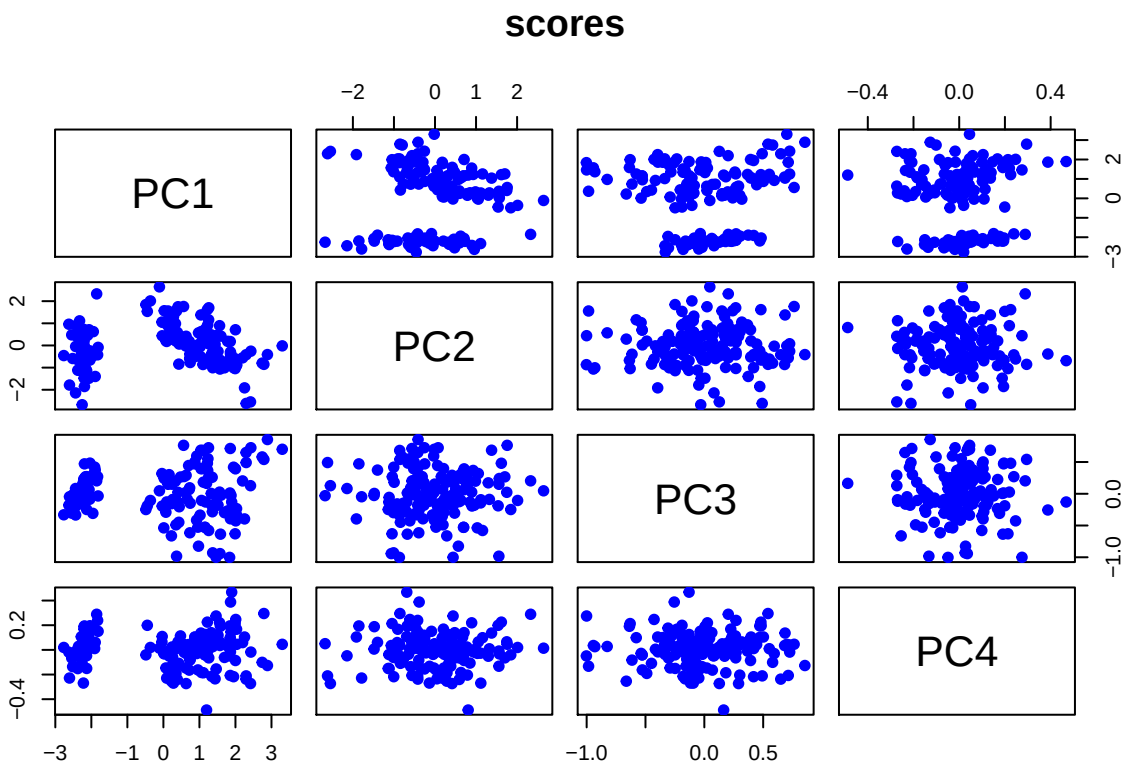
```
##             PC1          PC2          PC3          PC4
## 1   -2.25714118 -0.478423832  0.127279624  0.024087508
## 2   -2.07401302  0.671882687  0.233825517  0.102662845
## 3   -2.35633511  0.340766425 -0.044053900  0.028282305
## 4   -2.29170679  0.595399863 -0.090985297 -0.065735340
## 5   -2.38186270 -0.644675659 -0.015685647 -0.035802870
## 6   -2.06870061 -1.484205297 -0.026878250  0.006586116
## 7   -2.43586845 -0.047485118 -0.334350297 -0.036652767
## 8   -2.22539189 -0.222403002  0.088399352 -0.024529919
## 9   -2.32684533  1.111603700 -0.144592465 -0.026769540
## 10  -2.17703491  0.467447569  0.252918268 -0.039766068
## 11  -2.15907699 -1.040205867  0.267784001  0.016675503
## 12  -2.31836413 -0.132633999 -0.093446191 -0.133037725
## 13  -2.21104370  0.726243183  0.230140246  0.002416941
## 14  -2.62430902  0.958296347 -0.180192423 -0.019151375
## 15  -2.19139921 -1.853846555  0.471322025  0.194081578
## 16  -2.25466121 -2.677315230 -0.030424684  0.050365010
## 17  -2.20021676 -1.478655729  0.005326251  0.188186988
## 18  -2.18303613 -0.487206131  0.044067686  0.092779618
## 19  -1.89223284 -1.400327567  0.373093377  0.060891973
## 20  -2.33554476 -1.124083597 -0.132187626 -0.037630354
## 21  -1.90793125 -0.407490576  0.419885937  0.010884821
## 22  -2.19964383 -0.921035871 -0.159331502  0.059398340
## 23  -2.76508142 -0.456813301 -0.331069982  0.019582826
## 24  -1.81259716 -0.085272854 -0.034373442  0.150636353
## 25  -2.21972701 -0.136796175 -0.117599566 -0.269238379
## 26  -1.94532930  0.623529705  0.304620475  0.043416203
## 27  -2.04430277 -0.241354991 -0.086075649  0.067454082
## 28  -2.16133650 -0.525389422  0.206125707  0.010241084
```

```
## 29  -2.13241965 -0.312172005  0.270244895  0.083977887
## 30  -2.25769799  0.336604248 -0.068207276 -0.107918349
## 31  -2.13297647  0.502856075  0.074757996 -0.048027970
## 32  -1.82547925 -0.422280389  0.269564311  0.239069476
## 33  -2.60621687 -1.787587272 -0.047070727 -0.228470534
## 34  -2.43800983 -2.143546796  0.082392024 -0.048053409
## 35  -2.10292986  0.458665270  0.169706329  0.028926042
## 36  -2.20043723  0.205419224  0.224688852  0.168343905
## 37  -2.03831765 -0.659349230  0.482919584  0.195702902
## 38  -2.51889339 -0.590315163 -0.019370918 -0.136048774
## 39  -2.42152026  0.901161067 -0.192609402 -0.009705907
## 40  -2.16246625 -0.267981199  0.175296561  0.007023875
## 41  -2.27884081 -0.440240541 -0.034778398  0.106626042
## 42  -1.85191836  2.329610745  0.203552303  0.288896090
## 43  -2.54511203  0.477501017 -0.304745527 -0.066379077
## 44  -1.95788857 -0.470749613 -0.308567588  0.176501717
## 45  -2.12992356 -1.138415464 -0.247604064 -0.150539117
## 46  -2.06283361  0.708678586  0.063716370  0.139801160
## 47  -2.37677076 -1.116688691 -0.057026813 -0.151722682
## 48  -2.38638171  0.384957230 -0.139002234 -0.048671707
## 49  -2.22200263 -0.994627669  0.180886792 -0.014878291
## 50  -2.19647504 -0.009185585  0.152518539  0.049206884
## 51   1.09810244 -0.860091033  0.682300393  0.034717469
## 52   0.72889556 -0.592629362  0.093807452  0.004887251
## 53   1.23683580 -0.614239894  0.552157058  0.009391933
## 54   0.40612251  1.748546197  0.023024633  0.065549239
## 55   1.07188379  0.207725147  0.396925784  0.104387166
## 56   0.38738955  0.591302717 -0.123776885 -0.240027187
## 57   0.74403715 -0.770438272 -0.148472007 -0.077111455
## 58  -0.48569562  1.846243998 -0.248432992 -0.040384912
## 59   0.92480346 -0.032118478  0.594178807 -0.029779844
## 60   0.01138804  1.030565784 -0.537100055 -0.028366154
## 61  -0.10982834  2.645211115  0.046634215  0.013714785
## 62   0.43922201  0.063083852 -0.204389093  0.039992104
## 63   0.56023148  1.758832129  0.763214554  0.045578465
## 64   0.71715934  0.185602819  0.068429700 -0.164256922
## 65  -0.03324333  0.437537419 -0.194282030  0.108684396
## 66   0.87248429 -0.507364239  0.501830204  0.104593326
## 67   0.34908221  0.195656268 -0.489234095 -0.190869932
## 68   0.15827980  0.789451008  0.301028700 -0.204612265
## 69   1.22100316  1.616827281  0.480693656  0.225145511
## 70   0.16436725  1.298259939  0.172260719 -0.051554138
## 71   0.73521959 -0.395247446 -0.614467782 -0.083006045
## 72   0.47469691  0.415926887  0.264067576  0.113189079
## 73   1.23005729  0.930209441  0.367182178 -0.009911322
## 74   0.63074514  0.414997441  0.290921638 -0.273304557
## 75   0.70031506  0.063200094  0.444537765  0.043313222
## 76   0.87135454 -0.249956017  0.471001057  0.101376117
## 77   1.25231375  0.076998069  0.724727099  0.039556002
## 78   1.35386953 -0.330205463  0.259955701  0.066604931
## 79   0.66258066  0.225173502 -0.085577197 -0.036318171
## 80  -0.04012419  1.055183583  0.318506304  0.064571834
## 81   0.13035846  1.557055553  0.149482697 -0.009371129
## 82   0.02337438  1.567225244  0.240745761 -0.032663020
```

```
## 83   0.24073180  0.774661195  0.150707074  0.023572390
## 84   1.05755171  0.631726901 -0.104959762 -0.183354200
## 85   0.22323093  0.286812663 -0.663028512 -0.253977520
## 86   0.42770626 -0.842758920 -0.449129446 -0.109308985
## 87   1.04522645 -0.520308714  0.394464890  0.037084781
## 88   1.04104379  1.378371048  0.685997804  0.136378719
## 89   0.06935597  0.218770433 -0.290605718 -0.146653279
## 90   0.28253073  1.324886147 -0.089111491  0.008876070
## 91   0.27814596  1.116288852 -0.094172116 -0.269753497
## 92   0.62248441 -0.024839814  0.020412763 -0.147193289
## 93   0.33540673  0.985103828  0.198724011  0.006508757
## 94  -0.36097409  2.012495825 -0.105467721  0.019505467
## 95   0.28762268  0.852873116 -0.130452657 -0.107043742
## 96   0.09105561  0.180587142 -0.128547696 -0.229191812
## 97   0.22695654  0.383634868 -0.155691572 -0.132163118
## 98   0.57446378  0.154356489  0.270743347 -0.019794366
## 99  -0.44617230  1.538637456 -0.189765199  0.199278855
## 100  0.25587339  0.596852285 -0.091572385 -0.058426315
## 101  1.83841002 -0.867515056 -1.002044077 -0.049085303
## 102  1.15401555  0.696536401 -0.528389994 -0.040385459
## 103  2.19790361 -0.560133976  0.202236658  0.058986583
## 104  1.43534213  0.046830701 -0.163083761 -0.234982858
## 105  1.86157577 -0.294059697 -0.394307408 -0.016243853
## 106  2.74268509 -0.797736709  0.580364827 -0.101045973
## 107  0.36579225  1.556289178 -0.983598122 -0.132679346
## 108  2.29475181 -0.418663020  0.649530452 -0.237246445
## 109  1.99998633  0.709063226  0.392675073 -0.086221779
## 110  2.25223216 -1.914596301 -0.396224508  0.104488870
## 111  1.35962064 -0.690443405 -0.283661780  0.107500284
## 112  1.59732747  0.420292431 -0.023108991  0.058136869
## 113  1.87761053 -0.417849815 -0.026250468  0.145926073
## 114  1.25590769  1.158379741 -0.578311891  0.098826244
## 115  1.46274487  0.440794883 -1.000517746  0.274738504
## 116  1.58476820 -0.673986887 -0.636297054  0.191222383
## 117  1.46651849 -0.254768327 -0.037306280 -0.154811637
## 118  2.41822770 -2.548124795  0.127454475 -0.272892966
## 119  3.29964148 -0.017721580  0.700957033  0.045037725
## 120  1.25954707  1.701046715  0.266643612 -0.064963167
## 121  2.03091256 -0.907427443 -0.234015510  0.167390481
## 122  0.97471535  0.569855257 -0.825362161  0.027662914
## 123  2.88797650 -0.412259950  0.854558973 -0.126911337
## 124  1.32878064  0.480202496  0.005410239  0.139491837
## 125  1.69505530 -1.010536476 -0.297454114 -0.061437911
## 126  1.94780139 -1.004412720  0.418582432 -0.217609339
## 127  1.17118007  0.315338060 -0.129503907  0.125001677
## 128  1.01754169 -0.064131184 -0.336588365 -0.008625505
## 129  1.78237879  0.186735633 -0.269754304  0.030983849
## 130  1.85742501 -0.560413289  0.713244682 -0.207519953
## 131  2.42782030 -0.258418706  0.725386035 -0.017863520
## 132  2.29723178 -2.617554417  0.491826144 -0.210968943
## 133  1.85648383  0.177953334 -0.352966242  0.099675959
## 134  1.11042770  0.291944582  0.182875741 -0.185721512
## 135  1.19845835  0.808606364  0.164173760 -0.487849130
## 136  2.78942561 -0.853942542  0.541093785  0.294893130
```

```
## 137  1.57099294 -1.065013214 -0.942695700  0.035486875
## 138  1.34179696 -0.421020154 -0.180271551 -0.214702016
## 139  0.92173701 -0.017165594 -0.415434449  0.005220919
## 140  1.84586124 -0.673870645  0.012629804  0.194543500
## 141  2.00808316 -0.611835930 -0.426902678  0.246711805
## 142  1.89543421 -0.687273065 -0.129640697  0.468128374
## 143  1.15401555  0.696536401 -0.528389994 -0.040385459
## 144  2.03374499 -0.864624030 -0.337014969  0.045036251
## 145  1.99147547 -1.045665670 -0.630301866  0.213330527
## 146  1.86425786 -0.385674038 -0.255418178  0.387957152
## 147  1.55935649  0.893692855  0.026283300  0.219456899
## 148  1.51609145 -0.268170747 -0.179576781  0.118773236
## 149  1.36820418 -1.007877934 -0.930278721  0.026041407
## 150  0.95744849  0.024250427 -0.526485033 -0.162533529
```

Generación del gráfico de los scores



PCA sintetizado.

```
##   Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
## 1          5.1          3.5          1.4          0.2
## 2          4.9          3.0          1.4          0.2
## 3          4.7          3.2          1.3          0.2
```

```
## 4          4.6          3.1          1.5          0.2
## 5          5.0          3.6          1.4          0.2
## 6          5.4          3.9          1.7          0.4
```

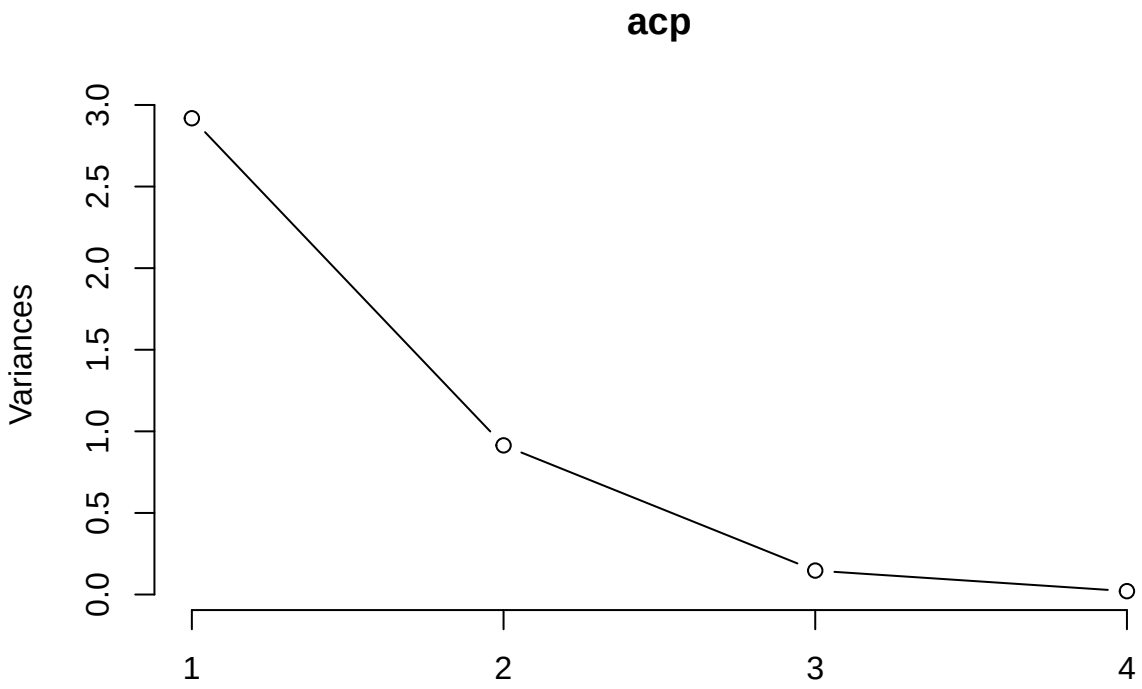
Aplicar el calculo de la varianza a las columnas.

```
## Largo.Sepalo Ancho.Sepalo Largo.Petalo Ancho.Petalo
##    0.6856935    0.1899794    3.1162779    0.5810063
```

Centrado por la media y escalada por la desviación standar (dividir entre sd).

```
## Standard deviations (1, .., p=4):
## [1] 1.7083611 0.9560494 0.3830886 0.1439265
##
## Rotation (n x k) = (4 x 4):
##                     PC1         PC2        PC3        PC4
## Largo.Sepalo  0.5210659 -0.37741762  0.7195664  0.2612863
## Ancho.Sepalo -0.2693474 -0.92329566 -0.2443818 -0.1235096
## Largo.Petalo  0.5804131 -0.02449161 -0.1421264 -0.8014492
## Ancho.Petalo  0.5648565 -0.06694199 -0.6342727  0.5235971
```

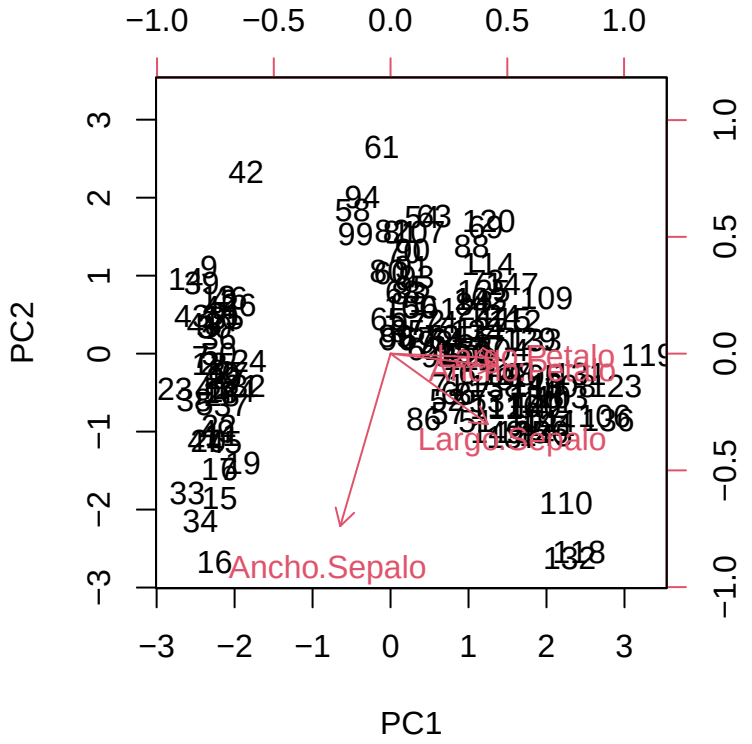
Generación del gráfico screeplot.



Visualizar el resumen.

```
## Importance of components:
##                           PC1    PC2     PC3     PC4
## Standard deviation     1.7084 0.9560 0.38309 0.14393
## Proportion of Variance 0.7296 0.2285 0.03669 0.00518
## Cumulative Proportion  0.7296 0.9581 0.99482 1.00000
```

Construcción del Biplot.



Componente principal calculada.

Suma del producto de la matriz acp de cada uno de los componentes por el dato de la matriz original por filas.

```
##           1           2           3           4           5           6
##  5.534456900 0.110652027 5.254102685 2.556778308 5.540391618 0.516516262
##           7           8           9          10          11          12
##  5.410422459 2.701916690 4.821462902 0.083717282 6.037007428 2.645431036
##          13          14          15          16          17          18
##  5.029889268 0.296579071 6.251368512 2.774099334 5.986917940 0.395696460
##          19          20          21          22          23          24
##  6.431427159 2.623728622 5.789055139 0.538218676 5.230363812 2.817504162
##          25          26          27          28          29          30
##  5.580628773 0.029847794 5.810776908 2.787953252 5.528522182 0.223623334
##          31          32          33          34          35          36
##  5.434161332 2.873989815 5.928876631 0.626871404 5.434161332 2.586329217
##          37          38          39          40          41          42
##  5.690776674 0.393080295 4.975765573 2.758402343 5.488285026 -0.093588174
##          43          44          45          46          47          48
##  5.079978756 2.623728622 6.085196405 0.194072425 5.973031401 2.473357910
##          49          50          51          52          53          54
```

```
##  5.806859293  0.253174243  9.187736428  4.891003260  8.818478034 -0.525317175
##           55           56           57           58           59           60
##  8.683168796  4.657212151  8.575749231 -0.288136807  8.689103515  4.035869961
##           61           62           63           64           65           66
##  6.170299562 -0.178554758  7.471541885  4.942256584  7.231541417 -0.447902201
##           67           68           69           70           71           72
##  8.206968884  4.595494167  7.722933741 -0.525317175  8.815749698  4.600726497
##           73           74           75           76           77           78
##  8.157590627 -0.649526236  8.398896967  5.028293147  8.482099613 -0.496539359
##           79           80           81           82           83           84
##  8.387027530  4.227029336  6.877358842 -0.557484249  7.662164096  5.111713544
##           85           86           87           88           89           90
##  7.770411486 -0.003865467  9.013612500  5.074314140  7.550115684 -0.412345868
##           91           92           93           94           95           96
##  7.726140124  4.858836186  7.312015728 -0.371557205  7.772311997  4.460820446
##           97           98           99          100          101          102
##  7.596287558 -0.455750696  6.577183369  4.431269536  9.775506706 -0.337547059
##          103          104          105          106          107          108
## 10.202806410  5.455859796  9.427258849 -0.943965351  7.644359942  6.416115907
##          109          110          111          112          113          114
##  9.009100245 -0.136696117  9.442334668  5.369823233  9.369217539 -0.340163224
##          115          116          117          118          119          120
##  9.036045500  5.127410535  9.038773836 -0.489463957 11.027254181  5.216836356
##          121          122          123          124          125          126
##  9.757702552 -0.116836775 10.859064970  5.114329709  9.595448059 -0.731103562
##          127          128          129          130          131          132
##  8.781447261  4.920554170  9.096815145 -0.903176688 10.284586592  6.515233295
##          133          134          135          136          137          138
##  9.154856455 -0.641677741  8.875096879  6.367478748  9.567080340 -0.437437541
##          139          140          141          142          143          144
##  8.769577825  5.547128689  9.601382777 -0.181944017  8.723405952  5.692267071
##          145          146          147          148          149          150
##  9.827613298 -0.211494926  8.851358007  5.262084256  9.352719256 -0.251510496

##          1          2          3          4          5          6          7
##  -2.543833  -6.030977  -1.430170  -3.455222  -2.508541  -6.843250  -1.543395
##          8          9         10         11         12         13         14
##  -3.758987  -2.264946  -6.123307  -1.640921  -3.752293  -2.415913  -5.193317
##         15         16         17         18         19         20         21
##  -1.756595  -4.913801  -2.634012  -6.255801  -1.728650  -4.227329  -2.767835
##         22         23         24         25         26         27         28
##  -6.368213  -1.571340  -3.963729  -2.616868  -6.307966  -1.595832  -3.864705
##         29         30         31         32         33         34         35
##  -2.579126  -6.044365  -1.402224  -3.970423  -2.631563  -6.665285  -1.402224
##         36         37         38         39         40         41         42
##  -3.554246  -2.657059  -6.064448  -1.347339  -3.765681  -2.470799  -5.529164
##         43         44         45         46         47         48         49
##  -1.422822  -4.227329  -2.744788  -5.945342  -1.673764  -3.540857  -2.661957
##         50         51         52         53         54         55         56
##  -6.143389  -2.022673  -5.069157  -4.566189  -9.012300  -1.894753  -4.468320
##         57         58         59         60         61         62         63
##  -4.271603  -7.798627  -1.859460  -4.394684  -3.281525  -9.626525  -1.452652
##         64         65         66         67         68         69         70
##  -4.693145  -3.575107 -10.549821  -1.945745  -4.078920  -4.128987  -9.012300
```

```
##        71         72         73         74         75         76         77
##  -2.149148  -4.461626  -4.325044 -10.239361  -1.847214  -4.798863  -4.480909
##        78         79         80         81         82         83         84
## -11.117187  -1.917799  -3.939731  -3.595704  -8.721923  -1.709497  -4.713227
##        85         86         87         88         89         90         91
##  -3.846647 -10.029314  -2.015325  -4.040144  -3.766265  -9.025688  -1.676654
##        92         93         94         95         96         97         98
##  -4.778780  -3.791761  -7.884263  -1.749688  -4.540567  -3.839299  -9.975761
##        99        100        101        102        103        104        105
##  -1.557085  -4.441544  -4.784288 -10.371856  -2.243221  -5.136099  -4.769593
##       106        107        108        109        110        111        112
## -13.452202  -1.815375  -5.249901  -4.823034 -12.688178  -2.246674  -5.030381
##       113        114        115        116        117        118        119
##  -4.767144 -10.180502  -2.229530  -5.861347  -4.646571 -13.697109  -2.206924
##       120        121        122        123        124        125        126
##  -4.152556  -4.890166 -10.015926  -2.164284  -4.904581  -4.812233 -12.522213
##       127        128        129        130        131        132        133
##  -2.005529  -5.168181  -4.649020 -12.310777  -2.104500  -6.312385  -4.651469
##       134        135        136        137        138        139        140
## -10.813421  -1.796222  -5.817266  -4.633321 -11.315234  -2.076114  -5.624524
##       141        142        143        144        145        146        147
##  -4.776941 -11.441035  -2.003080  -5.928289  -4.822030 -11.342011  -1.937393
##       148        149        150
##  -5.399700  -4.517647 -10.477574
```

```
##          1          2          3          4          5          6
##   4.1513137  -3.5692780   1.5937674  -4.6755236   4.0651445  -4.4624834
##          7          8          9         10         11         12
##   1.8096373  -5.0025472   3.7328931  -3.5937161   1.8256368  -4.9391199
##         13         14         15         16         17         18
##   4.0207196  -3.2859071   2.0272941  -5.7397962   4.2099512  -3.9987180
##         19         20         21         22         23         24
##   1.8984869  -5.1881654   4.5972662  -4.2134380   1.9384445  -5.2417054
##         25         26         27         28         29         30
##   4.3094396  -3.6425925   1.7963181  -5.1538399   4.2374830  -3.6961325
##         31         32         33         34         35         36
##   1.4649602  -5.3051326   4.2241638  -4.4770343   1.4649602  -4.7633890
##         37         38         39         40         41         42
##   4.3671836  -3.8864143   1.4924920  -5.0659745   3.9931878  -3.0665234
##         43         44         45         46         47         48
##   1.6364053  -5.1881654   4.4400337  -3.6082671   1.9260187  -4.6365345
##         49         50         51         52         53         54
##   4.3387584  -3.7839980   1.6471267  -8.0621672   7.8371017  -4.6050088
##         55         56         57         58         59         60
##   1.5165326  -7.4715472   7.2188107  -4.1604579   1.4303633  -6.7738472
##         61         62         63         64         65         66
##   5.6899349  -5.3224833   0.8813486  -7.9009872   6.0230797  -5.5668651
##         67         68         69         70         71         72
##   1.8025723  -7.1835127   7.1734924  -4.6050088   2.0770796  -7.4081199
##         73         74         75         76         77         78
##   7.4906377  -5.1764142   1.5014265  -8.0522799   7.7500389  -5.8403487
##         79         80         81         82         83         84
##   1.6737651  -6.7150836   6.1945248  -4.4048397   1.4276830  -8.0912690
##         85         86         87         88         89         90
```

```
##   6.4841382  -5.7373724   1.6897646  -7.6664927   6.3686502  -4.7318633
##          91          92          93          94          95          96
##   1.3273011  -7.8619981   6.5116701  -4.1214688   1.4854270  -7.3057036
##          97          98          99         100         101         102
##   6.5267761  -5.2299542   1.4392153  -7.2178381   8.0263332  -5.5814160
##         103         104         105         106         107         108
##   1.8221456  -8.6964399   8.1116090  -6.7050122   1.6861908  -9.7747036
##         109         110         111         112         113         114
##   8.3834360  -7.1193414   2.0930791  -8.5451472   8.1258217  -5.4691124
##         115         116         117         118         119         120
##   2.1925676  -8.7650908   7.9525897  -7.3247340   1.4508301  -7.8812127
##         121         122         123         124         125         126
##   8.2848410  -5.6105178   1.4072988  -8.2035727   8.1551404  -6.3972032
##         127         128         129         130         131         132
##   1.7466152  -8.1500326   7.9383770  -6.0946177   1.4632559 -10.4875145
##         133         134         135         136         137         138
##   7.9241644  -5.5133251   1.2153869 -10.0481872   7.7385067  -6.0160796
##         139         140         141         142         143         144
##   1.9189537  -9.0723399   8.0689711  -6.3576541   1.7608278  -9.3993635
##         145         146         147         148         149         150
##   8.0982898  -6.2697887   1.5600640  -8.6428999   7.5368494  -5.7327087
```