Motivations Virgen de la Puerta

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```r
library(tidyverse)
library(readxl)
library(FactoMineR)
library(factoextra)
library(Factoshiny)
```

Principal Components Analysis - PCA

Load the data

```r
otuzco <- read_csv2("data/Motivaciones_Virgen_de_Otuzco_short_UTF8.csv")
```

Check the structure

```r
str(otuzco)
```

```
spc_tbl_ [384 × 38] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ 1.1.Vive en Otuzco: num [1:384] 2 2 2 2 2 2 2 2 2 2 ...
 $ 2.1.Paz           : num [1:384] 5 4 5 4 5 4 5 4 4 3 ...
 $ 2.2.Grandeza      : num [1:384] 5 4 3 4 5 5 4 4 4 4 ...
 $ 2.3.Consuelo      : num [1:384] 5 3 5 3 3 5 4 4 5 3 ...
 $ 2.4.Belleza       : num [1:384] 4 5 5 5 5 5 5 4 3 4 ...
 $ 2.5.Misterio      : num [1:384] 5 4 4 4 4 5 5 4 3 2 ...
 $ 2.6.Tradición     : num [1:384] 5 3 3 3 4 4 4 3 5 4 ...
 $ 2.7.Fiesta        : num [1:384] 5 5 3 3 2 2 1 4 5 5 ...
 $ 2.8.Sitios        : num [1:384] 4 5 3 4 4 3 3 3 4 5 ...
 $ 2.9.Compartir     : num [1:384] 5 5 5 2 3 4 3 2 4 5 ...
 $ 2.10.Curiosidad   : num [1:384] 4 1 2 2 2 2 2 1 1 3 ...
 $ 2.11.Conocer      : num [1:384] 2 5 5 5 5 4 4 4 3 3 ...
 $ 2.12.Vacaciones   : num [1:384] 4 2 2 3 3 2 3 4 3 3 ...
 $ 2.13.Acompañar    : num [1:384] 5 5 5 5 5 5 5 5 5 5 ...
 $ 2.14.Escapar      : num [1:384] 5 1 2 2 1 3 3 3 3 2 ...
 $ 2.15.Estrés       : num [1:384] 5 1 2 2 1 3 3 3 3 2 ...
 $ 2.16.Aburrimiento : num [1:384] 5 1 1 3 3 2 3 2 2 2 ...
 $ 2.17.Fe           : num [1:384] 5 4 5 5 5 5 5 3 3 4 ...
 $ 2.18.Atmósfera    : num [1:384] 5 4 4 4 4 4 4 4 4 5 ...
 $ 2.19.Cumplir deseo: num [1:384] 5 3 2 2 4 3 3 3 4 5 ...
 $ 2.20.Respeto      : num [1:384] 5 5 5 4 4 5 4 4 4 NA ...
 $ 2.21.Redención    : num [1:384] 4 2 2 2 3 2 4 4 2 2 ...
 $ 2.22.Artículos    : num [1:384] 4 2 2 3 3 2 4 3 4 4 ...
 $ 2.23.Productos    : num [1:384] 4 2 2 3 3 2 4 3 4 4 ...
 $ 3.1.Satisfaccion  : num [1:384] 5 5 5 5 5 5 5 5 5 5 ...
 $ 4.1.Volver        : num [1:384] 3 5 5 5 5 5 5 5 5 5 ...
 $ 4.2.Recomendar    : num [1:384] 5 5 5 5 5 5 5 5 5 5 ...
 $ 4.3.Positivo      : num [1:384] 5 5 5 5 5 5 5 5 5 5 ...
```

```
$ 5.Nacionalidad    : num [1:384] 1 1 1 1 1 1 1 1 1 1 ...
$ 6.Sexo            : num [1:384] 2 1 1 2 2 2 1 1 2 2 ...
$ 7.Estado Civil    : num [1:384] 2 3 1 3 1 3 1 1 1 1 ...
$ 8.Edad            : num [1:384] 4 2 2 5 3 4 2 2 5 4 ...
$ 9.Formación       : num [1:384] 2 2 2 1 3 1 1 2 2 1 ...
$ 10.Profesión      : num [1:384] 8 8 8 8 8 8 8 8 8 8 ...
$ 11.Con quien      : num [1:384] 2 4 2 2 3 2 2 2 4 2 ...
$ 12.Veces          : num [1:384] 4 4 4 2 1 2 3 1 4 4 ...
$ 13.Gasto          : num [1:384] 3 2 5 5 2 4 4 2 3 4 ...
$ 14.Ingresos       : num [1:384] 1 1 2 2 2 2 2 2 2 2 ...
- attr(*, "spec")=
 .. cols(
 ..    `1.1.Vive en Otuzco` = col_double(),
 ..    `2.1.Paz` = col_double(),
 ..    `2.2.Grandeza` = col_double(),
 ..    `2.3.Consuelo` = col_double(),
 ..    `2.4.Belleza` = col_double(),
 ..    `2.5.Misterio` = col_double(),
 ..    `2.6.Tradición` = col_double(),
 ..    `2.7.Fiesta` = col_double(),
 ..    `2.8.Sitios` = col_double(),
 ..    `2.9.Compartir` = col_double(),
 ..    `2.10.Curiosidad` = col_double(),
 ..    `2.11.Conocer` = col_double(),
 ..    `2.12.Vacaciones` = col_double(),
 ..    `2.13.Acompañar` = col_double(),
 ..    `2.14.Escapar` = col_double(),
 ..    `2.15.Estrés` = col_double(),
 ..    `2.16.Aburrimiento` = col_double(),
 ..    `2.17.Fe` = col_double(),
 ..    `2.18.Atmósfera` = col_double(),
 ..    `2.19.Cumplir deseo` = col_double(),
 ..    `2.20.Respeto` = col_double(),
 ..    `2.21.Redención` = col_double(),
 ..    `2.22.Artículos` = col_double(),
 ..    `2.23.Productos` = col_double(),
 ..    `3.1.Satisfaccion` = col_double(),
 ..    `4.1.Volver` = col_double(),
 ..    `4.2.Recomendar` = col_double(),
 ..    `4.3.Positivo` = col_double(),
 ..    `5.Nacionalidad` = col_double(),
 ..    `6.Sexo` = col_double(),
 ..    `7.Estado Civil` = col_double(),
 ..    `8.Edad` = col_double(),
 ..    `9.Formación` = col_double(),
 ..    `10.Profesión` = col_double(),
 ..    `11.Con quien` = col_double(),
 ..    `12.Veces` = col_double(),
 ..    `13.Gasto` = col_double(),
 ..    `14.Ingresos` = col_double()
 .. )
- attr(*, "problems")=<externalptr>
```

Create the data matrix

```
data_matrix <- otuzco[, 2:38]
```

Run the PCA

```
pca_result <- PCA(data_matrix, graph = FALSE)
```

Explore the results

1.Top 20 Eigenvalues

```
pca_result$eig[1:20,]
```

	eigenvalue	percentage of variance	cumulative percentage of variance
comp 1	4.6959546	12.691769	12.69177
comp 2	2.5868284	6.991428	19.68320
comp 3	2.1298669	5.756397	25.43959
comp 4	1.9845005	5.363515	30.80311
comp 5	1.6360541	4.421768	35.22488
comp 6	1.4870147	4.018959	39.24384
comp 7	1.3843212	3.741409	42.98524
comp 8	1.3425212	3.628436	46.61368
comp 9	1.2949029	3.499738	50.11342
comp 10	1.2440848	3.362391	53.47581
comp 11	1.1577800	3.129135	56.60494
comp 12	1.0851192	2.932755	59.53770
comp 13	1.0081327	2.724683	62.26238
comp 14	1.0000000	2.702703	64.96508
comp 15	0.9759827	2.637791	67.60288
comp 16	0.9196399	2.485513	70.08839
comp 17	0.9051154	2.446258	72.53465
comp 18	0.8520835	2.302928	74.83758
comp 19	0.8150384	2.202806	77.04038
comp 20	0.7702567	2.081775	79.12216

2. Top 20 Variables

```
pca_result$var$coord[1:20, ]
```

	Dim.1	Dim.2	Dim.3	Dim.4
2.1.Paz	0.30758931	0.08765958	-0.086907723	0.109036605
2.2.Grandeza	0.15276481	0.23248401	0.105980942	0.034273775
2.3.Consuelo	0.37232160	0.03281033	-0.361527948	-0.118733145
2.4.Belleza	0.31630603	0.03556683	0.008740093	0.166749053
2.5.Misterio	0.21450155	0.15896249	0.090031902	0.326793765
2.6.Tradición	0.41143468	0.02458183	0.024753658	0.328491058
2.7.Fiesta	0.31141553	0.04463974	0.007556800	0.275067804
2.8.Sitios	0.22859128	0.02165627	0.187796520	0.577097819
2.9.Compartir	0.34351821	-0.11886030	-0.040789829	0.252141985

```
2.10.Curiosidad       0.62691023  0.21691708  0.049175900  0.293659979
2.11.Conocer         -0.29284506 -0.09698949  0.037072975  0.108133847
2.12.Vacaciones      -0.05192667 -0.09048804  0.248474868  0.265808333
2.13.Acompañar       -0.13277834  0.04440824 -0.060240442 -0.020897848
2.14.Escapar          0.68223642  0.12988966 -0.090748932  0.003690195
2.15.Estrés           0.61413739  0.05913762 -0.080084431 -0.011747679
2.16.Aburrimiento     0.73042861  0.06701899  0.016906234  0.152706444
2.17.Fe               0.24993582  0.13702658 -0.034849257  0.220415055
2.18.Atmósfera        0.36548864  0.27461660  0.085038094  0.111055855
2.19.Cumplir deseo    0.37251772  0.13736991 -0.018442958 -0.106620469
2.20.Respeto          0.24569359  0.34143574 -0.329088393 -0.023783737
                            Dim.5
2.1.Paz              -0.002532281
2.2.Grandeza          0.071211042
2.3.Consuelo          0.071935877
2.4.Belleza          -0.105120062
2.5.Misterio          0.115422497
2.6.Tradición        -0.097135753
2.7.Fiesta           -0.098193602
2.8.Sitios            0.068993381
2.9.Compartir         0.059814627
2.10.Curiosidad       0.136562465
2.11.Conocer         -0.043654740
2.12.Vacaciones      -0.014076509
2.13.Acompañar       -0.152507687
2.14.Escapar          0.119403228
2.15.Estrés          -0.033913121
2.16.Aburrimiento     0.036723623
2.17.Fe               0.045752392
2.18.Atmósfera       -0.174518998
2.19.Cumplir deseo   -0.221215699
2.20.Respeto         -0.165761560
```

3. Top 20 individuals

```
pca_result$ind$coord[1:20,]
```

```
        Dim.1         Dim.2        Dim.3        Dim.4        Dim.5
1    5.2749884 -0.009015246  1.1115307  1.67693408 -1.89225373
2   -3.1558167 -0.728905552  0.6187140  1.92580077 -0.28930452
3   -2.4422930 -0.594101121 -0.3463116  0.96549332  0.44849996
4   -2.2365839 -0.109102463  3.1424858 -0.01200255 -1.07845819
5   -2.0883166 -0.205585705 -0.2664967  1.29174421 -1.24566140
6   -1.2079193  0.509078596  1.3983151  0.58767412 -0.97550236
7   -0.3323454  0.165379953  0.5566438 -0.20205281 -0.91234615
8   -2.1525223 -0.681834463 -0.4390382 -0.01652958 -1.44253094
9   -0.6503402 -0.064993035  0.4588534 -0.57140779 -0.51483395
10  -0.6067234  0.540695827  1.9360497  0.37572051 -1.97648691
11  -2.7268784 -1.168663162  2.2990109  0.67482182  0.01900405
12  -1.2662283 -0.593640639  0.2549031  2.02759380 -0.90263374
13  -1.2727942 -0.330535370 -0.5133801  1.64633512 -1.44062816
14  -1.9535079 -0.141197686  1.3938482  2.33398449 -2.05666123
15  -2.8160880 -0.250318171  2.4972700  0.88643609 -0.10095567
```
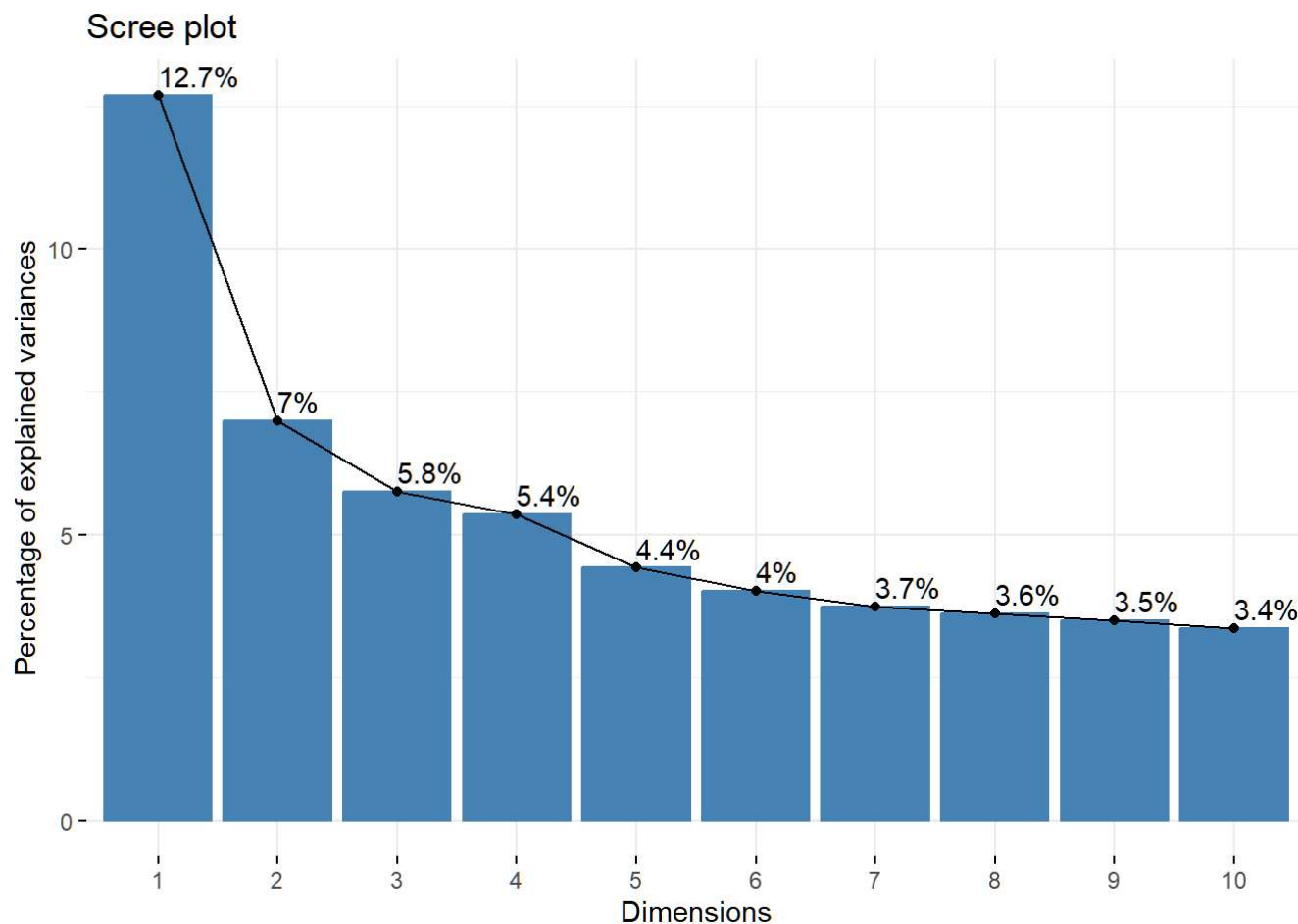
```
16   0.3467717   0.347875181   1.8070798   1.40874913   0.23676956
17  -1.4017719  -2.533999012  -0.7065582   4.13964547  -0.05361021
18  -1.6587118  -0.100489742   2.4795867   1.87778788   0.25603883
19  -0.2314642   1.297334505   2.3908462   0.19071184  -1.61970748
20   1.5734214   1.104445049  -0.8159041  -2.95610456  -0.61023418
```
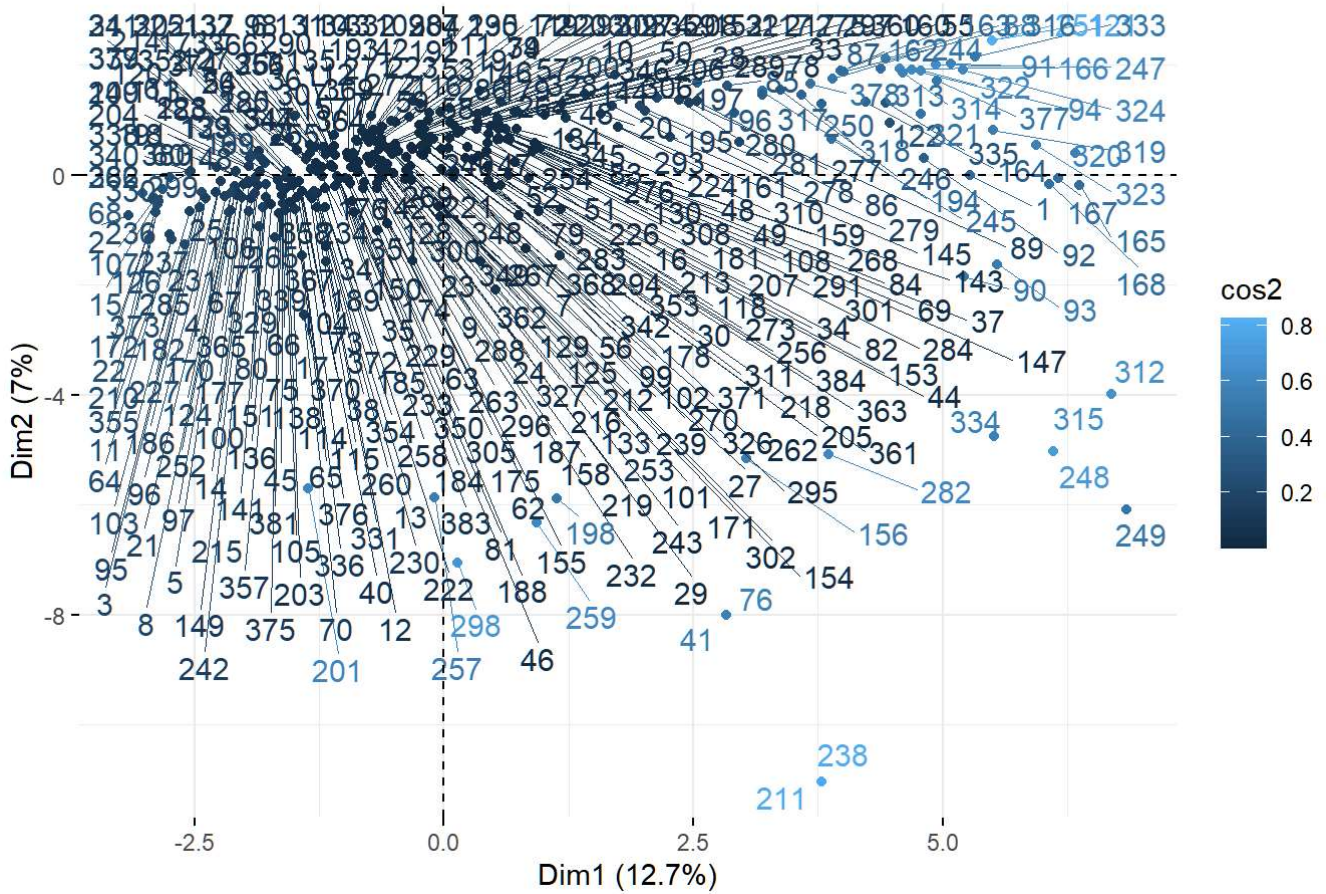
Scree plot (Contributions graph)

```r
fviz_eig(pca_result, addlabels = TRUE)
```


Visualize individuals and variables on the first two principal components

```r
fviz_pca_ind(pca_result, col.ind = "cos2", col.var = "contrib", repel = TRUE)
```

Individuals - PCA

Correlation circle

```
fviz_pca_var(pca_result, col.var = "cos2", repel = TRUE)
```

Variables - PCA