1. **PRIMO ESEMPIO DI PCA**

A <- read.table ('clipboard', header=TRUE)

 PLIC SC SA.SC TD TMI

Piem 0.088 0.471 -0.707 -0.607 -0.3950

Vaos -1.545 0.348 -0.642 -0.813 1.5780

Lomb 0.202 1.397 -0.836 -0.790 -0.5380

TrAA 0.677 0.435 -1.269 -0.966 -0.0750

Vene 0.088 1.334 -1.210 -0.848 -0.4970

FrVG 0.639 -0.005 -1.028 -0.804 -1.3010

Ligu 1.190 -0.247 0.470 -0.429 -0.3540

EmRo 0.658 1.177 -1.315 -0.863 -0.3470

Tosc 0.126 1.092 -0.795 -0.644 -1.3550

Umbr -1.431 0.675 -0.140 -0.524 -1.2870

Marc 0.278 1.090 -0.265 -0.702 -0.0006

Lazi 2.329 0.546 -0.080 -0.113 -0.0140

Abru 0.335 -0.373 0.402 -0.456 0.0400

Moli 0.658 -1.289 0.065 0.451 -1.1510

Camp -1.811 -1.314 2.031 1.664 0.4140

Pugl -0.766 -0.926 1.038 0.648 1.1090

Basi -0.747 -1.154 0.661 0.844 2.0010

Cala -0.500 -1.727 1.571 2.153 0.6320

Sici -0.918 -1.130 1.332 1.517 1.7830

Sard 0.449 -0.403 0.717 1.285 -0.2380

PCA = princomp(A)

biplot(PCA)

summary(PCA)

plot(PCA)

PCA

1. **SECONDO ESEMPIO DI PCA**

(Per questo esempio si ringrazia la studentessa Teresa Bruno)

A <- read.table ('clipboard', header=TRUE)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | cereali | tuberi | ortaggi | frutta | agrumi | vite | olivo |
| Abru | 3590855 | 1751220 | 5449426 | 708934 | 560 | 3365847 | 1294269 |
| Basi | 4363879 | 62500 | 3708553 | 1641121 | 1559906 | 390346 | 364225 |
| Cala | 1739823 | 662162 | 5519088 | 1452920 | 14683931 | 741594 | 10077833 |
| Camp | 3924660 | 3003977 | 10458024 | 7590865 | 704345 | 2496557 | 2405586 |
| EmRo | 28225968 | 2270305 | 23975740 | 15426392 | 0 | 8595036 | 69929 |
| FrVG | 9025287 | 205466 | 168715 | 394817 | 0 | 1548909 | 2274 |
| Lazi | 4623582 | 733404 | 6841368 | 2694107 | 71986 | 2642408 | 1716086 |
| Ligu | 18120 | 94820 | 230370 | 41257 | 4880 | 127165 | 180400 |
| Lomb | 32935561 | 290328 | 6959450 | 912570 | 0 | 1876437 | 45364 |
| Marc | 6804551 | 137124 | 1947801 | 256951 | 0 | 0 | 231802 |
| Moli | 2080439 | 136160 | 919430 | 215050 | 0 | 457307 | 449975 |
| Piem | 20721193 | 475128 | 2508111 | 4382869 | 0 | 3876660 | 824 |
| Pugl | 10020854 | 797250 | 28828207 | 2052407 | 2782495 | 18336000 | 12139400 |
| Sard | 1113011 | 469177 | 3242480 | 543111 | 853664 | 1329089 | 498888 |
| Sici | 8802313 | 2236681 | 11053669 | 3467058 | 18483078 | 10624445 | 3361878 |
| Tosc | 5384898 | 1167367 | 3288339 | 828962 | 955 | 4023110 | 1174819 |
| TrAA | 20535 | 219900 | 113826 | 15099290 | 0 | 1631673 | 10500 |
| Umbr | 7091903 | 77400 | 1725350 | 91299 | 0 | 1296170 | 409179 |
| ValA | 1665 | 22000 | 0 | 39450 | 0 | 45000 | 0 |
| Vene | 31121694 | 1233404 | 5441741 | 4449690 | 0 | 11464375 | 77865 |

> cor(A)

 cereali tuberi ortaggi frutta agrumi vite olivo

cereali 1.0000000 0.2130696 0.3721868 0.26962394 -0.12661997 0.4397723 -0.15381393

tuberi 0.2130696 1.0000000 0.5454557 0.44678729 0.29011734 0.4532031 0.16112085

ortaggi 0.3721868 0.5454557 1.0000000 0.37431921 0.19165926 0.8053964 0.58519195

frutta 0.2696239 0.4467873 0.3743192 1.00000000 -0.05012973 0.2456073 -0.09864136

agrumi -0.1266200 0.2901173 0.1916593 -0.05012973 1.00000000 0.2473089 0.55302367

vite 0.4397723 0.4532031 0.8053964 0.24560730 0.24730891 1.0000000 0.51855535

olivo -0.1538139 0.1611208 0.5851919 -0.09864136 0.55302367 0.5185553 1.00000000

>

PCA = princomp(A)

biplot(PCA)

summary(PCA)

plot(PCA)

PCA

Il biplot soffre della mancanza di standardizzazione.

**Esercizio. Provare a standardizzare, per vedere la differenza.**

AA = matrix(nrow=20,ncol=7)

AA[,1] = ( A[,1] - mean(A[,1]) ) / ( sd(A[,1]) )

mean(AA[,1])

[1] -6.00648e-17

sd(AA[,1])

[1] 1

for ( i in 1:7 )

{

AA[,i] = ( A[,i] - mean(A[,i]) ) / ( sd(A[,i]) )

}