

PCA

You ZUO

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Exo1

```
X<-read.table(text="
math scie fran lati d-m
jean 6.0 6.0 5.0 5.5 8.0
aline 8.0 8.0 8.0 8.0 9.0
annie 6.0 7.0 11.0 9.5 11.0
monique 14.5 14.5 15.5 15.0 8.0
didier 14.0 14.0 12.0 12.5 10.0
andr e 11.0 10.0 5.5 7.0 13.0
pierre 5.5 7.0 14.0 11.5 10.0
brigitte 13.0 12.5 8.5 9.5 12.0
evelyne 9.0 9.5 12.5 12.0 18.0
")

X <- scale(X, center = T, scale = F)
knitr::kable(X, format = "markdown", caption = "Tableau centr  ", digits = 2)
```

	math	scie	fran	lati	d.m
jean	-3.67	-3.83	-5.22	-4.56	-3
aline	-1.67	-1.83	-2.22	-2.06	-2
annie	-3.67	-2.83	0.78	-0.56	0
monique	4.83	4.67	5.28	4.94	-3
didier	4.33	4.17	1.78	2.44	-1
andr�e	1.33	0.17	-4.72	-3.06	2
pierre	-4.17	-2.83	3.78	1.44	-1
brigitte	3.33	2.67	-1.72	-0.56	1
evelyne	-0.67	-0.33	2.28	1.94	7

```
n <- nrow(X)
p <- ncol(X)
S <- var(X)*(n-1)/n
knitr::kable(S, format = "markdown", caption = "Matrice de variance", digits = 2)
```

	math	scie	fran	lati	d.m
math	11.39	9.92	2.66	4.82	0.11
scie	9.92	8.94	4.12	5.48	0.06
fran	2.66	4.12	12.06	9.29	0.39
lati	4.82	5.48	9.29	7.91	0.67
d.m	0.11	0.06	0.39	0.67	8.67

```
U <- eigen(S)$vectors
Lambda <- eigen(S)$values
```

Table 5: Contributions relatives des individus aux axes

jean	0.30	0.03	0.08	0.11	0.15
aline	0.06	0.00	0.04	0.04	0.02
annie	0.04	0.11	0.00	0.15	0.00
monique	0.37	0.00	0.14	0.15	0.11
didier	0.16	0.04	0.01	0.03	0.40
andr�e	0.03	0.20	0.09	0.00	0.25
pierre	0.00	0.36	0.04	0.07	0.02
brigitte	0.02	0.15	0.03	0.30	0.00
evelyne	0.01	0.11	0.56	0.14	0.04

```
C <- X%*%U
knitr::kable(C, format = "markdown", caption = "Composantes principales", digits = 2)
```

```
## Warning in kable_markdown(x = structure(c("jean", "aline", "annie",
## "monique", : The table should have a header (column names)
```

jean	-8.70	1.70	2.55	-0.15	-0.12
aline	-3.94	0.71	1.81	-0.09	0.04
annie	-3.21	-3.46	0.30	0.17	0.02
monique	9.76	-0.22	3.34	-0.17	0.10
didier	6.37	2.17	0.96	0.07	-0.19
andr�e	-2.97	4.65	-2.63	-0.02	0.15
pierre	-1.05	-6.23	1.69	0.12	0.04
brigitte	1.98	4.07	-1.40	0.24	0.01
evelyne	1.77	-3.40	-6.62	-0.16	-0.06

```
COR <- C^2 / rowSums(X^2)
knitr::kable(COR,format="markdown",
caption = "Contribution relative des axes aux individus",
digits = 2)
```

```
## Warning in kable_markdown(x = structure(c("jean", "aline", "annie",
## "monique", : The table should have a header (column names)
```

jean	0.89	0.03	0.08	0	0
aline	0.80	0.03	0.17	0	0
annie	0.46	0.53	0.00	0	0
monique	0.89	0.00	0.11	0	0
didier	0.88	0.10	0.02	0	0
andr�e	0.24	0.58	0.19	0	0
pierre	0.03	0.91	0.07	0	0
brigitte	0.17	0.74	0.09	0	0
evelyne	0.05	0.20	0.75	0	0

```
CTR<- 1/n* C^2 / matrix(eigen(S)$values,n,p,byrow = TRUE)
knitr::kable(CTR,format="latex",
caption = "Contributions relatives des individus aux axes",
digits = 2)
```

Table 6: Variables

2.73	1.97	-0.15	-0.04	0.06
2.69	1.29	-0.04	0.08	-0.05
2.62	-2.26	0.32	0.06	0.04
2.58	-1.12	0.07	-0.10	-0.05
0.16	-0.39	-2.91	0.01	0.00

Table 7: Variables normées

0.81	0.58	-0.04	-0.01	0.02
0.90	0.43	-0.01	0.03	-0.02
0.75	-0.65	0.09	0.02	0.01
0.92	-0.40	0.02	-0.04	-0.02
0.06	-0.13	-0.99	0.00	0.00

```
D<- U * matrix(sqrt(Lambda),p,p,byrow=TRUE)
knitr::kable(D,format="latex",
caption = "Variables",digits = 2)
```

```
F<- D / sqrt((1/n*colSums(X^2)))
knitr::kable(F,format="latex",
caption = "Variables normées",digits = 2)
```