

Trabalho Nº6 - Modelos Markovianos

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1. Resumo

HI-SEAS (Hawai'i Space Exploration Analog and Simulation) é um habitat em um local isolado semelhante a Marte no lado Mauna Loa da área de sela na Ilha Grande do Havaí, a aproximadamente 8200 pés acima do nível do mar. O HI-SEAS é único, além de sua configuração em um ambiente analógico diferenciado, como:

selecionamos a tripulação para atender às nossas necessidades de pesquisa (em análogos fortuitos, como estações antárticas, os critérios de seleção da tripulação não são controlados pelos pesquisadores); as condições (habitat, missão, comunicações, etc.) são explicitamente projetadas para serem semelhantes às de uma missão de exploração planetária; o local é acessível durante todo o ano e tem muito pouca variação de clima, permitindo estudos de ambiente isolado e confinado de maior duração do que em outros locais; o ambiente semelhante a Marte fornece tarefas analógicas de alta fidelidade, como trabalho de campo geológico realizado por exploradores humanos e / ou robôs. # 2. Introdução *****

1. Base de Dados

1.1 Descrição dos dados

A base original foi retirada do portal *Kaggle* e pode ser obtida no link www.kaggle.com. São dados coletados na estação meteorológica HI-SEAS de setembro a dezembro de 2016, no Havaí

UNIXTime: total de segundos desde 1 de janeiro de 1970; Data: data da coleta no formato “mm/dd/yyyy”; Time: hora da coleta no formato “hh:mm:ss”; WindDirectionG: direção do vento em graus; TimeSunRise e TimeSunSet: hora do nascer e pôr do sol; Radiation: nível de radiação solar medida em W/m² (watts por metro quadrado); Temperature: temperatura em graus Fahrenheit; Pressure: pressão barométrica medida em mm Hg (milímetros de mercúrio); Humidity: humidade relativa do ar em percentual; Speed: velocidade do vento medida em m/h (milhas por hour);

Para a nossa análise fizemos alguns ajustes na base original. A categorizamos a variável referente a direção do vento criamos algumas covariáveis com base nos dados originais

TimeHora: DiaNoite: WindDirection: DiaMes: Mes: TimeSeg:

Solar radiation: watts per meter² Temperature: degrees Fahrenheit Humidity: percent Barometric pressure: Hg Wind direction: degrees Wind speed: miles per hour Sunrise/sunset: Hawaii time

", sendo dados dos EUA, entre 1997-2002, de acidentes de carro relatados pela polícia nos quais há um evento prejudicial (pessoas ou propriedade) e do qual pelo menos um veículo foi rebocado. Os dados são restritos aos ocupantes do banco da frente, incluem apenas um subconjunto das variáveis registradas e são restritos de outras maneiras também.

Esses conjuntos de dados são dados meteorológicos da

Para cada conjunto de dados, os campos são:

A base original possui uma base de dados com 26.217 observações nas 15 variáveis a seguir.

```
## PACOTES USADOS
```

```
library(dplyr)
library(tidyr)
library(stringr)
library(ggplot2)
library(corrplot)
library(gamlss)
library(gamlss.data)
library(gamlss.dist)
```

```
## Carregando dados
```

```
dados = read.csv("SolarPredictionAjustada.csv", sep = ";", dec = ".", header = TRUE)
str(dados)
```

```
'data.frame': 32686 obs. of 17 variables:
```

```
$ i..UNIXTime : int 1472724008 1472724310 1472725206 1472725505 1472725809 1472726704 1472727006 1472727300 1472727600 1472727900 1472728200 1472728500 1472728800 1472729100 1472729400 1472729700 1472730000 1472730300 1472730600 1472730900 1472731200 1472731500 1472731800 1472732100 1472732400 1472732700 1472733000 1472733300 1472733600 1472733900 1472734200 1472734500 1472734800 1472735100 1472735400 1472735700 1472736000 1472736300 1472736600 1472736900 1472737200 1472737500 1472737800 1472738100 1472738400 1472738700 1472739000 1472739300 1472739600 1472739900 1472740200 1472740500 1472740800 1472741100 1472741400 1472741700 1472742000 1472742300 1472742600 1472742900 1472743200 1472743500 1472743800 1472744100 1472744400 1472744700 1472745000 1472745300 1472745600 1472745900 1472746200 1472746500 1472746800 1472747100 1472747400 1472747700 1472748000 1472748300 1472748600 1472748900 1472749200 1472749500 1472749800 1472750100 1472750400 1472750700 1472751000 1472751300 1472751600 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```

			3rd Qu.: 354.2	3rd Qu.:55.0
			Max. :1601.3	Max. :71.0
Pressure	Humidity	Speed	TimeHour	DiaMes
Min. :30.2	Min. : 8	Min. : 0.00	Min. : 0.0	Min. : 1.0
1st Qu.:30.4	1st Qu.: 56	1st Qu.: 3.37	1st Qu.: 6.0	1st Qu.: 9.0
Median :30.4	Median : 85	Median : 5.62	Median :12.0	Median :16.0
Mean :30.4	Mean : 75	Mean : 6.24	Mean :11.6	Mean :15.8
3rd Qu.:30.5	3rd Qu.: 97	3rd Qu.: 7.87	3rd Qu.:18.0	3rd Qu.:23.0
Max. :30.6	Max. :103	Max. :40.50	Max. :23.0	Max. :31.0
TimeSec	DayNight	WindDirection	Month	
Min. : 1	Min. :0.000	Length:32686	Min. : 9.0	
1st Qu.:21617	1st Qu.:0.000	Class :character	1st Qu.:10.0	
Median :43230	Median :0.000	Mode :character	Median :11.0	
Mean :43278	Mean :0.477		Mean :10.5	
3rd Qu.:64849	3rd Qu.:1.000		3rd Qu.:11.0	
Max. :86185	Max. :1.000		Max. :12.0	

```
## Ajustando base
```

```
dados$WindDirection <- as.factor(dados$WindDirection)
dados$DayNight <- as.factor(dados$DayNight)
dados$Month <- as.factor(dados$Month)

dados$Radiation <- as.numeric(dados$Radiation)
dados$Temperature <- as.numeric(dados$Temperature)
dados$Pressure <- as.numeric(dados$Pressure)
dados$Humidity <- as.numeric(dados$Humidity)
dados$Speed <- as.numeric(dados$Speed)
```

```
dados = dados[,-c(1,2,3,4,5,6)]
str(dados)
```

```
'data.frame': 32686 obs. of 11 variables:
 $ Radiation : num 2.58 2.83 2.16 2.21 2.25 2.15 2.07 2.06 2.1 2.07 ...
 $ Temperature : num 51 51 51 51 51 51 51 51 52 52 52 ...
 $ Pressure : num 30.4 30.4 30.4 30.4 30.4 ...
 $ Humidity : num 103 103 103 103 103 103 103 103 103 103 ...
 $ Speed : num 11.25 9 7.87 18 11.25 ...
 $ TimeHour : int 0 0 0 0 0 0 0 0 1 1 ...
 $ DiaMes : int 1 1 1 1 1 1 1 1 1 1 ...
 $ TimeSec : int 8 310 1206 1505 1809 2704 3006 3304 3607 3905 ...
 $ DayNight : Factor w/ 2 levels "0","1": 1 1 1 1 1 1 1 1 1 1 ...
 $ WindDirection: Factor w/ 8 levels "E","N","NE","NW",...: 1 6 6 6 3 1 6 1 1 1 ...
 $ Month : Factor w/ 4 levels "9","10","11",...: 1 1 1 1 1 1 1 1 1 1 ...
```

```
summary(dados)
```

Radiation	Temperature	Pressure	Humidity	Speed
-----------	-------------	----------	----------	-------

Min. :	1.1	Min. :	34.0	Min. :	30.2	Min. :	8	Min. :	0.00
1st Qu.:	1.2	1st Qu.:	46.0	1st Qu.:	30.4	1st Qu.:	56	1st Qu.:	3.37
Median :	2.7	Median :	50.0	Median :	30.4	Median :	85	Median :	5.62
Mean :	207.1	Mean :	51.1	Mean :	30.4	Mean :	75	Mean :	6.24
3rd Qu.:	354.2	3rd Qu.:	55.0	3rd Qu.:	30.5	3rd Qu.:	97	3rd Qu.:	7.87
Max. :	1601.3	Max. :	71.0	Max. :	30.6	Max. :	103	Max. :	40.50

TimeHour	DiaMes	TimeSec	DayNight	WindDirection
Min. : 0.0	Min. : 1.0	Min. : 1	0:17078	S :9232
1st Qu.: 6.0	1st Qu.: 9.0	1st Qu.:21617	1:15608	SE :7516
Median :12.0	Median :16.0	Median :43230		NE :4590
Mean :11.6	Mean :15.8	Mean :43278		E :4365
3rd Qu.:18.0	3rd Qu.:23.0	3rd Qu.:64849		N :3076
Max. :23.0	Max. :31.0	Max. :86185		NW :1735
				(Other):2172

Month
 9 :7417
 10:8821
 11:8284
 12:8164

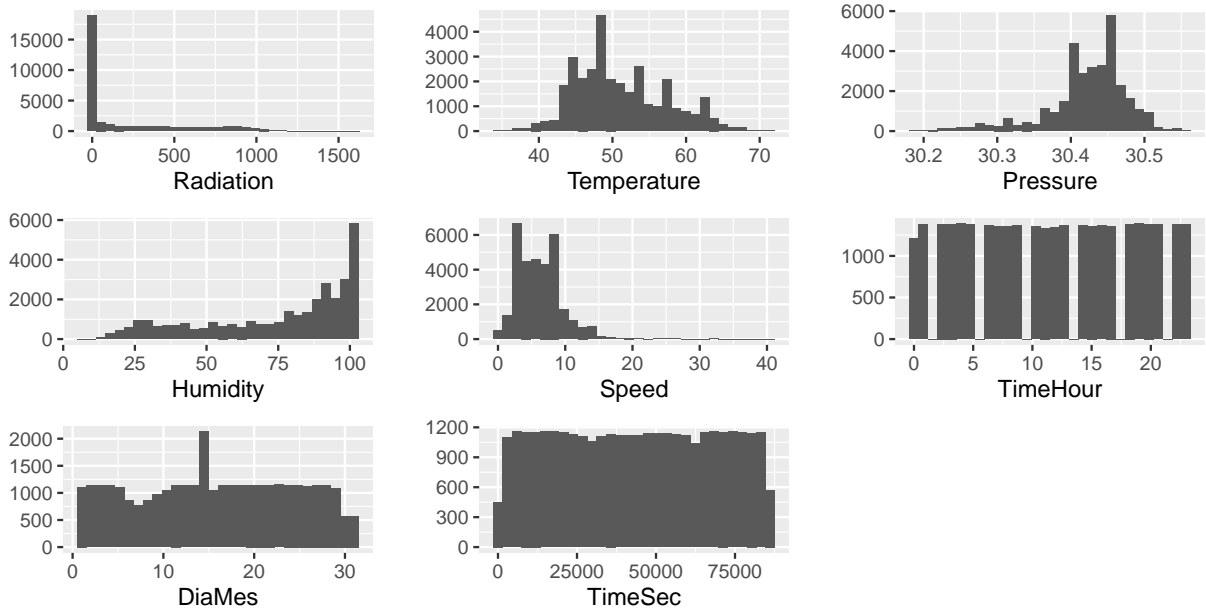
2 Análise Descritiva

2.1 Medidas de Resumo

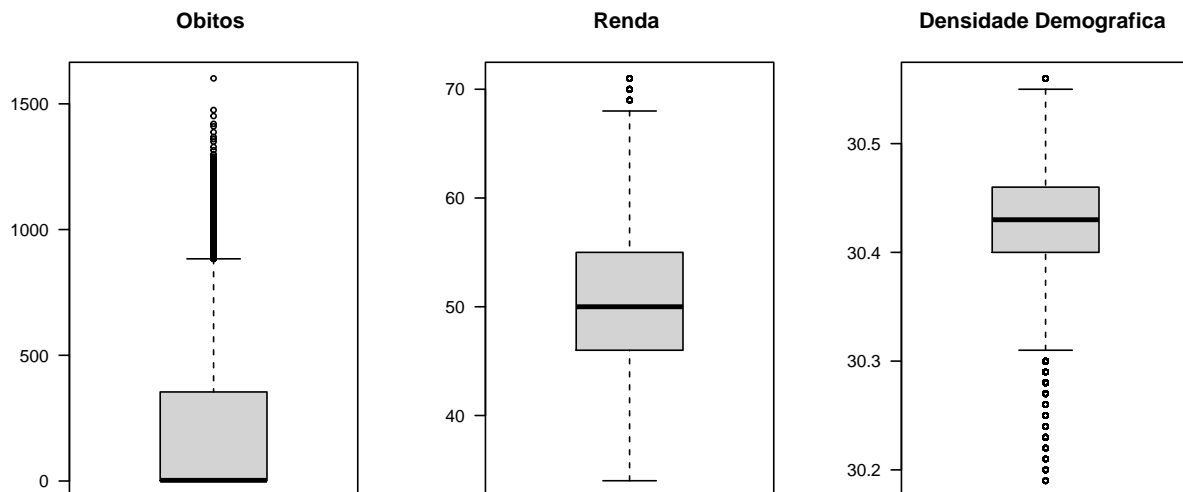
```
library(gridExtra)

g1 <- ggplot(dados, aes(x=Radiation)) + geom_histogram() + xlab('Radiation') + ylab('')
g2 <- ggplot(dados, aes(x=Temperature)) + geom_histogram() + xlab('Temperature') + ylab('')
g3 <- ggplot(dados, aes(x=Pressure)) + geom_histogram() + xlab('Pressure') + ylab('')
g4 <- ggplot(dados, aes(x=Humidity)) + geom_histogram() + xlab('Humidity') + ylab('')
g5 <- ggplot(dados, aes(x=Speed)) + geom_histogram() + xlab('Speed') + ylab('')
g6 <- ggplot(dados, aes(x=TimeHour)) + geom_histogram() + xlab('TimeHour') + ylab('')
g7 <- ggplot(dados, aes(x=DiaMes)) + geom_histogram() + xlab('DiaMes') + ylab('')
g8 <- ggplot(dados, aes(x=TimeSec)) + geom_histogram() + xlab('TimeSec') + ylab('')

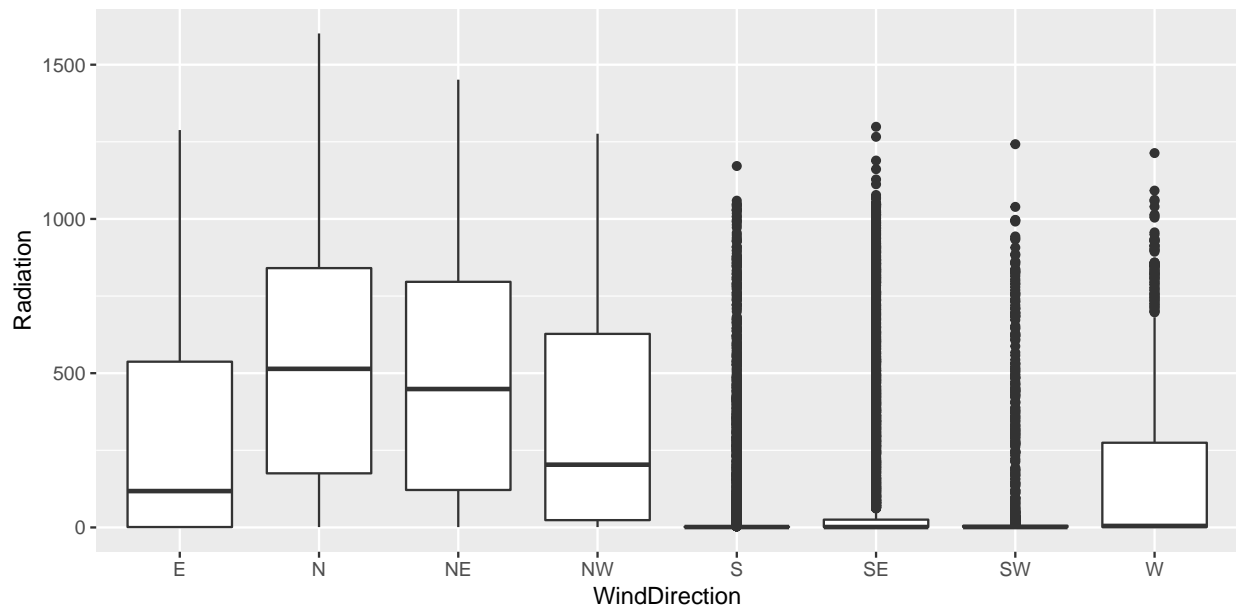
grid.arrange(g1,g2,g3,g4,g5,g6,g7,g8,ncol=3, nrow=3)
```



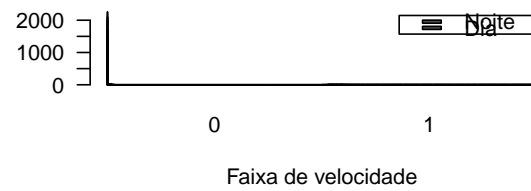
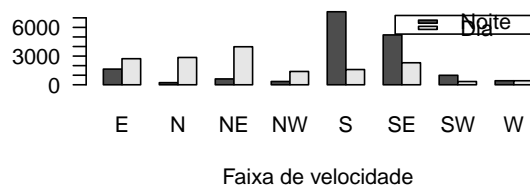
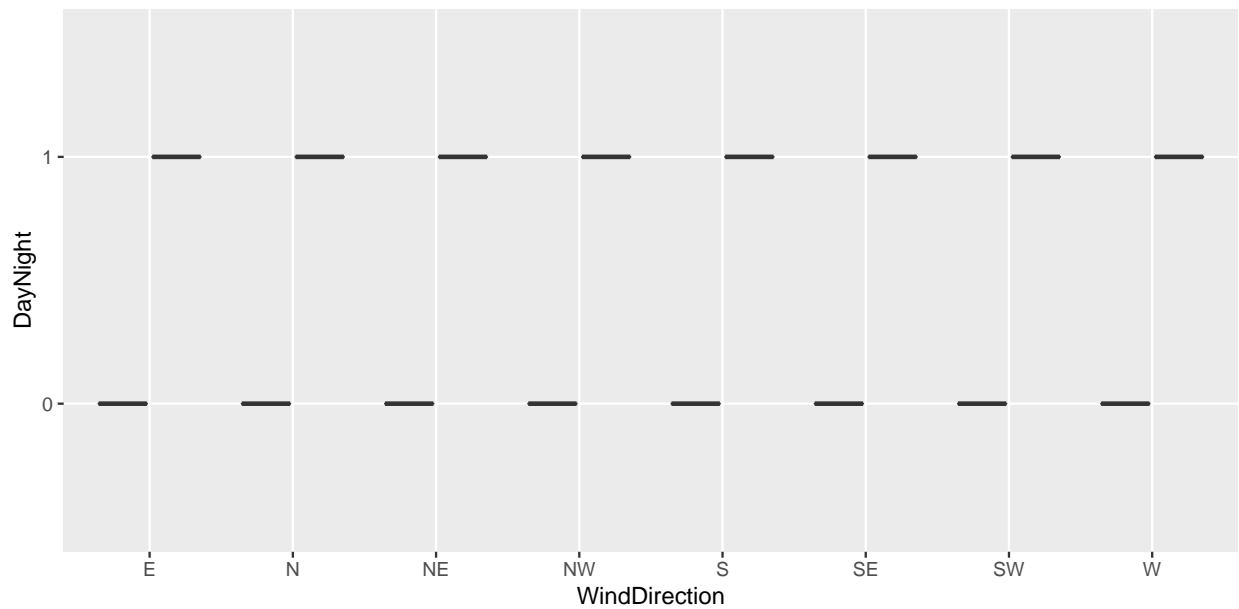
```
x11()
par(mfrow=c(1,3))
boxplot(dados$Radiation, xlab = '', ylab = '', main = 'Obitos ', las=1)
boxplot(dados$Temperature, xlab = '', ylab = '', main = 'Renda ', las=1)
boxplot(dados$Pressure, xlab = '', ylab = '', main = 'Densidade Demografica ', las=1)
```



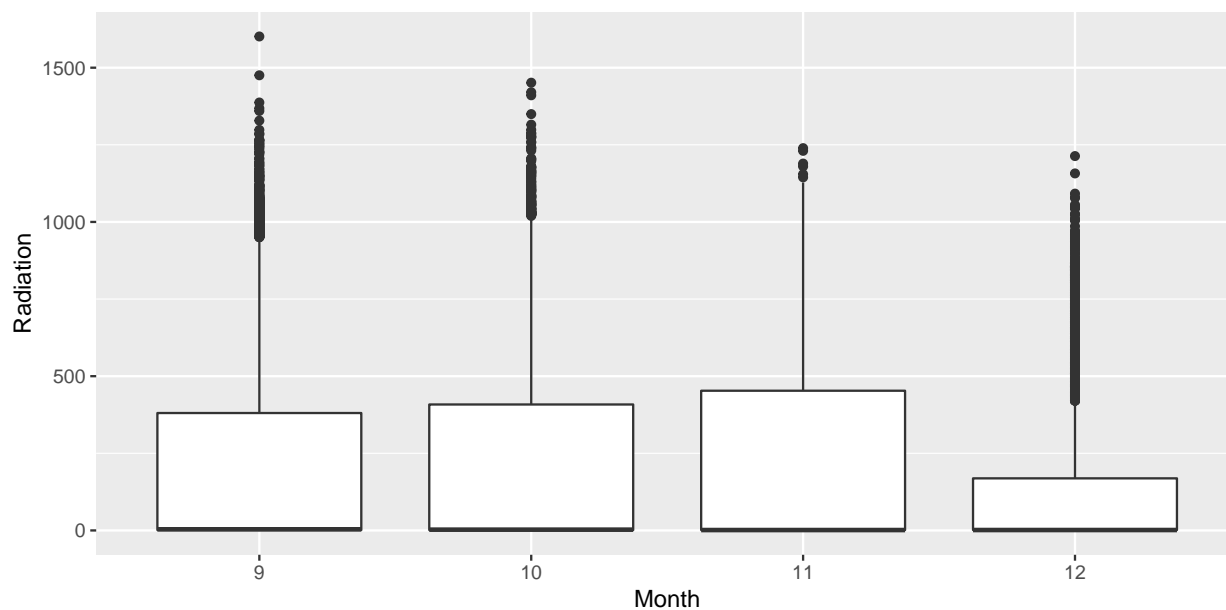
Direção vento X Radiaton



Direção vento X DiaNoite



Direção vento X Radiaton

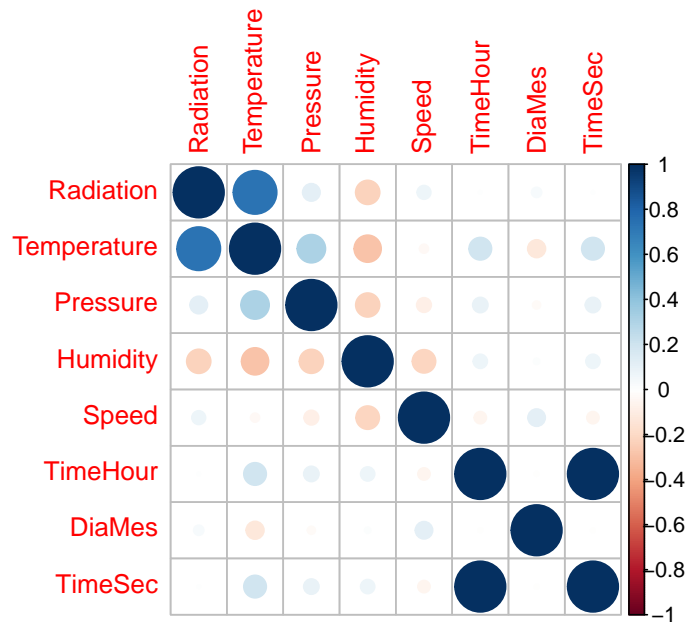


```
X <- cor(dados[,1:8])
K <- cor(dados[,c("Radiation", "Temperature")])
X
```

	Radiation	Temperature	Pressure	Humidity	Speed	TimeHour
Radiation	1.000000	0.73495	0.11902	-0.22617	0.07363	0.004398
Temperature	0.734955	1.00000	0.31117	-0.28505	-0.03146	0.197464
Pressure	0.119016	0.31117	1.00000	-0.22397	-0.08364	0.091069
Humidity	-0.226171	-0.28505	-0.22397	1.00000	-0.21162	0.077899
Speed	0.073627	-0.03146	-0.08364	-0.21162	1.00000	-0.057939
TimeHour	0.004398	0.19746	0.09107	0.07790	-0.05794	1.000000
DiaMes	0.039978	-0.12371	-0.02463	0.01464	0.11734	-0.008010
TimeSec	0.004348	0.19723	0.09107	0.07785	-0.05791	0.999134

	DiaMes	TimeSec
Radiation	0.039978	0.004348
Temperature	-0.123705	0.197227
Pressure	-0.024633	0.091066
Humidity	0.014637	0.077851
Speed	0.117337	-0.057908
TimeHour	-0.008010	0.999134
DiaMes	1.000000	-0.007966
TimeSec	-0.007966	1.000000

```
corrplot(X, method="circle")
```

```
X <- cor(dados[,1:8])
K <- cor(dados[,c("Radiation", "Temperature")])
X
```

	Radiation	Temperature	Pressure	Humidity	Speed	TimeHour
Radiation	1.000000	0.73495	0.11902	-0.22617	0.07363	0.004398
Temperature	0.734955	1.00000	0.31117	-0.28505	-0.03146	0.197464
Pressure	0.119016	0.31117	1.00000	-0.22397	-0.08364	0.091069
Humidity	-0.226171	-0.28505	-0.22397	1.00000	-0.21162	0.077899
Speed	0.073627	-0.03146	-0.08364	-0.21162	1.00000	-0.057939
TimeHour	0.004398	0.19746	0.09107	0.07790	-0.05794	1.000000
DiaMes	0.039978	-0.12371	-0.02463	0.01464	0.11734	-0.008010
TimeSec	0.004348	0.19723	0.09107	0.07785	-0.05791	0.999134

	DiaMes	TimeSec
Radiation	0.039978	0.004348
Temperature	-0.123705	0.197227
Pressure	-0.024633	0.091066
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Speed	0.117337	-0.057908
TimeHour	-0.008010	0.999134
DiaMes	1.000000	-0.007966
TimeSec	-0.007966	1.000000

```
corrplot(X, method="circle")
```

