HUDM6122 Homework_02

Chenguang Pan

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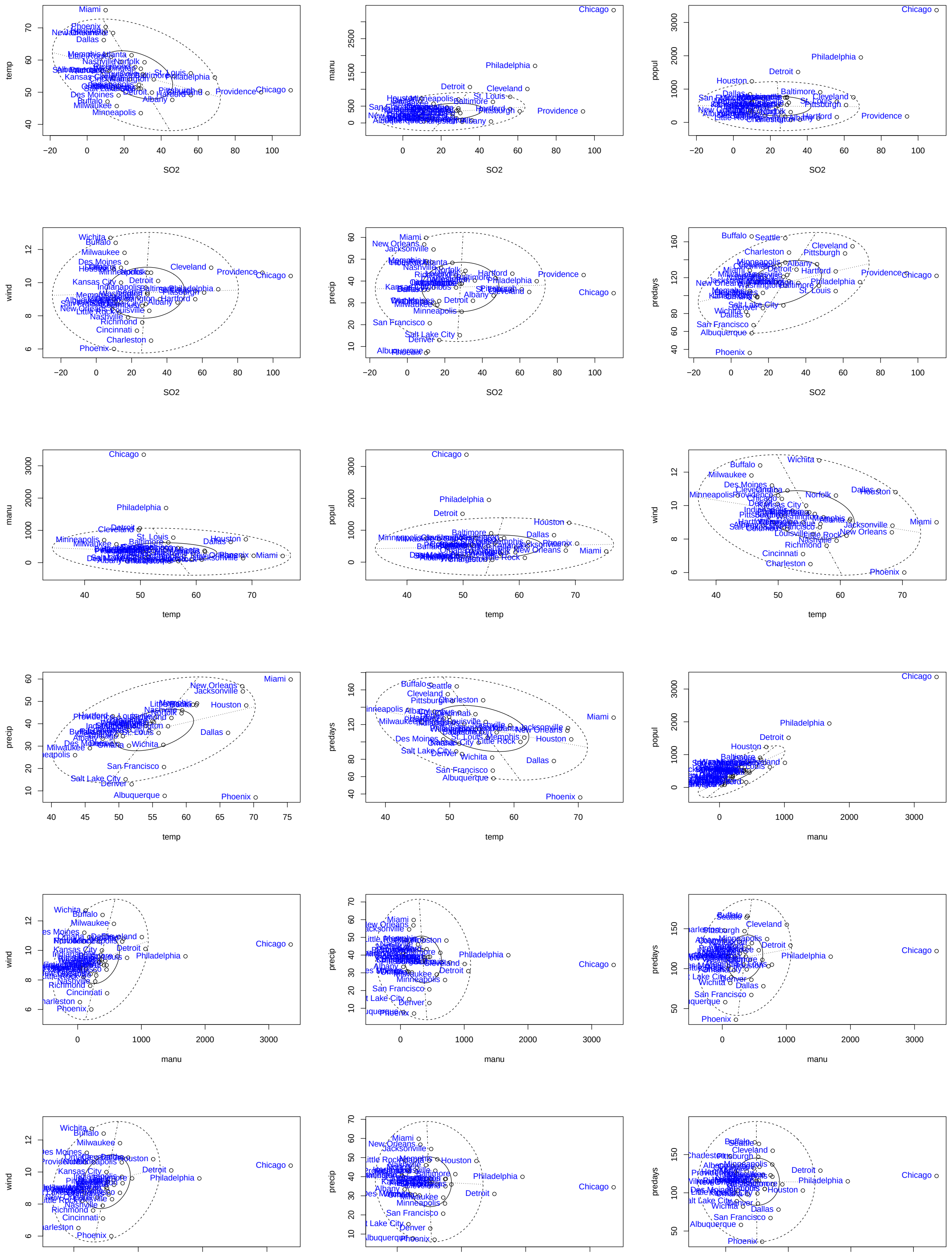
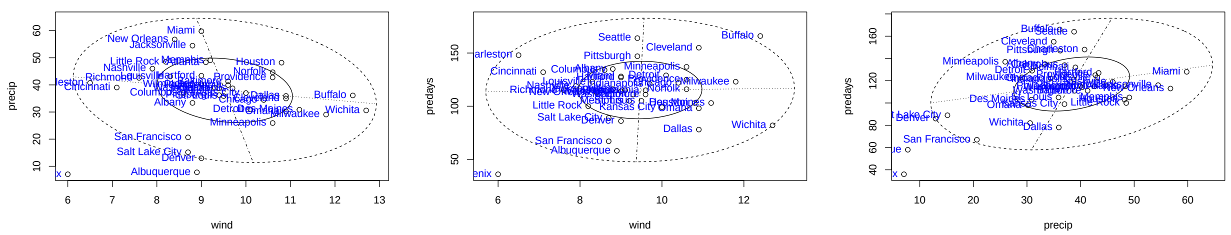
0.1 Ex. 2.1

Several techniques worth to be noted: - use a for-loop within a for-loop to map all pairs - use `text()` to give each point a name. - the bivariate boxplot function `bvbox` is inclueded in the package `MVA`

```
> # import the data
> library(HSAUR2)
> library(MVA)
> attach(USairpollution)
> head(USairpollution)
            SO2 temp manu popul wind precip predays
Albany       46 47.6   44   116  8.8  33.36     135
Albuquerque  11 56.8   46   244  8.9   7.77      58
Atlanta      24 61.5  368   497  9.1  48.34     115
Baltimore    47 55.0  625   905  9.6  41.31     111
Buffalo      11 47.1  391   463 12.4  36.11     166
Charleston   31 55.2   35    71  6.5  40.75     148
> dim(USairpollution)
[1] 41  7
> # draw the bivariate boxplot of each pair of variables with a for-loop
> for (i in 1:7) {
+   for (j in i:7) {
+     if (i != j) {
+       var_pair <- USairpollution[, c(i, j)]
+       bvbox(var_pair,
+             xlab = names(USairpollution)[i],
+             ylab = names(USairpollution)[j])
+       text(USairpollution[,i],USairpollution[,j],
+           row.names(USairpollution), # to add the point name
+           pos=2,col = "blue")
+     }
+   }
+ }
```


SO2
temp
manu
popul
wind
precip
predays
-20
0
20
40
60
80
100
Chicago
Miami
Phoenix
New Orleans
Dallas
Memphis
Atlanta
Nashville
Norfolk
Salt Lake City
Kansas City
St. Louis
Philadelphia
Providence
Des Moines
Buffalo
Milwaukee
Minneapolis
Albany
Detroit
Hartford
Pittsburgh
Cleveland
Baltimore
Houston
Wichita
Seattle
Charleston
Cincinnati
Richmond
Albuquerque
Denver
San Francisco
Jacksonville
Little Rock
Louisville
Indianapolis
Washington
Omaha
Columbus
Wilmington



From the graphs, we can easily find that the outliers among the observations are “Chicago”, “Detroit”, “Cleveland”,“Philadelphia”, “Miami”, “Phoenix”,“Albuquerque”, “Providence”. I run the correlation matrix on all observations first.

```
> # create the correaltion matrix on all observations
> round(cor(USairpollution),2)
          SO2  temp  manu popul  wind precip predays
SO2      1.00 -0.43  0.64  0.49  0.09   0.05    0.37
temp    -0.43  1.00 -0.19 -0.06 -0.35   0.39   -0.43
manu     0.64 -0.19  1.00  0.96  0.24  -0.03    0.13
popul    0.49 -0.06  0.96  1.00  0.21  -0.03    0.04
wind     0.09 -0.35  0.24  0.21  1.00  -0.01    0.16
precip   0.05  0.39 -0.03 -0.03 -0.01   1.00    0.50
predays  0.37 -0.43  0.13  0.04  0.16   0.50    1.00
> # remove all identified outliers
> drop_city <- match(c("Chicago", "Detroit","Cleveland",
+                      "Philadelphia", "Miami","Phoenix",
+                      "Albuquerque", "Providence"), rownames(USairpollution))
>
> round(cor(USairpollution[-drop_city,]),2)
          SO2  temp  manu popul  wind precip predays
SO2      1.00 -0.40  0.10 -0.16 -0.26  -0.03    0.39
temp    -0.40  1.00 -0.02  0.25 -0.21   0.64   -0.41
manu     0.10 -0.02  1.00  0.82  0.26  -0.15   -0.06
popul   -0.16  0.25  0.82  1.00  0.29   0.03   -0.13
wind    -0.26 -0.21  0.26  0.29  1.00  -0.26   -0.13
precip  -0.03  0.64 -0.15  0.03 -0.26   1.00    0.28
predays  0.39 -0.41 -0.06 -0.13 -0.13   0.28    1.00
```

Then remove all the outliers.