PCA: Houses

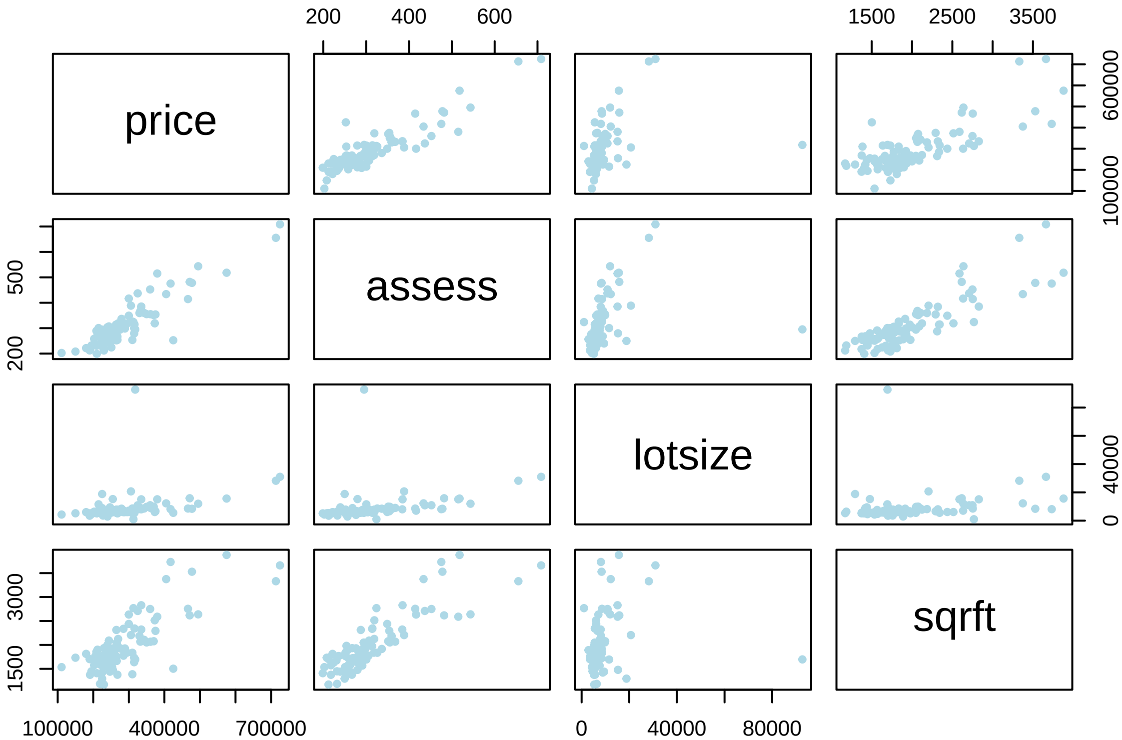
Gustavo Cepparo and Milica Cudina

First, we read in our house data.

```
data=read.csv("housepriceall.csv",header=TRUE)
attach(data)
```

Let me do a bit of exploratory data analysis.

```
plot(data, pch=20, col="lightblue")
```




```
cor(data)
```

```
##             price    assess   lotsize     sqrft
## price   1.0000000 0.9052794 0.3471245 0.7879065
## assess  0.9052794 1.0000000 0.3281463 0.8656345
## lotsize 0.3471245 0.3281463 1.0000000 0.1838422
## sqrft   0.7879065 0.8656345 0.1838422 1.0000000
```

Obviously, the scale of the price is different from the scale of the square footage. Also, the assessed price and the price are artificially on a different scale. Let's look at the means and variances.

```
apply(data, 2, mean)
```

```
##       price      assess     lotsize       sqrft
## 293546.0341    315.7364   9019.8636   2013.6932
```

```r
apply(data, 2, sd)
```

```
##        price       assess      lotsize        sqrft
## 102713.44517     95.31444  10174.15041    577.19158
```

Let's take a look at what the principal component analysis is telling us.

```r
pr.out<-prcomp(data, scale=TRUE)
```

Here are the outputs of `prcomp`.

```r
pr.out$center
```

```
##       price      assess     lotsize       sqrft
## 293546.0341    315.7364   9019.8636   2013.6932
```

```r
pr.out$scale
```

```
##        price       assess      lotsize        sqrft
## 102713.44517     95.31444  10174.15041    577.19158
```

```r
pr.out$rotation
```

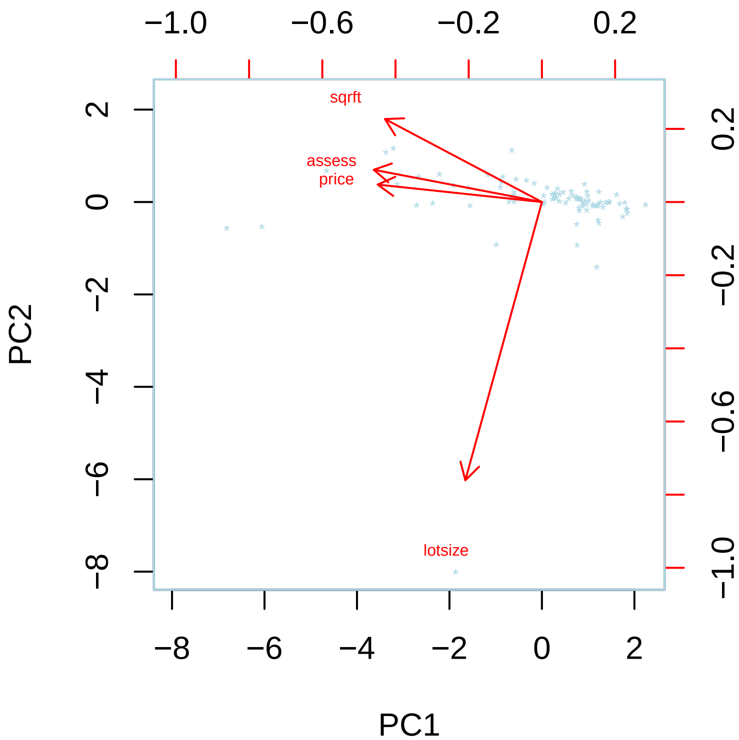
```
##                PC1         PC2        PC3         PC4
## price   -0.5608750  0.05950919 -0.6507820  0.50829197
## assess  -0.5742342  0.11020662 -0.1214913 -0.80209066
## lotsize -0.2615396 -0.95073388  0.1633602  0.03186797
## sqrft   -0.5359770  0.28358110  0.7314616  0.31188825
```

```r
dim(pr.out$x)
```

```
## [1] 88  4
```

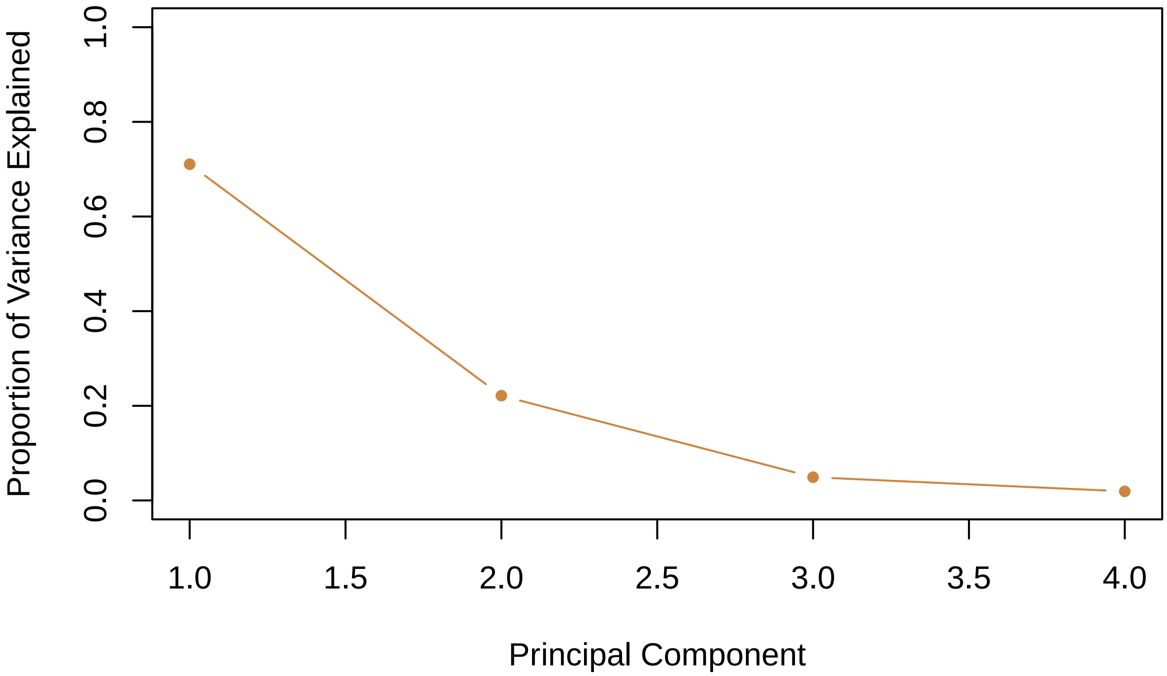
Of course, it's much better to look at the `biplot`.

```r
biplot(pr.out, scale=0, cex=0.5, xlabs=rep("*", length(price)),
       col=c("lightblue", "red"))
```



How many principal components are "sufficient"?

```
#transforming standard deviations to variances
pr.var=pr.out$sdev^2
#pr.var
#proportion of variance explained
pve=pr.var/sum(pr.var)
#pve
#plots
plot(pve,xlab="Principal Component", ylab="Proportion of Variance Explained", col="peru", pch=20,
ylim=c(0,1),type='b')
```




```
plot(cumsum(pve),xlab="Principal Component", ylab="Cumulative Proportion of Variance Explained", col="p
ylim=c(0,1),type='b')
```