Carseats: Categorical predictors

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Here, I am adapting the lab associated with Chapter 3 of the textbook.

Qualitative Predictors

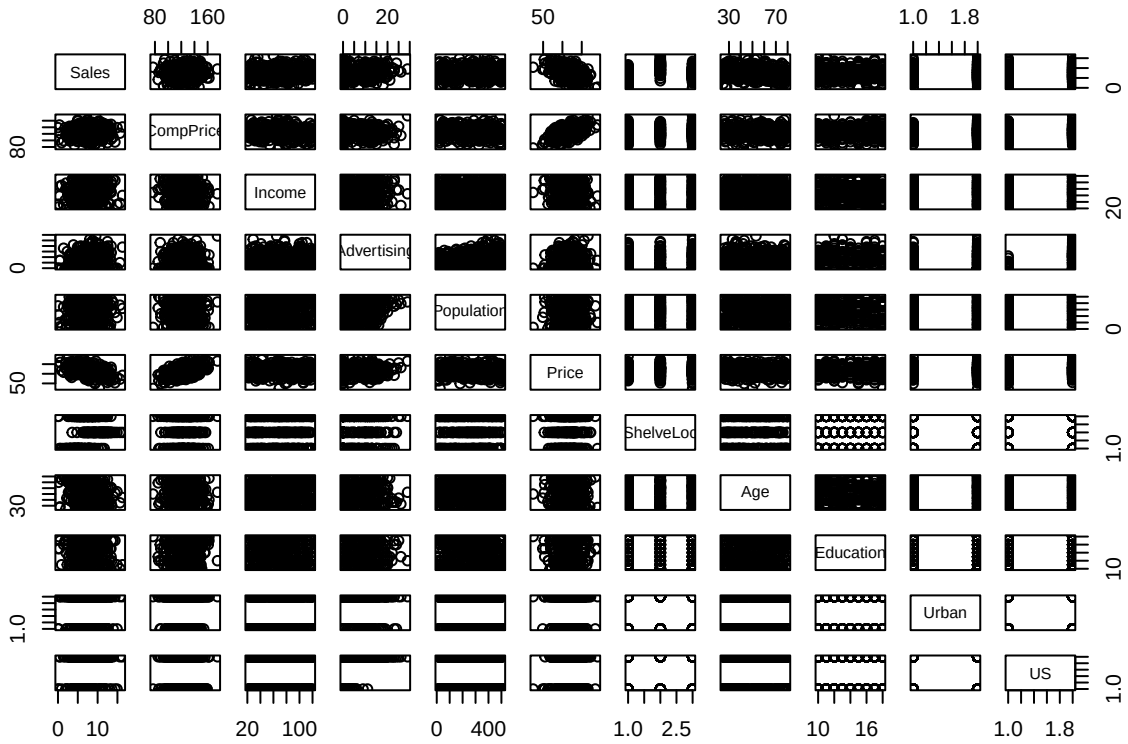
We will now examine the **simulated** `Carseats` data, which is part of the `ISLR2` library. We will attempt to predict `Sales` (child car seat sales) in 400 locations based on a number of predictors.

```
library(ISLR2)
head(Carseats)
```

```
##   Sales CompPrice Income Advertising Population Price ShelveLoc Age Education
## 1  9.50       138     73          11        276   120       Bad  42        17
## 2 11.22       111     48          16        260    83      Good  65        10
## 3 10.06       113     35          10        269    80    Medium  59        12
## 4  7.40       117    100           4        466    97    Medium  55        14
## 5  4.15       141     64           3        340   128       Bad  38        13
## 6 10.81       124    113          13        501    72       Bad  78        16
##   Urban  US
## 1   Yes Yes
## 2   Yes Yes
## 3   Yes Yes
## 4   Yes Yes
## 5   Yes  No
## 6    No Yes
```

What about a spreadsheet array?

```
plot(Carseats)
```



While we do not get much out of the array, we can easily identify the categorical predictors.

The `Carseats` data includes qualitative predictors such as `shelveloc`, an indicator of the quality of the shelving location—that is, the space within a store in which the car seat is displayed—at each location. The predictor `shelveloc` takes on three possible values: *Bad*, *Medium*, and *Good*. Given a qualitative variable such as `shelveloc`, `R` generates dummy variables automatically. Below we fit a multiple regression model that includes some interaction terms.

```
lm.fit <- lm(Sales ~ . + Income:Advertising + Price:Age,
    data = Carseats)
summary(lm.fit)
```

```
##
## Call:
## lm(formula = Sales ~ . + Income:Advertising + Price:Age, data = Carseats)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.9208 -0.7503  0.0177  0.6754  3.3413
##
## Coefficients:
##                       Estimate Std. Error t value       Pr(>|t|)
## (Intercept)          6.5755654  1.0087470   6.519 0.000000000222 ***
## CompPrice            0.0929371  0.0041183  22.567        < 2e-16 ***
## Income               0.0108940  0.0026044   4.183 0.000035665275 ***
## Advertising          0.0702462  0.0226091   3.107       0.002030 **
## Population           0.0001592  0.0003679   0.433       0.665330
## Price               -0.1008064  0.0074399 -13.549        < 2e-16 ***
## ShelveLocGood        4.8486762  0.1528378  31.724        < 2e-16 ***
## ShelveLocMedium      1.9532620  0.1257682  15.531        < 2e-16 ***
## Age                 -0.0579466  0.0159506  -3.633       0.000318 ***
## Education           -0.0208525  0.0196131  -1.063       0.288361
```

```
## UrbanYes            0.1401597  0.1124019   1.247       0.213171
## USYes              -0.1575571  0.1489234  -1.058       0.290729
## Income:Advertising  0.0007510  0.0002784   2.698       0.007290 **
## Price:Age           0.0001068  0.0001333   0.801       0.423812
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.011 on 386 degrees of freedom
## Multiple R-squared:  0.8761, Adjusted R-squared:  0.8719
## F-statistic:   210 on 13 and 386 DF,  p-value: < 2.2e-16
```

The `contrasts()` function returns the coding that `R` uses for the dummy variables.

```
attach(Carseats)
contrasts(ShelveLoc)
```

```
##        Good Medium
## Bad       0      0
## Good      1      0
## Medium    0      1
```

You should use `?contrasts` to learn about other contrasts, and how to set them.

`R` has created a `ShelveLocGood` dummy variable that takes on a value of 1 if the shelving location is good, and 0 otherwise. It has also created a `ShelveLocMedium` dummy variable that equals 1 if the shelving location is medium, and 0 otherwise. A bad shelving location corresponds to a zero for each of the two dummy variables. The fact that the coefficient for `ShelveLocGood` in the regression output is positive indicates that a good shelving location is associated with high sales (relative to a bad location). And `ShelveLocMedium` has a smaller positive coefficient, indicating that a medium shelving location is associated with higher sales than a bad shelving location but lower sales than a good shelving location.