NCSU ST 503 HW 10

Probems 11.1, 11.2, 11.3, and 11.4 Faraway, Julian J. Linear Models with R, Second Edition Chapman & Hall / CRC Press.

Bruce Campbell

05 November, 2017

11.1 seatpos PCR analysis

Using the seatpos data, perform a PCR analysis with hipcenter as the response and HtShoes, Ht, Seated, Arm, Thigh and Leg as predictors. Select an appropriate number of components and give an interpretation to those you choose. Add Age and Weight as predictors and repeat the analysis. Use both models to predict the response for predictors taking these values:

$(Age, Weight, HtShoes, Ht, Seated, Arm, Thigh, Leg) = (64.800, 263.700, 181.080, 178.560, 91.440, 35.640,$

```r
rm(list = ls())
data(seatpos, package="faraway")
df <- seatpos
df.pca.inputs <-subset ( df,select = c("HtShoes", "Ht", "Seated", "Arm", "Thigh","Leg"))
pca.seatpos <- prcomp(df.pca.inputs)
summary(pca.seatpos)
```

```
## Importance of components:
##                           PC1     PC2     PC3     PC4     PC5     PC6
## Standard deviation     17.1573 2.89689 2.11907 1.56412 1.22502 0.46218
## Proportion of Variance  0.9453 0.02695 0.01442 0.00786 0.00482 0.00069
## Cumulative Proportion   0.9453 0.97222 0.98664 0.99450 0.99931 1.00000
```

We see that the first two PCA cpmonents account for 97.2% of the variance and the prportion of the variance in the third component is 1.4%. WE choose to fit a regression model with the first two principal components.

First we investigate the loadings on the first two principal components to see if we can discern any patterns that will wllow for interpretation.

Table 1: First Principal Component

	first.pc.loadings
HtShoes	-0.649
Ht	-0.651
Seated	-0.268
Arm	-0.151
Thigh	-0.168
Leg	-0.181

Table 2: Second Principal Component

	first.pc.loadings
HtShoes	0.105
Ht	0.058
Seated	0.385
Arm	-0.463
Thigh	-0.789
Leg	-0.038

We see that the first component is an average size measure while the second is a contrast measure between $\{Arm, Thigh, Leg\}$ and $\{HtShoes, Ht, Seated\}$.

11.2

11.3

11.4