MCMC application

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Non-parametric bootstrap is used to compute a 95% confidence interval for the correlation between the Bodyfat and Weight variables.

```
# Function for correlation
corr.func <- function(data, index) {
  sample_data <- data[index, ]
  cor(sample_data$Bodyfat, sample_data$Weight)
}

boot.result <- boot(data = BodyFat,
                    statistic = corr.func,
                    R = 1000)

ci_bas <- boot.ci(boot.result, type = "basic") # Standard interval
ci_bca <- boot.ci(boot.result, type = "bca")   # Bias corrected
```

```
##     Lower     Upper
## 0.4824352 0.7379212
```

```
##     Lower     Upper
## 0.4460799 0.7019260
```

The firs interval being the standard interval and the second being bias corrected.

Next we will estimate a linear regression with BodyFat as the dependent variable and all the other nine variables as reggressors.

```
##
## Call:
## lm(formula = Bodyfat ~ ., data = BodyFat)
##
## Coefficients:
## (Intercept)          Age       Weight       Height         Neck        Chest
##  -23.664200     0.083779    -0.083322     0.035932     0.001123    -0.138742
##     Abdomen        Ankle       Biceps        Wrist
##    1.032741     0.225943     0.148276    -2.203399
```

Taking a closer look at the coefficient for Weight, we compute a 95% bootstrap confidence interval for the regression coefficient of Weight.

```
coef.func <- function(data, index) {
  data.sample <- data[index, ]
  model <- lm(Bodyfat ~ ., data = data.sample)
```

```
  coef.weight <- coef(model)["Weight"]
}


coef.boot.result <- boot(data = BodyFat,
                         statistic = coef.func,
                         R = 1000)

ci_bas <- boot.ci(coef.boot.result, type = "basic") # Standard interval
ci_bca <- boot.ci(coef.boot.result, type = "bca")   # Bias corrected
```

```
##       Lower       Upper
## -0.23165678  0.06738119
```

```
##       Lower       Upper
## -0.23743008  0.06153786
```

The firs interval being the standard interval and the second being bias corrected.

Lastly we will compare the bootstrap confidence interval for the weight coefficient to that we would get when making the usual assumption of normality. The confidence interval for the coefficient of weight when assuming normality we get by running the code below.

```
##       2.5 %      97.5 %
## -0.25160518  0.08496079
```

It is clear to see that using bootstrap, we are able to to get a narrower confidence interval.