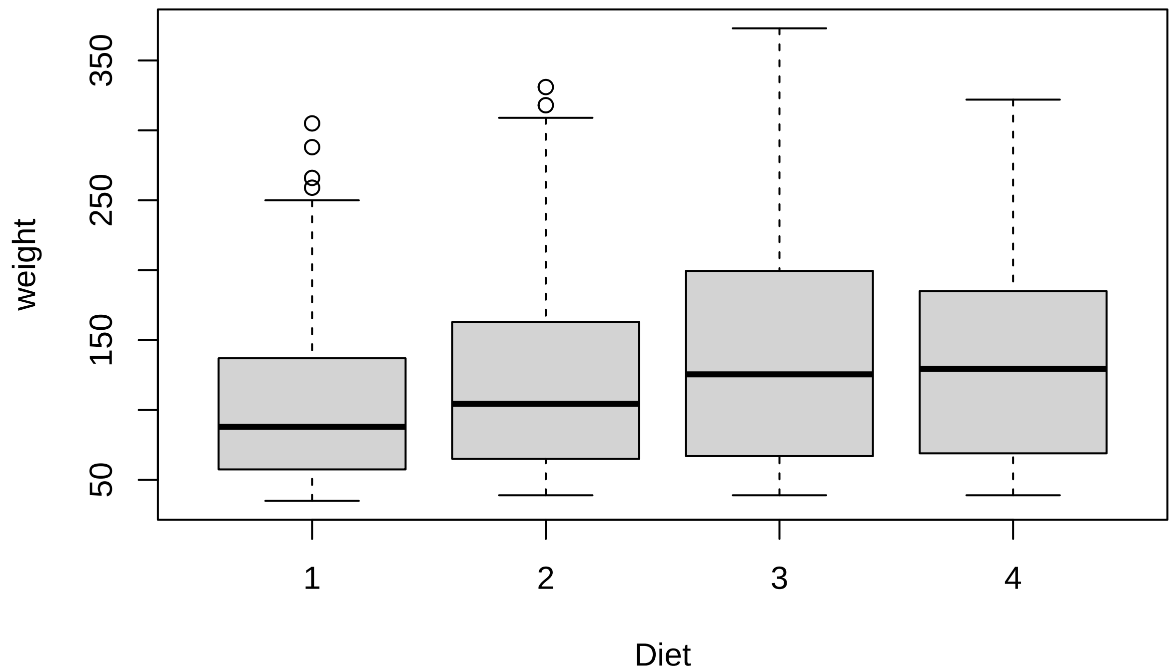
```r
# Activating the necessary libraries
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(readr)
# Reading my in-built dataset R-Chickweight
head(ChickWeight)
```

```
##   weight Time Chick Diet
## 1     42    0     1    1
## 2     51    2     1    1
## 3     59    4     1    1
## 4     64    6     1    1
## 5     76    8     1    1
## 6     93   10     1    1
```

```r
# Boxplot
# Plot between Diet and Weight of Chicken
boxplot(weight~Diet,ChickWeight)
```




```
# The below boxplots are based on the 4 different diets taken by the Chickens.
# Boxplot shows  us the distribution of data based on 5 number summary (minimum,1st Quartile(Q1)), Medi
# For Diet-1 we have values ranging from 40 to 250 i.e., minimum and maximum and we have a few outliers
# For Diet-2 we have minimum value almost same as Diet-1 i.e., 42 to 300 with 2 outliers. Median is aro
# For Diet-3 we have minimum value almost same as Diet-2 i.e., 42 to 350+. Median is around 106.
# For Diet-4 we have minimum value almost same as Diet-2 i.e., 42 to 300. Median is around 106.

# For Diet-3 we can say that the weight of chickens consuming Diet-3 is more as compared to other diets


# Finding the Average weight of chickens for of all the 4 diets.
mean(ChickWeight$weight[ChickWeight$Diet==1])
```

```
## [1] 102.6455
```

```
mean(ChickWeight$weight[ChickWeight$Diet==2])
```

```
## [1] 122.6167
```

```
mean(ChickWeight$weight[ChickWeight$Diet==3])
```

```
## [1] 142.95
```

```r
mean(ChickWeight$weight[ChickWeight$Diet==4])
```

```
## [1] 135.2627
```

```r
# Average weight of chicken for Diet-1 is 102.64gm
# Average weight of chicken for Diet-2 is 122.61gm
# Average weight of chicken for Diet-3 is 142.95gm
# Average weight of chicken for Diet-4 is 135.26gm
```

```r
# Finding Mean and Standard Deviation for Diet-3 and Diet-4

# Mean
mean(ChickWeight$weight[ChickWeight$Diet==3])
```

```
## [1] 142.95
```

```r
mean(ChickWeight$weight[ChickWeight$Diet==4])
```

```
## [1] 135.2627
```

```r
# Average weight of chicken for Diet-3 is 142.95gm
# Average weight of chicken for Diet-4 is 135.26gm

# Standard Deviation
sd(ChickWeight$weight[ChickWeight$Diet==3])
```

```
## [1] 86.54176
```

```r
sd(ChickWeight$weight[ChickWeight$Diet==4])
```

```
## [1] 68.82871
```

```r
# S.D. for  weight of chickens for Diet-3 is 86.5
# S.D. for  weight of chickens for Diet-3 is 68.8

# This implies data is more widely spread for Diet-3.
```

```r
# Running BESTmcmc Analysis:
library(BEST)
```

```
## Loading required package: HDInterval
```

```r
bestOut<-BESTmcmc(ChickWeight$weight[ChickWeight$Diet==3],ChickWeight$weight[ChickWeight$Diet==4])
```

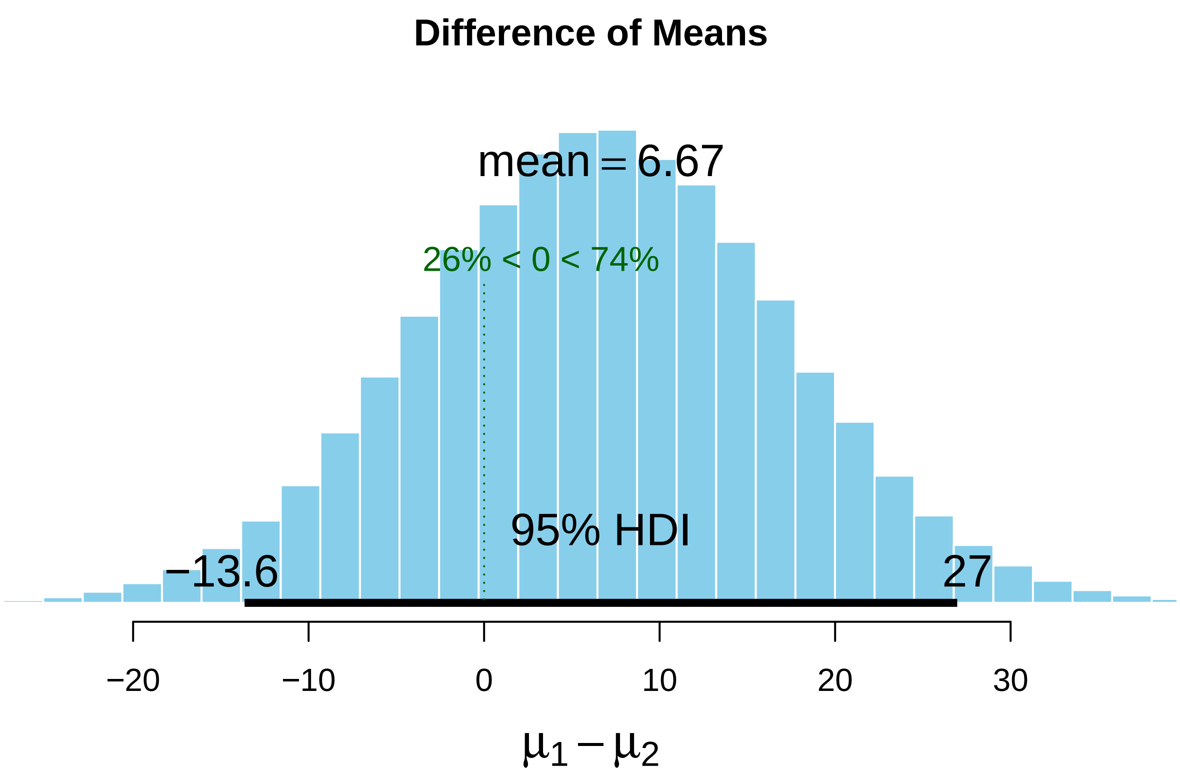
```
## Waiting for parallel processing to complete...
```

```
## done.
```

```r
bestOut
```

```
## MCMC fit results for BEST analysis:
## 100002 simulations saved.
##           mean     sd median   HDIlo  HDIup  Rhat n.eff
## mu1     141.31  8.080 141.28 125.310 157.05 1.000 62615
## mu2     134.64  6.520 134.67 121.565 147.08 1.000 58992
## nu       54.39 34.296  45.96   8.067 122.06 1.001 24531
## sigma1   85.62  5.887  85.36  74.332  97.29 1.000 53874
## sigma2   68.41  4.710  68.17  59.195  77.51 1.000 54943
##
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## 'Rhat' is the potential scale reduction factor (at convergence, Rhat=1).
## 'n.eff' is a crude measure of effective sample size.
```

```r
plot(bestOut)
```




```r
# HDI i.e., High Density Interval is ranging from -13.4 to 26.9. for Diet-3 and Diet-4.
# Greatest liklehood population mean difference is 6.67.
# %age of population mean difference less than zero is 25.7%
# %age population mean difference greater than zero is 74.3%
# Yes, the results are exactly the same as we interpreted because we have 0 in the 95% HDI ranging from
```

```r
# MCMC Fit Results.
bestOut
```

```
## MCMC fit results for BEST analysis:
## 100002 simulations saved.
##          mean     sd median   HDIlo  HDIup  Rhat n.eff
## mu1    141.31  8.080 141.28 125.310 157.05 1.000 62615
## mu2    134.64  6.520 134.67 121.565 147.08 1.000 58992
## nu      54.39 34.296  45.96   8.067 122.06 1.001 24531
## sigma1  85.62  5.887  85.36  74.332  97.29 1.000 53874
## sigma2  68.41  4.710  68.17  59.195  77.51 1.000 54943
##
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## 'Rhat' is the potential scale reduction factor (at convergence, Rhat=1).
## 'n.eff' is a crude measure of effective sample size.
```

```r
# 100002 simulations
# mu1=141.29 for Diet 3 and previous mean for Diet 3 was 142.95
# mu2=134.61 for Diet 4 and previous mean for Diet 4 was 135.26

# Both the means are very close to each other.

# sigma1=85.58 and previous sd for Diet 3 was 86.54
# sigma2=68.40 and previous sd for Diet 4 was 68.82

# Both the S.D. for each Diet depict how much they data is spread out.
```

```r
# Conducting a t-test for BEST Analysis.
# Diet 3 and Diet-4
t.test(ChickWeight$weight[ChickWeight$Diet==3],ChickWeight$weight[ChickWeight$Diet==4])
```

```
##
##  Welch Two Sample t-test
##
## data:  ChickWeight$weight[ChickWeight$Diet == 3] and ChickWeight$weight[ChickWeight$Diet == 4]
## t = 0.75908, df = 226.16, p-value = 0.4486
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -12.26840  27.64298
## sample estimates:
## mean of x mean of y
##  142.9500  135.2627
```

```r
# P-value is 0.4486 >0.05 that means there is no mean difference b/w the mean of two groups.
# Avg. weight of chickens having diet 3 and diet 4 is same.
```

Repeating process 3 to 6 for Diet-1 and Diet-2

```r
# Finding Mean and Standard Deviation for Diet-1 and Diet-2

# Mean
mean(ChickWeight$weight[ChickWeight$Diet==1])
```

```
## [1] 102.6455
```

```r
mean(ChickWeight$weight[ChickWeight$Diet==2])
```

```
## [1] 122.6167
```

```r
# Average weight of chicken for Diet-1 is 142.95gm
# Average weight of chicken for Diet-2 is 135.26gm

# Standard Deviation
sd(ChickWeight$weight[ChickWeight$Diet==1])
```

```
## [1] 56.65655
```

```r
sd(ChickWeight$weight[ChickWeight$Diet==2])
```

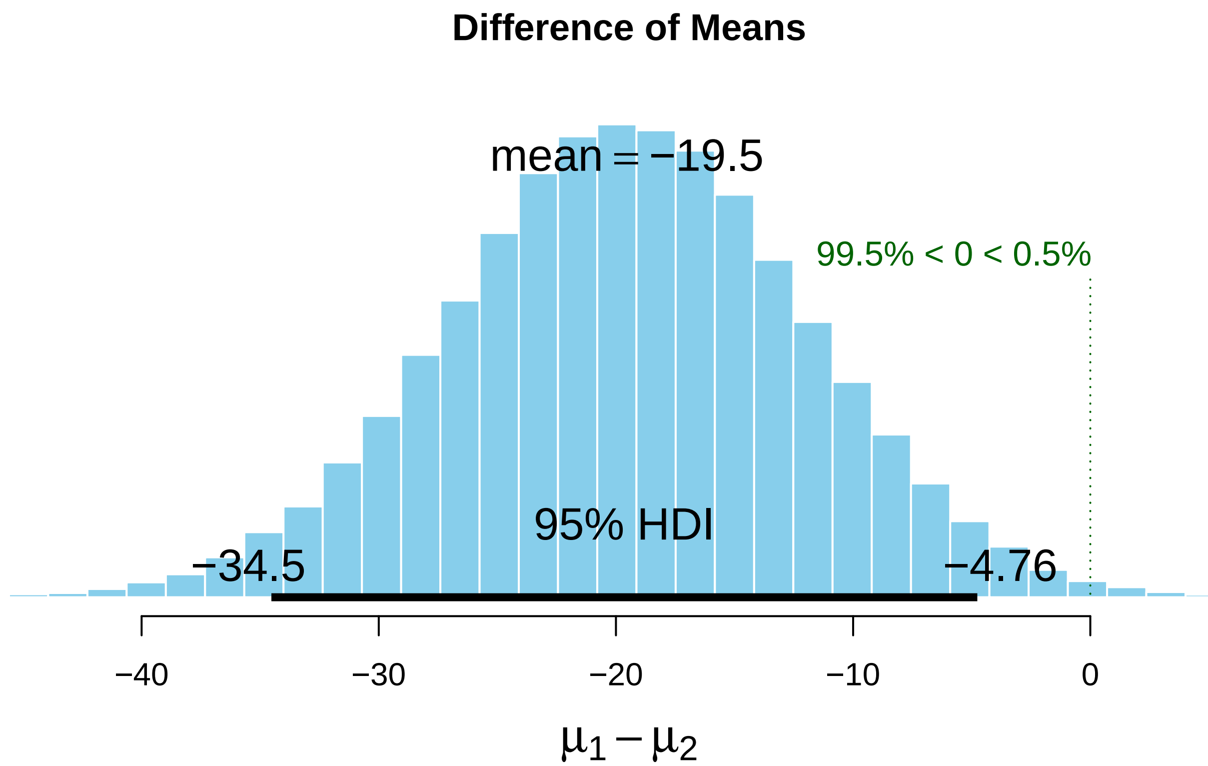
```
## [1] 71.60749
```

```r
# S.D. for  weight of chickens for Diet-1 is 56.65
# S.D. for  weight of chickens for Diet-2 is 71.60

# This implies data is more widely spread for Diet-3.
```

```r
# Running BESTmcmc Analysis:
library(BEST)

bestOut_2<-BESTmcmc(ChickWeight$weight[ChickWeight$Diet==1],ChickWeight$weight[ChickWeight$Diet==2])
```

```
## Waiting for parallel processing to complete...done.
```

```r
plot(bestOut_2)
```




```
# HDI i.e., High Density Interval is ranging from -34.3 to -4.48. for Diet-1 and Diet-2.
# Greatest likelihood population mean difference is -19.5.
# %age of population mean difference less than zero is 99.5%
# %age population mean difference greater than zero is 0.5%
# Yes, the results are exactly the same as we interpreted because we have 0 in the 95% HDI ranging from
```

```
# MCMC Fit Results.
bestOut_2
```

```
## MCMC fit results for BEST analysis:
## 100002 simulations saved.
##           mean     sd median  HDIlo  HDIup  Rhat n.eff
## mu1      99.21  4.284  99.22  90.82 107.54 1.001 27363
## mu2     118.75  6.889 118.72 105.50 132.53 1.000 38513
## nu       24.64 21.876  17.35   3.63  68.34 1.005  7961
## sigma1   52.89  3.605  52.94  45.70  59.87 1.002 18085
## sigma2   67.73  5.572  67.63  57.04  78.93 1.001 24214
##
## 'HDIlo' and 'HDIup' are the limits of a 95% HDI credible interval.
## 'Rhat' is the potential scale reduction factor (at convergence, Rhat=1).
## 'n.eff' is a crude measure of effective sample size.
```

```
# 100002 simulations
# mu1=99.21 for Diet 1 and previous mean for Diet 1 was 102.64
# mu2=118.68 for Diet 2 and previous mean for Diet 2 was 122.61
```

```r
# Both the means are very close to each other.

# sigma1=52.87 and previous S.D. for Diet 1 was 56.65.
# sigma2=67.66 and previous S.D. for Diet 2 was 71.60.

# Both the S.D. for each Diet depict how much they data is spread out.
```

```r
# Conduct a t-test
# Diet 1 and Diet-2
t.test(ChickWeight$weight[ChickWeight$Diet==1],ChickWeight$weight[ChickWeight$Diet==2])
```

```
##
##  Welch Two Sample t-test
##
## data:  ChickWeight$weight[ChickWeight$Diet == 1] and ChickWeight$weight[ChickWeight$Diet == 2]
## t = -2.6378, df = 201.38, p-value = 0.008995
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -34.899942  -5.042482
## sample estimates:
## mean of x mean of y
##  102.6455  122.6167
```

```r
# P-value is 0.0089 <0.05 that means there is a mean difference b/w the average weight chickens in two
# Avg. weight of chickens having diet 1 and diet 2 is different.
```