

ST30005 Multivariate Analysis

Tutorial Week 3

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Q1:

we will use data collected by Anderson (1935) on three species of irises in the Gaspé Peninsula of Quebec, Canada. The data are of historical interest in statistics, because they were employed by R. A. Fisher (1936) to introduce the method of discriminant analysis. The data frame `iris` is part of the standard R distribution:

```
library(car)
dim(iris)

## [1] 150  5

head(iris)

##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1         5.1         3.5         1.4         0.2  setosa
## 2         4.9         3.0         1.4         0.2  setosa
## 3         4.7         3.2         1.3         0.2  setosa
## 4         4.6         3.1         1.5         0.2  setosa
## 5         5.0         3.6         1.4         0.2  setosa
## 6         5.4         3.9         1.7         0.4  setosa

str(iris)

## 'data.frame': 150 obs. of  5 variables:
##  $ Sepal.Length: num  5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...
##  $ Sepal.Width : num  3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...
##  $ Petal.Length: num  1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...
##  $ Petal.Width : num  0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...
##  $ Species     : Factor w/ 3 levels "setosa","versicolor",...: 1 1 1 1 1 1 1 1 1 1 ...
```

The first four variables in the data set represent measurements (in cm) of parts of the flowers, while the final variable specifies the species of iris (three species). (Sepals are the green leaves that comprise the calyx of the plant, which encloses the flower.)

Perform a MANOVA to assess any statistical significant difference in three species of iris flowers with the flower characteristics.

Q2:

Different soil characteristics were measured on three types of contours (Top, Slope & Depression) and at four depths. Data is given in the *Soils* data set in the `car` package. Using contours as the grouping variable and the variables pH, N, Dens, P, Ca, Mg, K, Na & Conduc as dependent variables, conduct one-way MANOVA to assess the differences of contour types with the soil characteristics. Explain the results.