kNN Clustering - Classification

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This example shows how to do knn clustering for classification.

The iris database comes with R. It has 150 instances and 5 columns: - Sepal.Length - Sepal.Width - Petal.Length - Petal.Width - Species: setosa, versicolor or virginica

Load and look at the data

```
attach(iris)
str(iris)    # display the structure of the object
```

```
## '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 ...
```

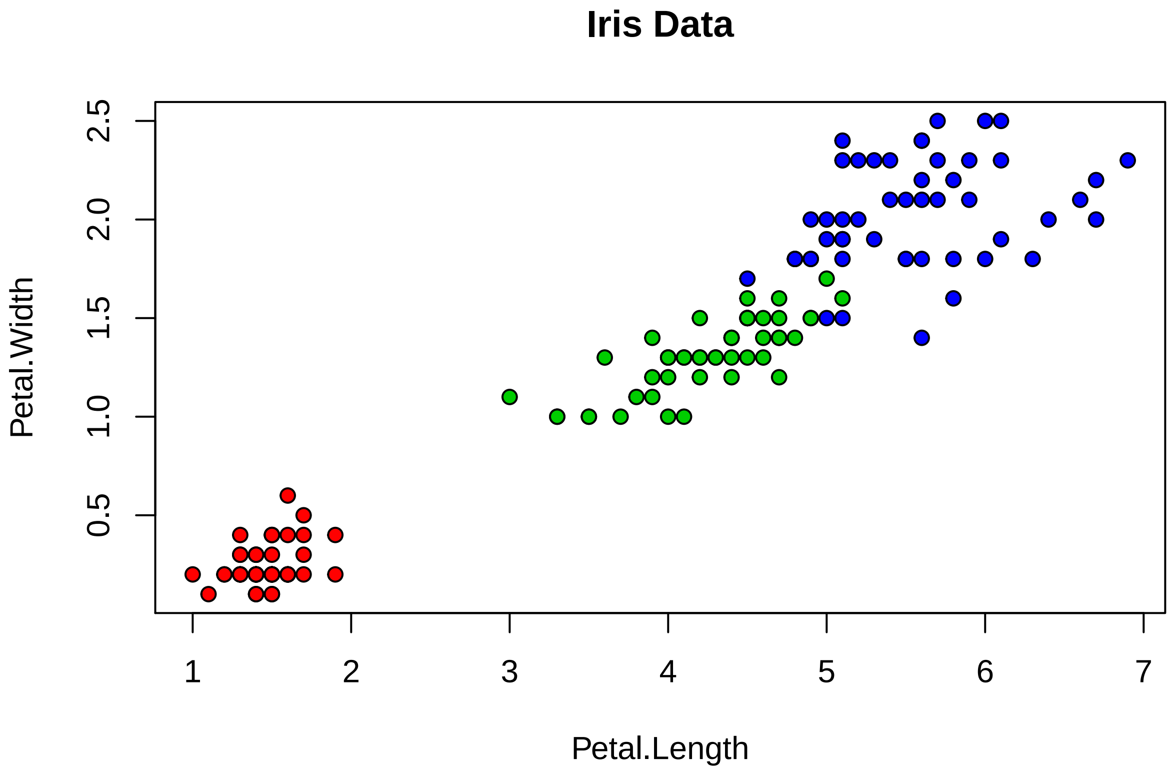
```
summary(iris)
```

```
##   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width   
##  Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100  
##  1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300  
##  Median :5.800   Median :3.000   Median :4.350   Median :1.300  
##  Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199  
##  3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800  
##  Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500  
##        Species  
##  setosa    :50  
##  versicolor:50  
##  virginica :50  
##                 
##                 
## 
```

Plot the data

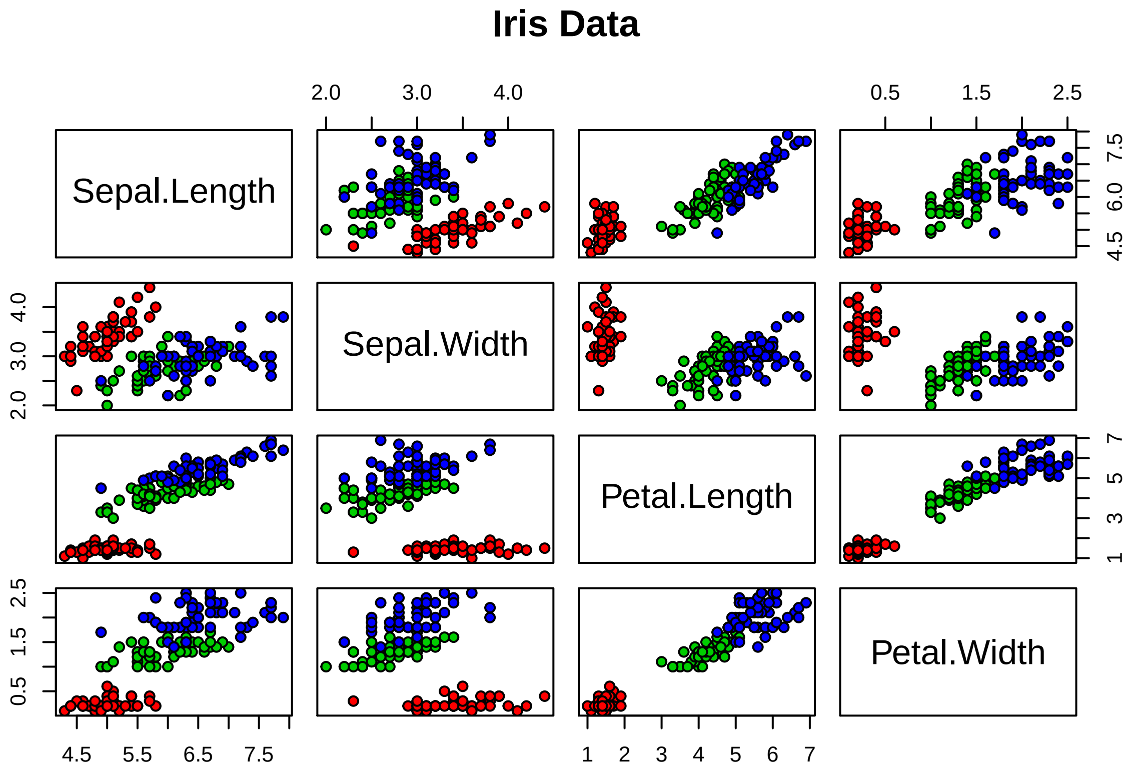
We let the 3 classes show as 3 different colors with the bg parameter and the "unclass" values 1, 2, 3 representing the 3 types of irises.

```
plot(Petal.Length, Petal.Width, pch=21, bg=c("red","green3","blue")
     [unclass(Species)], main="Iris Data")
```



Pairs scatter plots

```
pairs(iris[1:4], main = "Iris Data", pch = 21, bg = c("red", "green3", "blue")[unclass(Species)])
```



Divide into train/test sets

We will randomly sample the data set to let 2/3 be training and 1/3 test,

```
set.seed(1958)  # setting a seed gets the same results every time
ind <- sample(2, nrow(iris), replace=TRUE, prob=c(0.67, 0.33))
iris.train <- iris[ind==1, 1:4]
iris.test <- iris[ind==2, 1:4]
iris.trainLabels <- iris[ind==1, 5]
iris.testLabels <- iris[ind==2, 5]
```

Classify

The knn() function uses Euclidean distance to find the k nearest neighbors.

Classificiation is decided by majority vote with ties broken at random.

Using an odd k can avoid some ties.

```
library(class)
iris_pred <- knn(train=iris.train, test=iris.test, cl=iris.trainLabels, k=3)
```

Compute accuracy

We built a classifier with 98% accuracy.

It's often a good idea to scale the variables for clustring to make the distance calculations better. However in this case, the 3 predictors are roughly in the same scale so it's probably not necessary.

```
results <- iris_pred == iris.testLabels
acc <- length(which(results==TRUE)) / length(results)
# or combine into one line:
#acc <- length(which(iris_pred == iris.testLabels)) / length(iris_pred)
acc
```

```
## [1] 0.98
```