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Instituto Tecnológico de Tijuana

Subdirección Académica
Departamento de Sistemas y Computación
Ingeniería en Sistemas Computacionales
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MINERÍA DE DATOS

BDD-1703SC9A

"Practice 4"

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"Por una juventud integrada al desarrollo de México"

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Practice 4

In this practice, an example of the KNN model will be developed, firstly, the data will be stored in a variable using the "Read" method, to have a better use of the data it is necessary to select only the fields' Age, estimated salary and purchased " .

```
# Importing the dataset
dataset = read.csv('Social_Network_Ads.csv')
dataset = dataset[3:5]
```

The "factor" function is used to encode a vector as a factor (the terms "category" and "enumerated type" are also used for factors), we change the categorical values to 0 and 1.

```
# Encoding the target feature as factor
dataset$Purchased = factor(dataset$Purchased, levels = c(0, 1))
```

To perform the division of the dataset for training and testing we use the "caTools" library, specifying the randomness coefficient as 123. The data will be divided into a 75% margin for training and the remainder for testing, each percentage of dataset will have its own independent variable.

```
# Splitting the dataset into the Training set and Test set
# install.packages('caTools')
library(caTools)
set.seed(123)
split = sample.split(dataset$Purchased, SplitRatio = 0.75)
training_set = subset(dataset, split == TRUE)
test_set = subset(dataset, split == FALSE)
```

We scale the training and test data to perform better on predictions.

```
# Feature Scaling
training_set[-3] = scale(training_set[-3])
test_set[-3] = scale(test_set[-3])
```

To make the prediction it is necessary to import the "class" library which contains the knn function where the values of:

- train: using the specific training data in the “Age” and “EstimatedSalary” fields.
- test: using the specific test data in the "Age" and "EstimatedSalary" fields.
- cl: using the "Purchased" field as the true classification factor.
- k: using 5 as the neighbor number of the training dataset.
- prob: using "true".

```
# Fitting K-NN to the Training set and Predicting the Test set results
library(class)
y_pred = knn(train = training_set[, -3],
             test = test_set[, -3],
             cl = training_set[, 3],
             k = 5,
             prob = TRUE)
y_pred
```

Result:

```
> y_pred
  [1] 0 0 0 0 0 1 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0
 [50] 0 0 0 1 1 1 0 1 0 0 1 0 0 0 1 1 0 1 1 1 1 1 1 1 0 0 0 1 0 0 1 0 1 0 1 0
1 1 0 0 1 1 0 1 0 1 1 1 1
 [99] 0 1
attr(,"prob")
  [1] 1.0 1.0 1.0 1.0 1.0 0.8 0.8 1.0 0.6 1.0 1.0 1.0 0.8 1.0 1.0 1.0 1.0 1.0
1.0 1.0 0.6 1.0 1.0 0.8
 [25] 1.0 0.8 1.0 1.0 0.8 1.0 1.0 0.8 0.8 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.8 1.0
1.0 1.0 0.8 1.0 1.0 1.0
 [49] 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.8 0.8 0.8 1.0 0.6 1.0 0.6 1.0
0.8 0.8 1.0 0.8 0.8 0.8
 [73] 0.8 0.8 0.6 1.0 0.8 1.0 1.0 1.0 1.0 0.8 1.0 1.0 0.8 0.8 0.8 0.6 0.8 1.0
0.8 0.8 0.8 0.8 1.0 0.6
 [97] 1.0 0.8 1.0 1.0
Levels: 0 1
```

To verify the correct use of the data, it shows a confusion matrix, using the test set and the prediction as parameters.

```
# Making the Confusion Matrix
cm = table(test_set[, 3], y_pred)
cm
```

Result:

```
> cm
   y_pred
     0  1
  0 59  5
  1  6 30
```

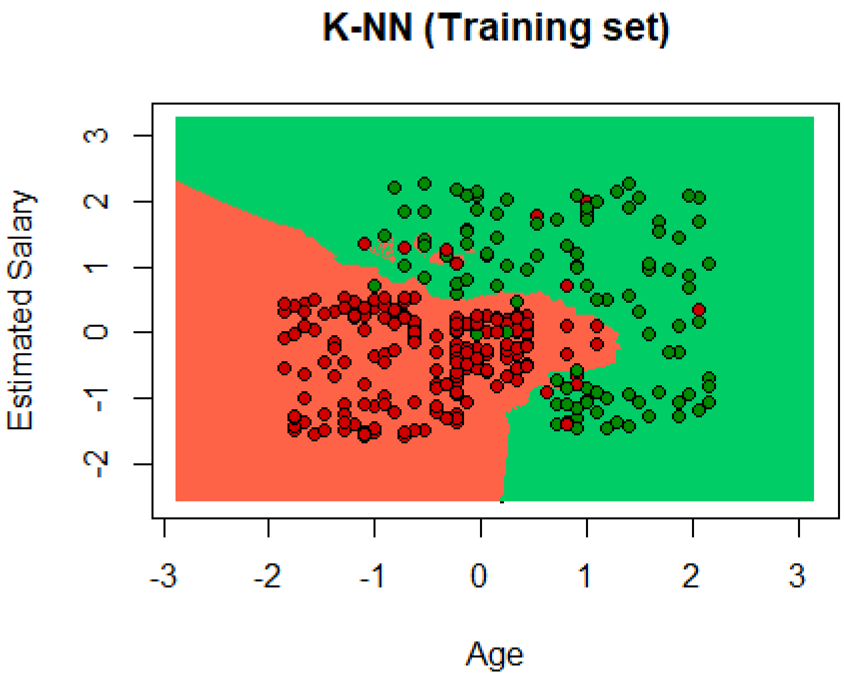
Finally we will show a graph using the "ElemStatLearn" library that allows a better visualization of the KNN model with the training data.

1. We import the library
2. In a new variable we define the data of the training dataset
3. We create 2 new variables with the transformation of the values of the “Age” field for “X1” and the “Estimated Salary” field for “X2”
4. We create a data frame "grid_set" from all the combinations of the vectors or factors provided previously
5. The names of the fields are changed to their previous ones
6. We generate a new variable "y_grid" for the prediction, where the method "KNN" is used using the values of the previous example as a parameter, in this case changing the test parameter for grid_set

7. We start the visualization of the data, defining the main name as well as the X axis and the Y axis, marking the limits of both with the values obtained from the variables X1 and X2
8. We add a contour line to the existing graph, using the "contour" method with the parameters of the sequences X1 and X2, as well as the values obtained in the prediction "y_grid"
9. Ending with the "points" methods that allow to make a change in the design of the graph to visually show the separation of the categories by sections and the points as such in different colors

```
# Visualising the Training set results
library(ElemStatLearn)
set = training_set
X1 = seq(min(set[, 1]) - 1, max(set[, 1]) + 1, by = 0.01)
X2 = seq(min(set[, 2]) - 1, max(set[, 2]) + 1, by = 0.01)
grid_set = expand.grid(X1, X2)
colnames(grid_set) = c('Age', 'EstimatedSalary')
y_grid = knn(train = training_set[, -3], test = grid_set, cl = training_set[,
3], k = 5)
plot(set[, -3],
     main = 'K-NN (Training set)',
     xlab = 'Age', ylab = 'Estimated Salary',
     xlim = range(X1), ylim = range(X2))
contour(X1, X2, matrix(as.numeric(y_grid), length(X1), length(X2)), add =
TRUE)
points(grid_set, pch = '.', col = ifelse(y_grid == 1, 'springgreen3',
'tomato'))
points(set, pch = 21, bg = ifelse(set[, 3] == 1, 'green4', 'red3'))
```

Result:



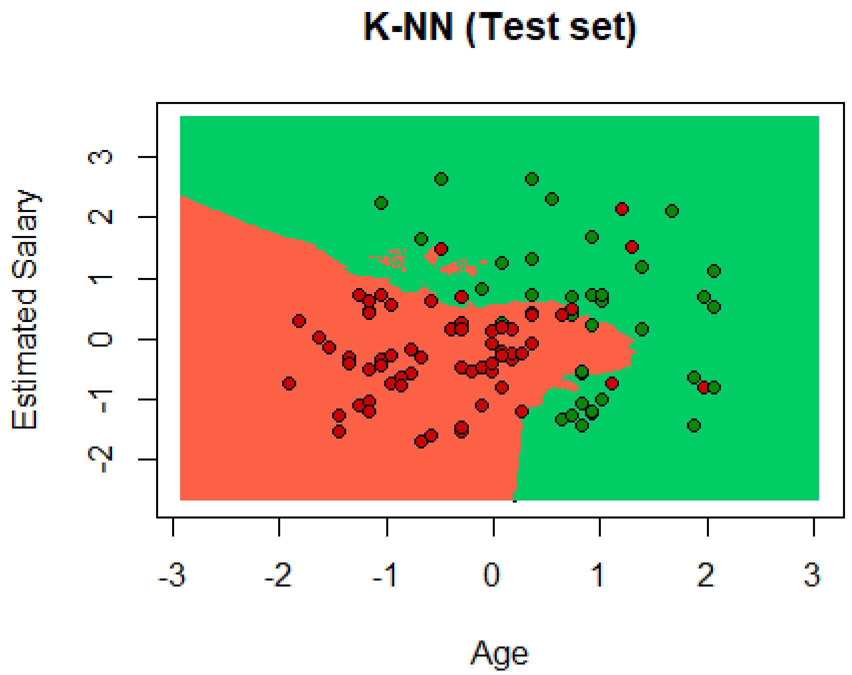
In the same way as the previous graph, now with the test dataset we use the "ElemStatLearn" library that allows a better visualization of the KNN model with the test data.

1. We import the library
2. In a new variable we define the data of the test dataset
3. We create 2 new variables with the transformation of the values of the “Age” field for “X1” and the “Estimated Salary” field for “X2”
4. We create a data frame "grid_set" from all the combinations of the vectors or factors provided previously
5. The names of the fields are changed to their previous ones
6. We generate a new variable "y_grid" for the prediction, where the method "KNN" is used using the values of the previous example as a parameter, in this case changing the test parameter for grid_set
7. We start the visualization of the data, defining the main name as well as the X axis and the Y axis, marking the limits of both with the values obtained from the variables X1 and X2
8. We add a contour line to the existing graph, using the "contour" method with the parameters of the sequences X1 and X2, as well as the values obtained in the prediction "y_grid"
9. Ending with the "points" methods that allow to make a change in the design of the graph to visually show the separation of the categories by sections and the points as such in different colors

```
# Visualising the Test set results
library(ElemStatLearn)
set = test_set
```

```
X1 = seq(min(set[, 1]) - 1, max(set[, 1]) + 1, by = 0.01)
X2 = seq(min(set[, 2]) - 1, max(set[, 2]) + 1, by = 0.01)
grid_set = expand.grid(X1, X2)
colnames(grid_set) = c('Age', 'EstimatedSalary')
y_grid = knn(train = training_set[, -3], test = grid_set, cl = training_set[, 3], k = 5)
plot(set[, -3],
     main = 'K-NN (Test set)',
     xlab = 'Age', ylab = 'Estimated Salary',
     xlim = range(X1), ylim = range(X2))
contour(X1, X2, matrix(as.numeric(y_grid), length(X1), length(X2)), add = TRUE)
points(grid_set, pch = '.', col = ifelse(y_grid == 1, 'springgreen3', 'tomato'))
points(set, pch = 21, bg = ifelse(set[, 3] == 1, 'green4', 'red3'))
```

Result:


K-NN (Test set)
Estimated Salary
Age