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Kelas : IF 3A Reguler

Tugas Besar Data Mining
Klasifikasi C5.0

Tujuan:

- ✓ Menerapkan algoritma C5.0 Alat:
- ✓ R dan R Studio

Deskripsi:

Pada tugas besar ini kelompok kami menggunakan metode klasifikasi C5.0 dan memakai dataset Cryotherapy Dataset yang memiliki Kumpulan data memberikan informasi yang berkaitan dengan pasien, yang karakteristiknya seperti Jumlah Kutil, Area kutil, jenis kelamin dan usia, dll. Digunakan untuk menentukan tingkat ekstremitas kanker, yaitu 0 jinak atau ganas.

Dataset: Cryotheraphy.csv Terdiri dari:

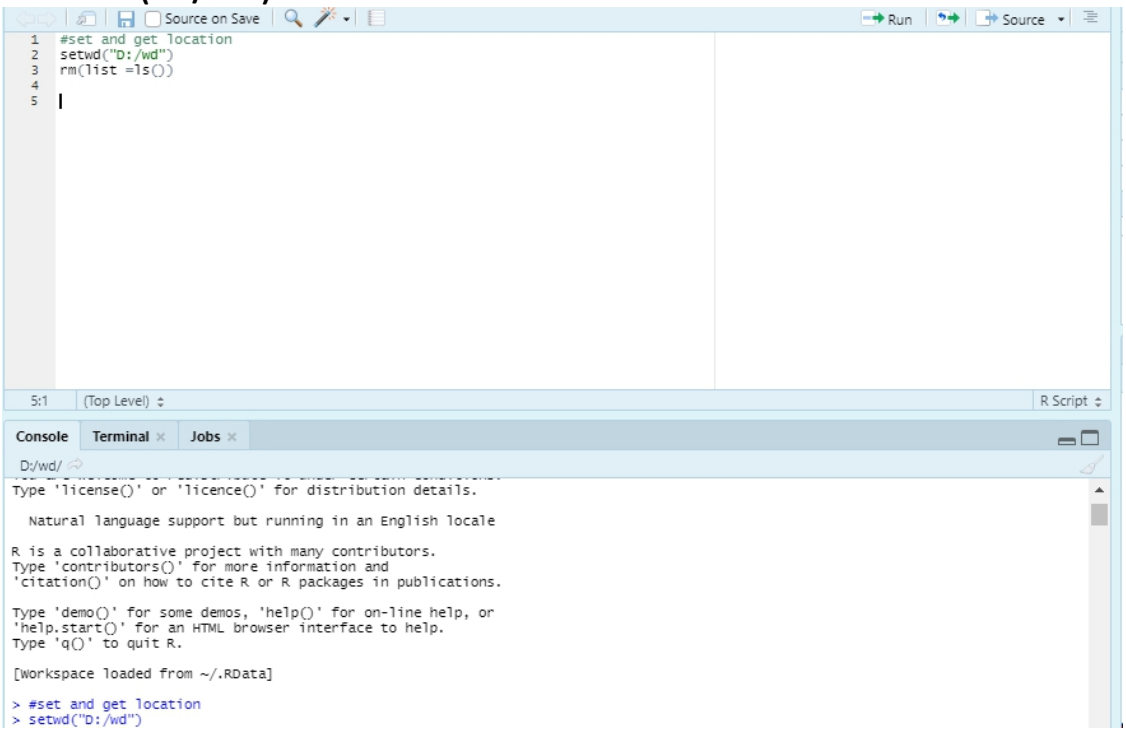
- 90 data

-7 variabel

	A	B	C	D	E	F
1	sex,"age","Time","Number_of_Warts","Type","Area","Result_of_Treatment"					
2	1,"35","12","5","1","100","0"					
3	1,"29","7","5","1","96","1"					
4	1,"50","8","1","3","132","0"					
5	1,"32","11.75","7","3","750","0"					
6	1,"67","9.25","1","1","42","0"					
7	1,"41","8","2","2","20","1"					
8	1,"36","11","2","1","8","0"					
9	1,"59","3.5","3","3","20","0"					
10	1,"20","4.5","12","1","6","1"					
11	2,"34","11.25","3","3","150","0"					
12	2,"21","10.75","5","1","35","0"					
13	2,"15","6","2","1","30","1"					
14	2,"15","2","3","1","4","1"					
15	2,"15","3.75","2","3","70","1"					
16	2,"17","11","2","1","10","0"					
17	2,"17","5.25","3","1","63","1"					
18	2,"23","11.75","12","3","72","0"					
19	2,"27","8.75","2","1","6","0"					
20	2,"15","4.25","1","1","6","1"					
21	2,"18","5.75","1","1","80","1"					
22	1,"22","5.5","2","1","70","1"					
23	2,"16","8.5","1","2","60","1"					
24	1,"28","4.75","3","1","100","1"					
25	2,"40","9.75","1","2","80","0"					
26	1,"30","2.5","2","1","115","1"					
27	2,"34","12","3","3","95","0"					
28	1,"20","0.5","2","1","75","1"					
29	2,"35","12","5","3","100","0"					
30	2,"24","9.5","3","3","20","0"					
31	2,"19","8.75","6","1","160","1"					
32	1,"35","9.25","9","1","100","1"					
33	1,"29","7.25","6","1","96","1"					
34	1,"50","8.75","11","3","132","0"					

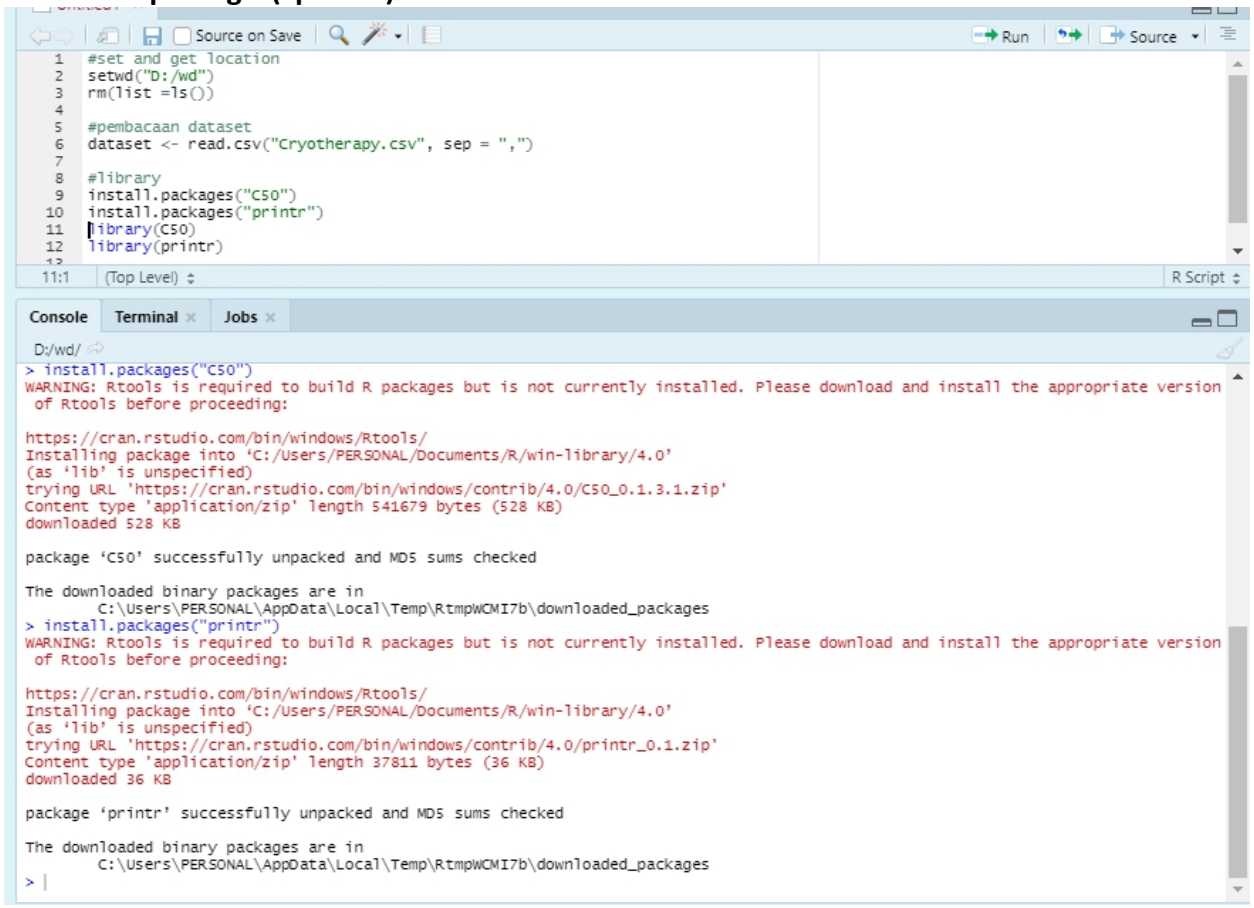
Tugas Besar Data Mining:

- Pengaturan lokasi direktori
  setwd("D:/wd")



- Membaca dataset
  dataset <- read.csv("Cryotherapy.csv", sep = ";")

- Instalasi package
  install.packages("C50")
  install.packages("printr")



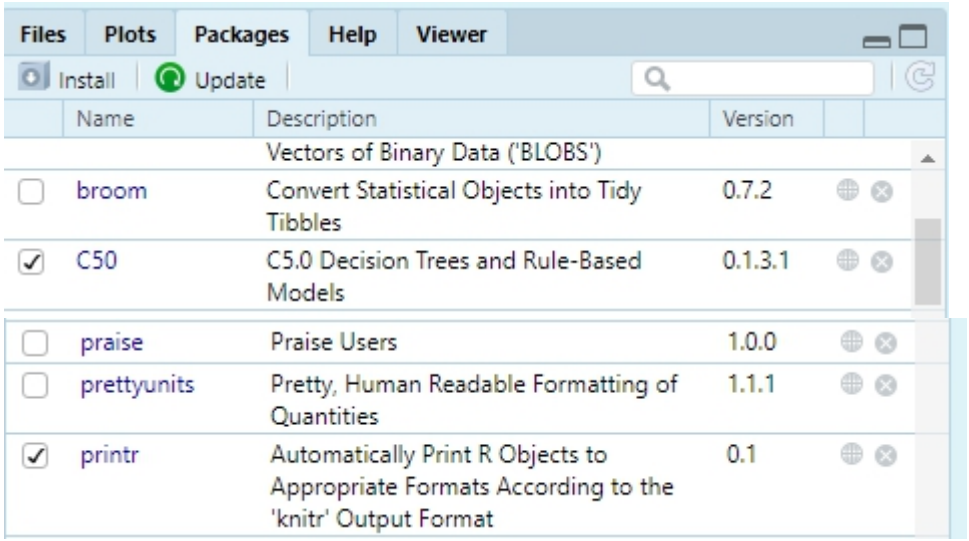
```
#set and get location
setwd("D:/wd")
rm(list =ls())

#pembacaan dataset
dataset <- read.csv("Cryotherapy.csv", sep = ",")

#library
install.packages("C50")
install.packages("printr")
library(C50)
library(printr)
```

```
> install.packages("C50")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version
 of Rtools before proceeding:

https://cran.rstudio.com/bin/windows/Rtools/
Installing package into 'C:/Users/PERSONAL/Documents/R/win-library/4.0'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.0/C50_0.1.3.1.zip'
Content type 'application/zip' length 541679 bytes (528 KB)
downloaded 528 KB

package 'C50' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\PERSONAL\AppData\Local\Temp\RtmpWCMI7b\downloaded_packages
> install.packages("printr")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version
 of Rtools before proceeding:

https://cran.rstudio.com/bin/windows/Rtools/
Installing package into 'C:/Users/PERSONAL/Documents/R/win-library/4.0'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.0/printr_0.1.zip'
Content type 'application/zip' length 37811 bytes (36 KB)
downloaded 36 KB

package 'printr' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\PERSONAL\AppData\Local\Temp\RtmpWCMI7b\downloaded_packages
>
```

- Menggunakan package
  library(C50)
  library(printr)

```
> library(C50)
> library(printr)
>
```

- Melihat package yang sudah terinstall



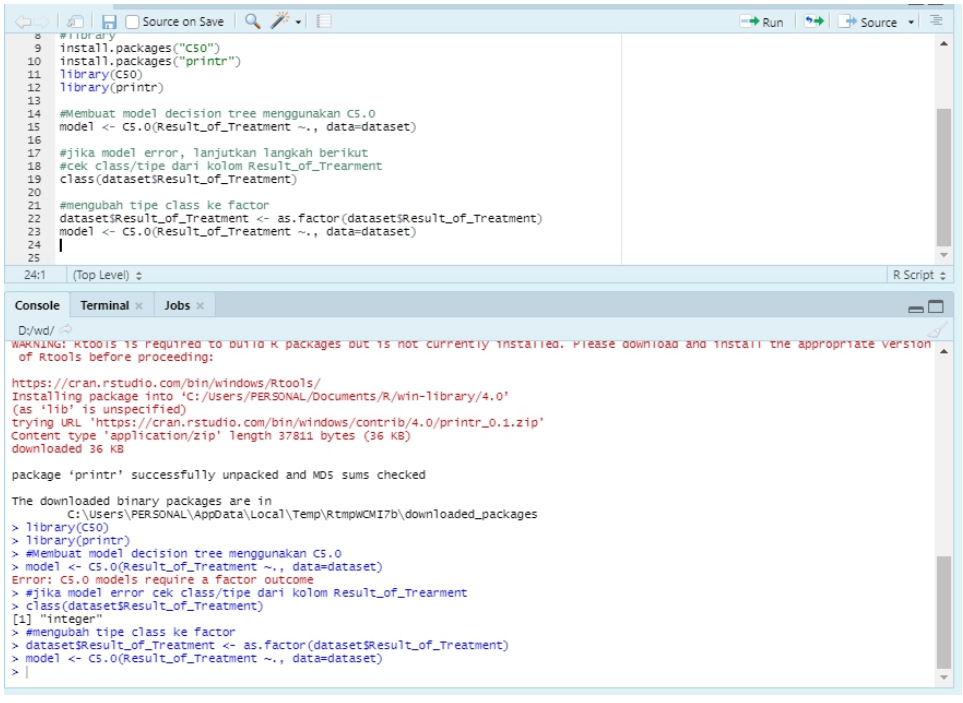
- Pembuatan model decision tree menggunakan algoritman C5.0

```
> model <- C5.0(Result_of_Treatment ~., data=dataset)
Error: C5.0 models require a factor outcome
>
```

- Terjadi error karena outputnya bukan factor, factor adalah tipe data. Sehingga untuk melihat tipe kita ketikkan **class(dataset$buys_computer)**

```
> #jika model error cek class/tipe dari kolom Result_of_Trearment
> class(dataset$Result_of_Treatment)
[1] "integer"
>
```

- Setelah di cek tipe datanya, ternyata tipe datanya adalah character. Sehingga kita harus mengonversinya ke factor dengan mengetikkan **dataset$buys_computer <- as.factor(dataset$buys_computer)**. Selanjutnya jalankan perintah untuk membuat model. Pembuatan model sudah berhasil.



- Melihat model

Model

```
> model

Call:
C5.0.formula(formula = Result_of_Treatment ~ ., data = dataset)

Classification Tree
Number of samples: 90
Number of predictors: 6

Tree size: 8

Non-standard options: attempt to group attributes
```

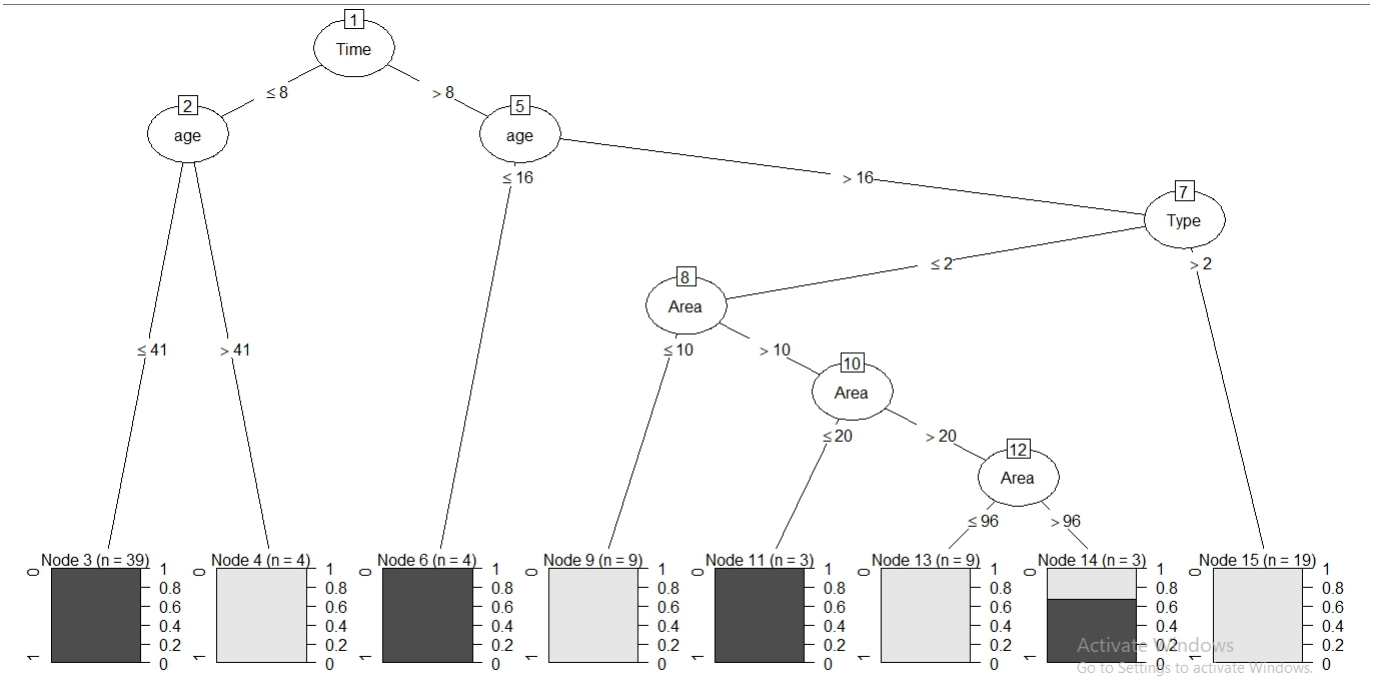
summary(model)

```
> summary(model)

Call:
C5.0.formula(formula = Result_of_Treatment ~ ., data = dataset)


C5.0 [Release 2.07 GPL Edition]         Tue Jan 12 13:29:37 2021
-------------------------------

Class specified by attribute `outcome'

Read 90 cases (7 attributes) from undefined.data

Decision tree:

Time <= 8:
:...age <= 41: 1 (39)
:   age > 41: 0 (4)
Time > 8:
:...age <= 16: 1 (4)
    age > 16:
    :...Type > 2: 0 (19)
        Type <= 2:
        :...Area <= 10: 0 (9)
            Area > 10:
            :...Area <= 20: 1 (3)
                Area > 20:
                :...Area <= 96: 0 (9)
                    Area > 96: 1 (3/1)


Evaluation on training data (90 cases):

            Decision Tree
          ----------------
          Size      Errors

             8    1( 1.1%)   <<


           (a)   (b)    <-classified as
          ----  ----
            41     1    (a): class 0
                  48    (b): class 1


        Attribute usage:

        100.00% age
        100.00% Time
         47.78% Type
         26.67% Area


Time: 0.0 secs

>
```

- Menampilkan pohon yang sudah dibangun
  plot(model)

```
#cek class/tipe dari kolom Result_of_Trearment
class(dataset$Result_of_Treatment)

#mengubah tipe class ke factor
dataset$Result_of_Treatment <- as.factor(dataset$Result_of_Treatment)
model <- C5.0(Result_of_Treatment ~., data=dataset)

#melihat hasil model
model
summary(model)

#menampilkam gambar/pohon model
plot(model)
```

```
            8    1( 1.1%)   <<


          (a)   (b)    <-classified as
          ----  ----
           41     1    (a): class 0
                 48    (b): class 1


        Attribute usage:

        100.00% age
        100.00% Time
         47.78% Type
         26.67% Area


Time: 0.0 secs

> #menampilkam gambar/pohon model
> plot(model)
>
```



- Menjadikan dataset sebagai data testing. Namun hanya kolom 1, 2, 3, 4,5,6 saja dan tanpa label.
  datatesting <- dataset[,1:6]

Untitled1* × datatesting ×

Filter

	sex	age	Time	Number_of_Warts	Type	Area
1	1	35	12.00	5	1	100
2	1	29	7.00	5	1	96
3	1	50	8.00	1	3	132
4	1	32	11.75	7	3	750
5	1	67	9.25	1	1	42
6	1	41	8.00	2	2	20
7	1	36	11.00	2	1	8
8	1	59	3.50	3	3	20
9	1	20	4.50	12	1	6
10	2	34	11.25	3	3	150
11	2	21	10.75	5	1	35
12	2	15	6.00	2	1	30
13	2	15	2.00	3	1	4
14	2	15	3.75	2	3	70
15	2	17	11.00	2	1	10
16	2	17	5.25	3	1	63
17	2	23	11.75	12	3	72
18	2	27	8.75	2	1	6
19	2	15	4.25	1	1	6
20	2	18	5.75	1	1	80
21	1	22	5.50	2	1	70

predictions < - predict(model, datatesting)

```
#melihat hasil model
model
summary(model)

#menampilkam gambar/pohon model
plot(model)

#membuat dataset
datatesting <- dataset[,1:6]

#prediksi
predictions <- predict(model, datatesting)
```

Environment | History | Connections | Tutorial

Global Environment

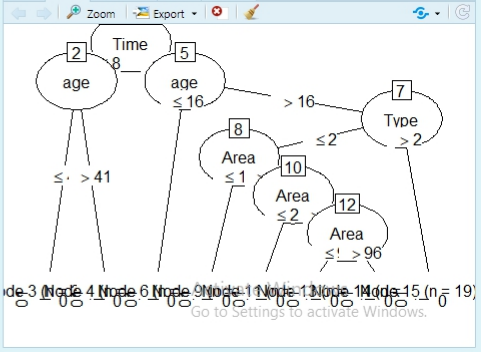
Data

dataset	90 obs. of 7 variables
datatesting	90 obs. of 6 variables
model	List of 18

Values

predictions	Factor w/ 2 levels "0","1": 2 2 1 1 1 2 1…

```
            41     1    (a): class 0
                  48    (b): class 1


       Attribute usage:

       100.00% age
       100.00% Time
        47.78% Type
        26.67% Area


Time: 0.0 secs

> #menampilkam gambar/pohon model
> plot(model)
> #membuat dataset
> datatesting <- dataset[,1:6]
> View(datatesting)
> #prediksi
> predictions <- predict(model, datatesting)
>
```



- Membandingkan hasil prediksi dengan dataset
  table(predictions, dataset$buys_computer)

```
> table(predictions, dataset$Result_of_Treatment)

predictions  0  1
          0 41  0
          1  1 48
> |
```

- rules yang dihasilkan

```
> rulemodel <- C5.0(Result_of_Treatment ~., data = dataset, rules = TRUE)
> rulemodel

Call:
C5.0.formula(formula = Result_of_Treatment ~ ., data = dataset, rules = TRUE)

Rule-Based Model
Number of samples: 90
Number of predictors: 6

Number of Rules: 8

Non-standard options: attempt to group attributes

> |
```

```
> summary(rulemodel)

Call:
C5.0.formula(formula = Result_of_Treatment ~ ., data = dataset, rules = TRUE)


C5.0 [Release 2.07 GPL Edition]         Tue Jan 12 13:40:59 2021
-------------------------------

Class specified by attribute `outcome'

Read 90 cases (7 attributes) from undefined.data

Rules:

Rule 1: (19, lift 2.0)
        Time > 8
        Type > 2
        ->  class 0  [0.952]

Rule 2: (16, lift 2.0)
        age > 16
        Time > 8
        Area > 20
        Area <= 96
        ->  class 0  [0.944]

Rule 3: (9, lift 1.9)
        Time > 8
        Area <= 10
        ->  class 0  [0.909]

Rule 4: (9, lift 1.9)
        age > 41
        ->  class 0  [0.909]

Rule 5: (39, lift 1.8)
        age <= 41
        Time <= 8
        ->  class 1  [0.976]
```

```
Rule 6: (15, lift 1.8)
        age <= 16
        ->  class 1  [0.941]

Rule 7: (5, lift 1.6)
        Type <= 2
        Area > 10
        Area <= 20
        ->  class 1  [0.857]

Rule 8: (11/1, lift 1.6)
        Type <= 2
        Area > 96
        ->  class 1  [0.846]

Default class: 1


Evaluation on training data (90 cases):

             Rules
       ----------------
         No      Errors

          8    1( 1.1%)   <<


        (a)   (b)    <-classified as
       ----  ----
         41     1    (a): class 0
               48    (b): class 1


      Attribute usage:

       84.44% Time
       72.22% age
       45.56% Area
       38.89% Type
```

Rule yang dihasilkan :

➢ **rule 1 :** time > 8 type > 2 class -> 0 (jinak) ➢ **rule 2 :** age > 16 Time > 8 Area > 20 Area <= 96 class -> 0 (jinak) ➢ **rule 3 :** Time > 8 Area <= 10 class -> 0 (jinak) ➢ **rule 4 :** age > 41 Area <= 10 Class -> 0 (Jinak)	➢ **rule 5 :** age <= 41 Time <= 8 class -> 1 (Ganas) ➢ **rule 6 :** age <= 16 class -> 1 (Ganas) ➢ **rule 7 :** Type <= 2 Area > Area <= 20 class -> 1 (Ganas) ➢ **rule 8 :** Type <= 2 Area >96 class -> 1 (Ganas)

Kode penuh:

```
#set and get location
setwd("D:/wd")
rm(list =ls())

#pembacaan dataset
dataset <- read.csv("Cryotherapy.csv", sep = ",")

#library
install.packages("C50")
install.packages("printr")
library(C50)
library(printr)

#Membuat model decision tree menggunakan C5.0
model <- C5.0(Result_of_Treatment ~., data=dataset)

#jika model error cek class/tipe dari kolom Result_of_Trearment
class(dataset$Result_of_Treatment)

#mengubah tipe class ke factor
dataset$Result_of_Treatment <- as.factor(dataset$Result_of_Treatment)
model <- C5.0(Result_of_Treatment ~., data=dataset)

#melihat hasil model
model
summary(model)

#menampilkam gambar/pohon model
plot(model)

#membuat dataset
datatesting <- dataset[,1:6]

#prediksi
predictions <- predict(model, datatesting)

#membandingkan hasil prediksi dari datatesting dengan dataset
table(predictions, dataset$Result_of_Treatment)

#Memngetahui rule model
rulemodel <- C5.0(Result_of_Treatment ~., data = dataset, rules = TRUE)
rulemodel
summary(rulemodel)
```