Tugas Besar Data Mining
Klasifikasi C5.0

Menerapkan algoritma C5.0 dengan R dan R Studio

Nama Kelompok;

Evriska Dayanti - 3311901003
Ayusda Renjani - 3311901019
Gabriella Joice Sitompul - 3311901029

—Klasifikasi C5.0

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 1 ganas

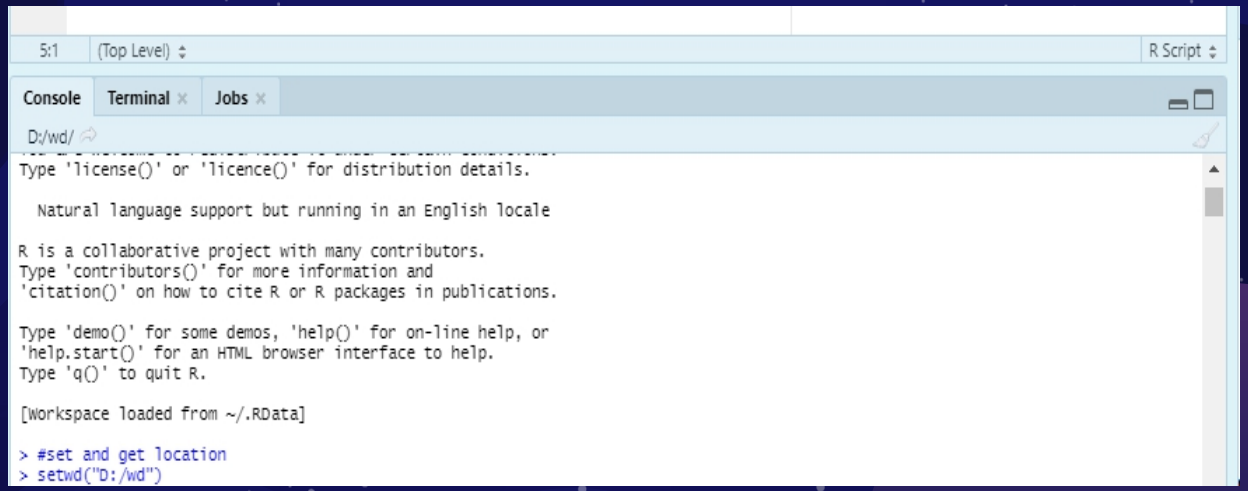
Dataset: Cryotheraphy.csv Terdiri dari 90 data 7 variabel

	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"					

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"

-Langkah-langkah-

- Pengaturan lokasi direktori



Membaca Dataset

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

```
1  #set and get location
2  setwd("D:/wd")
3  rm(list =ls())
4
5  #pembacaan dataset
6  dataset <- read.csv("Cryotherapy.csv", sep = ",")
7
8
```

8:1 (Top Level) R Script

Console Terminal Jobs

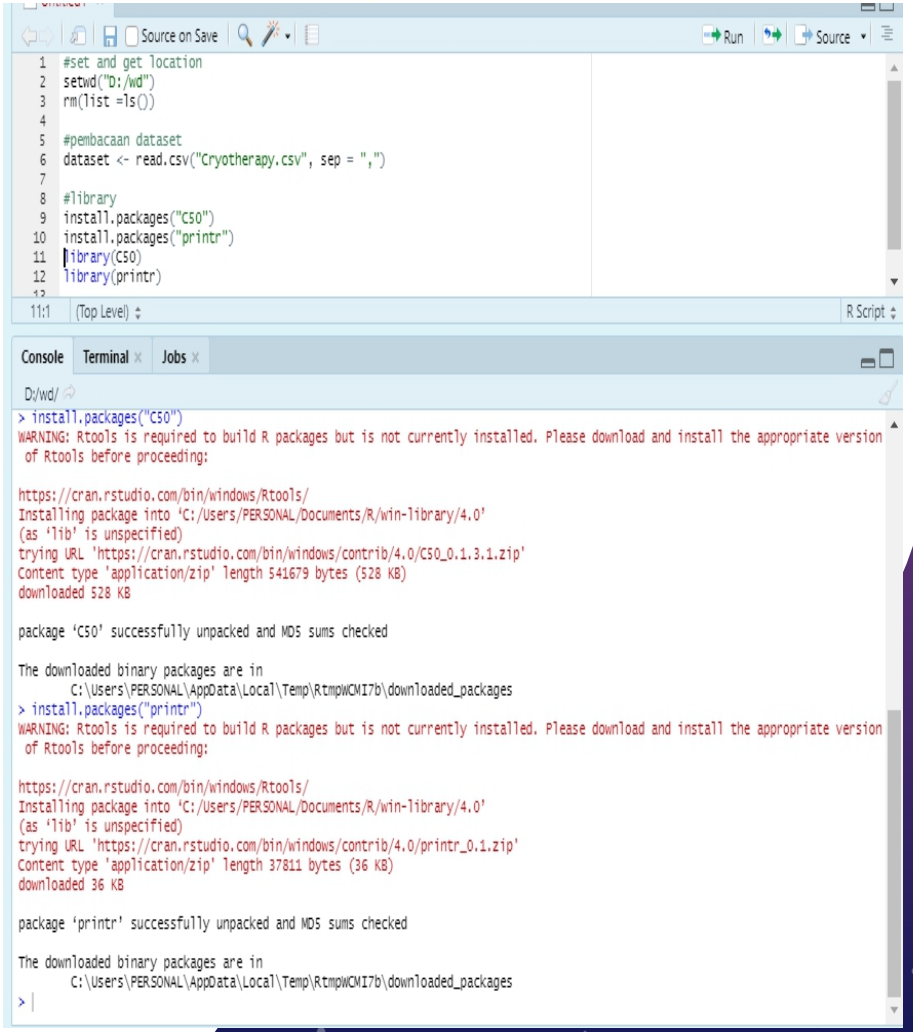
D:/wd/

```
> #set and get location
> setwd("D:/wd")
> rm(list =ls())
> #pembacaan dataset
> dataset <- read.csv("Cryotherapy.csv", sep = ",")
```

Instalasi package

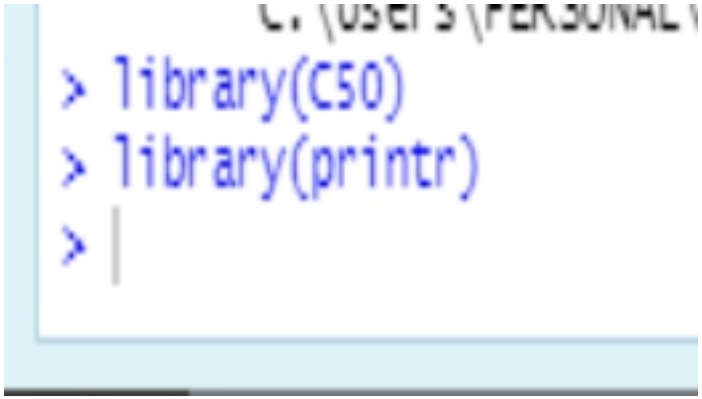
install.packages("C50")

install.packages("printr")

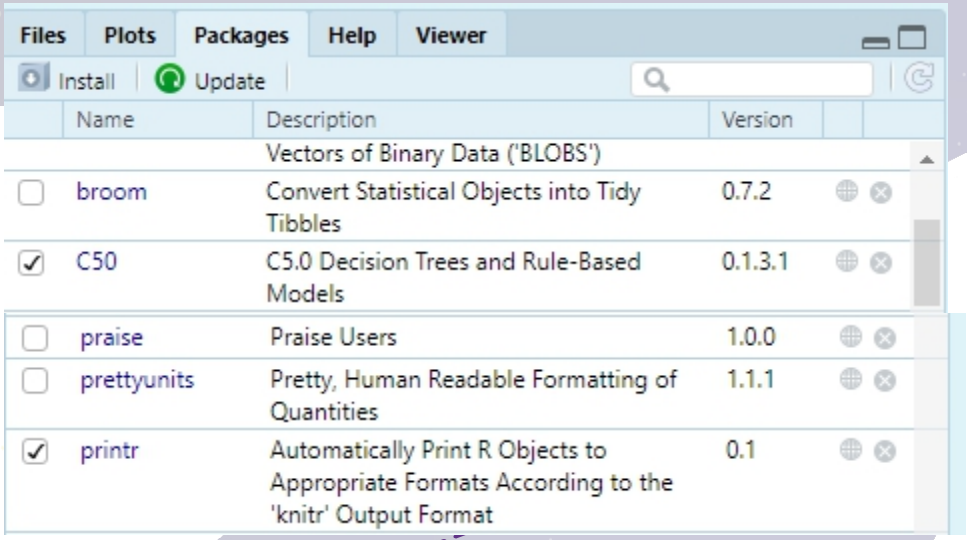


Menggunakan package

library(C50) library(printr)



01 **Melihat package yang sudah terinstall**



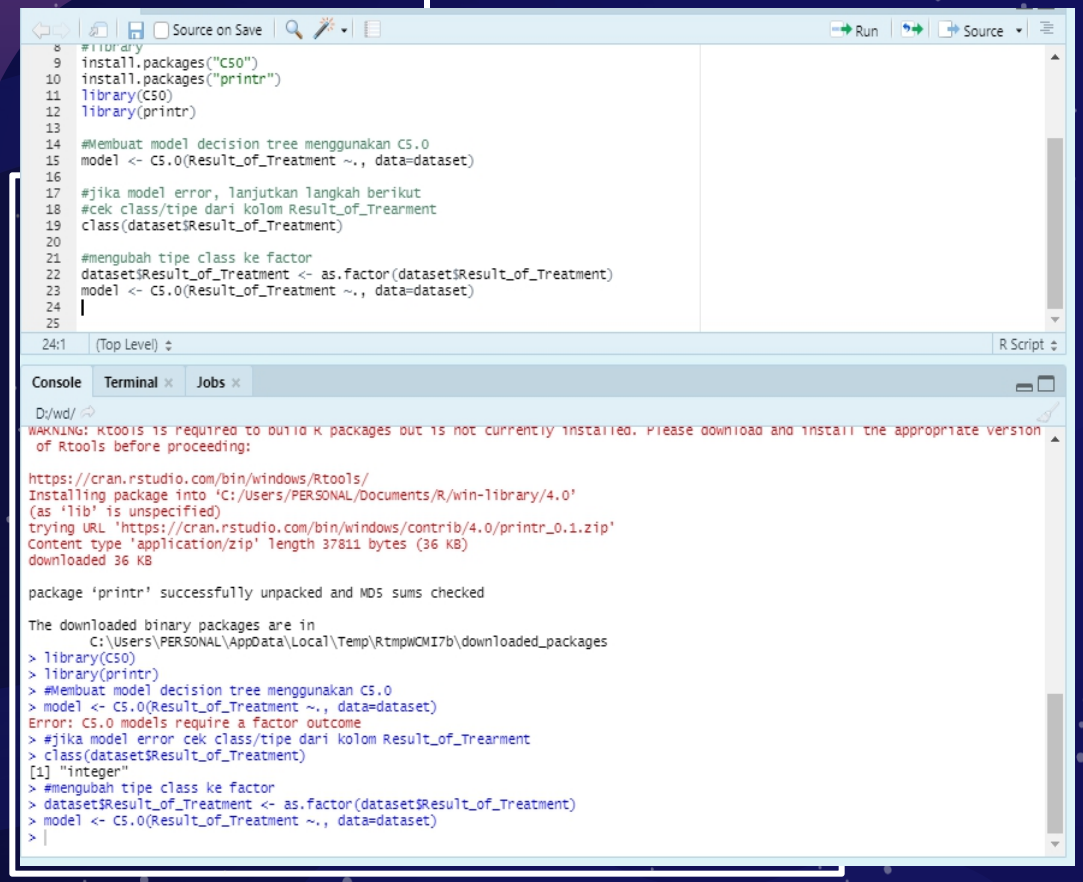
02 **Pembuatan model decision tree menggunakan algoritman C5.0**

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

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

```
> #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 mengonversinya ke factor dengan mengetikkan **dataset$Result_of_treatment <- as.factor(dataset$Result_of_Treatment)**. Selanjutnya jalankan perintah untuk membuat model. Pembuatan model sudah berhasil.



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
```

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

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
       4    44    (b): class 1


    Attribute usage:

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


Time: 0.0 secs

>
```

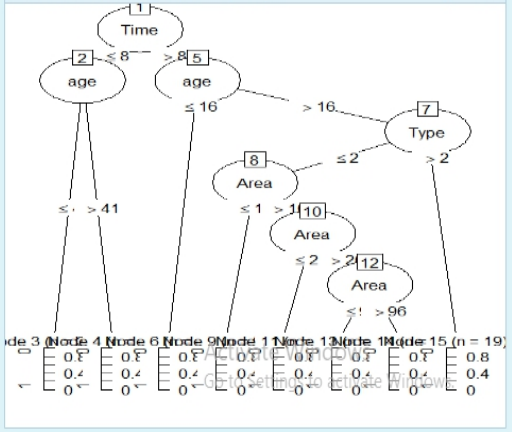
Plot Model

```r
#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)
```

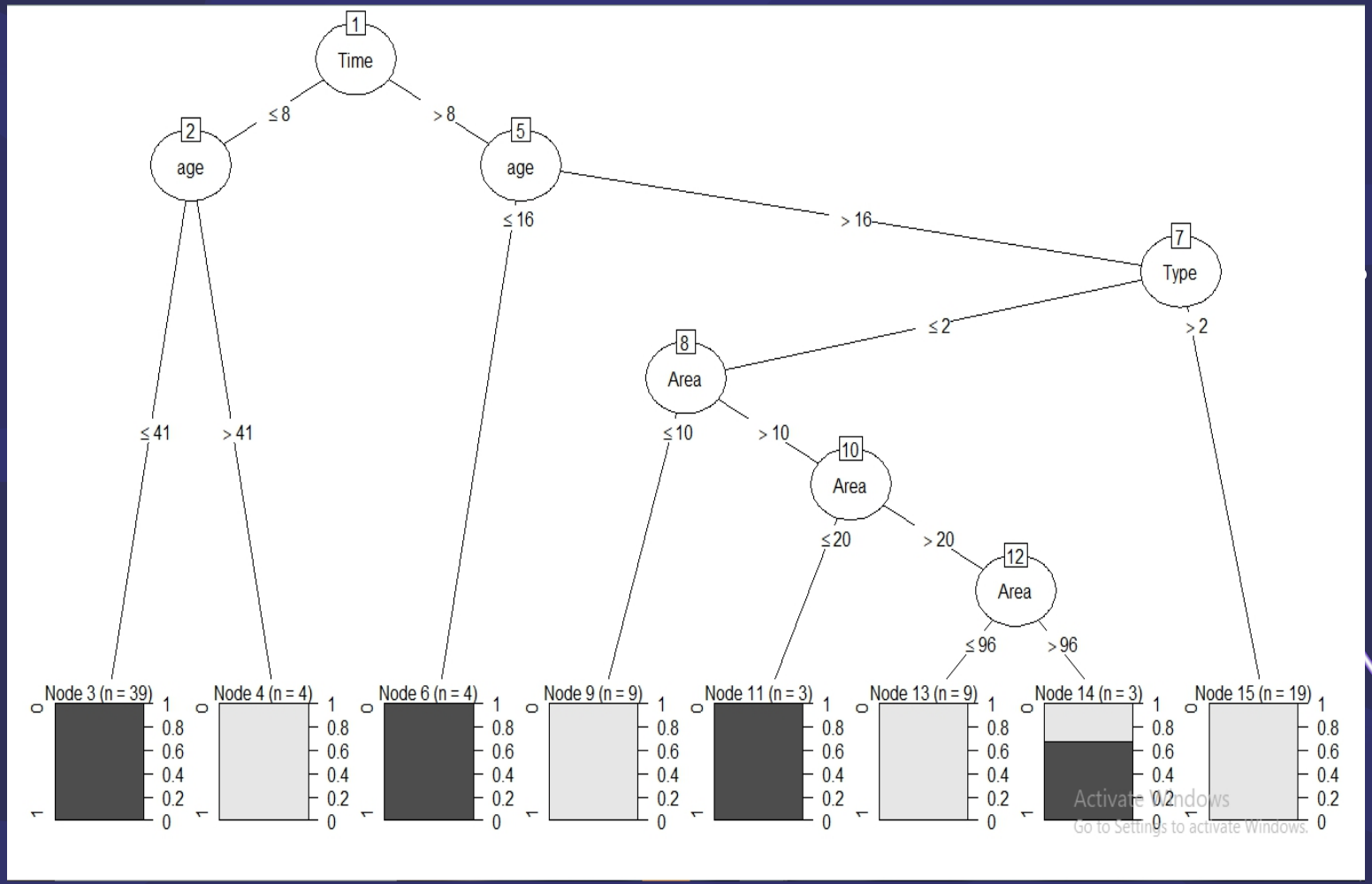
Global Environment

Data	
dataset	90 obs. of 7 variables
model	List of 18

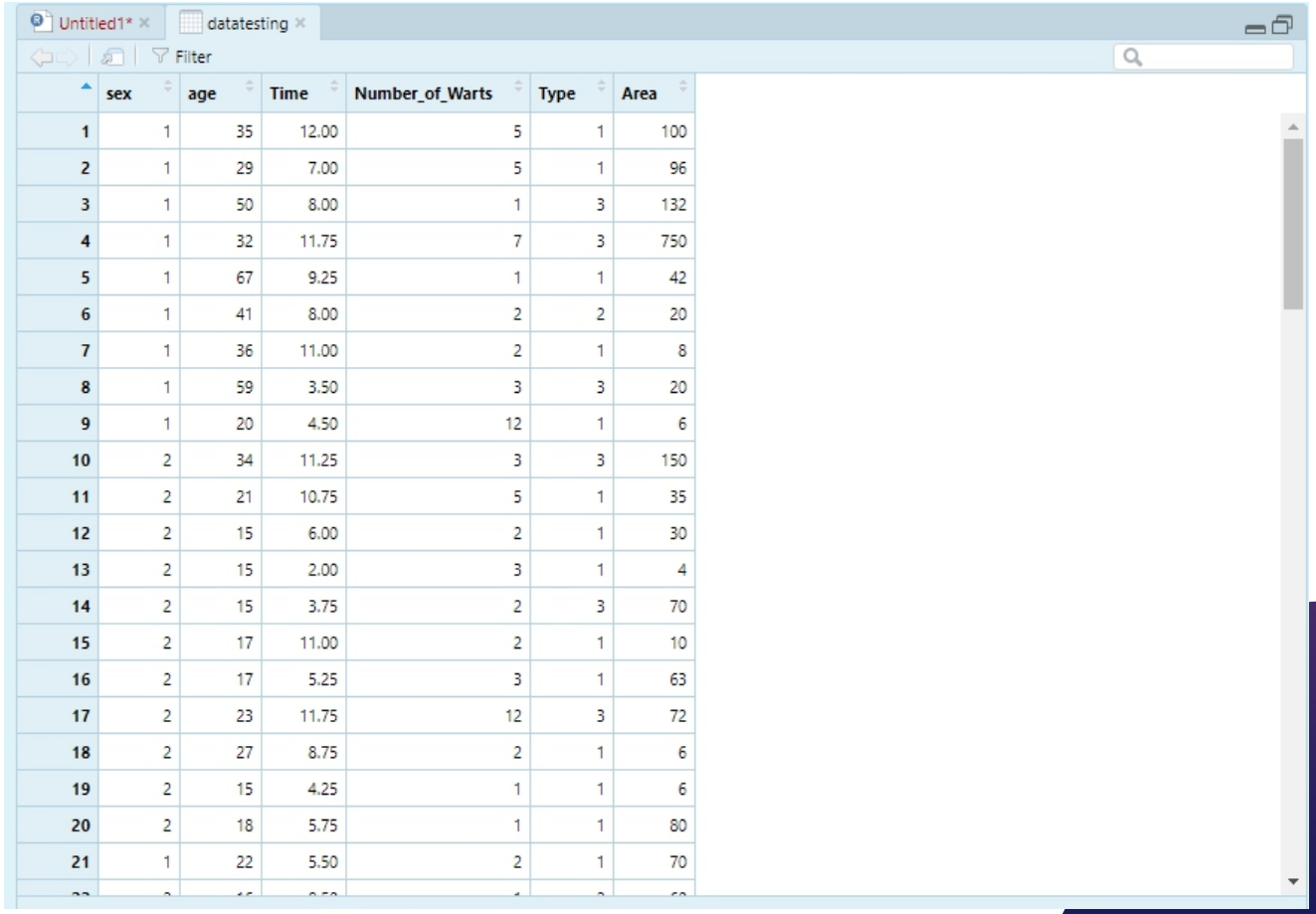
```
            8    1( 1.1%)   <<


          (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)
>
```



Menampilkan pohon yang sudah dibangun



Menjadikan dataset sebagai data testing. Namun hanya kolom 1, 2, 3, 4 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)

Untitled1* | datatesting

Source on Save | Run | Source

```
24
25  #melihat hasil model
26  model
27  summary(model)
28
29  #menampilkam gambar/pohon model
30  plot(model)
31
32  #membuat dataset
33  datatesting <- dataset[,1:6]
34
35  #prediksi
36  predictions <- predict(model, datatesting)
37
38
```

37:1 (Top Level) R Script

Console | Terminal | Jobs

D:/wd/

```
           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)
>
```

Environment | History | Connections | Tutorial

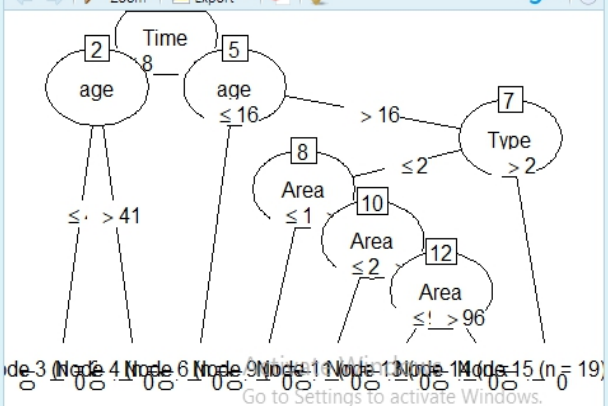
Import Dataset | List

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…

Files | Plots | Packages | Help | Viewer

Zoom | Export



Membandingkan hasil prediksi dengan dataset
table(predictions, dataset$Result_of_Treatment)

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

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

Melihat tingkat akurasi
mean(predictions == dataset$Result_of_Treatment)

```
> #Melihat tingkat akurasi
> mean(predictions  == dataset$Result_of_Treatment)
[1] 0.9888889
```

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]
```

RULES YANG DIHASILKAN

```
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
```

RULES 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 > 10
Area <= 20
class -> 1 (Ganas)
- rule 8 :
Type <= 2
Area > 96
class -> 1 (Ganas)

Sekian Terimakasih :)