Nama Anggota :

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2. Umi Nasintha (3311901016)
3. Ajeng Kartika Puspa

Tugas Besar Data Mining
Klasifikasi C5.0

Tujuan :

- ✓ Menerapakn algoritma C5.0 alat:
- ✓ R dan R Studio

Deskripsi

Pada tugas besar ini kelompok kali menggunakan metode klasifikasi C5.0 dan memakai dataset mammographic_masses Dataset yang memiliki kumpulan data memberikan informasi yang berkaitan dengan skrining kanker payudara.

Dataset Mammographic mass.csv Terdiri dari :
-961 data
-5 variable

1	BI_RADS,age,shape,margin,density,severity
2	5,67,3,5,3,1
3	4,43,1,1,?,1
4	5,58,4,5,3,1
5	4,28,1,1,3,0
6	5,74,1,5,?,1
7	4,65,1,?,3,0
8	4,70,?,?,3,0
9	5,42,1,?,3,0
10	5,57,1,5,3,1
11	5,60,?,5,1,1
12	5,76,1,4,3,1
13	3,42,2,1,3,1
14	4,64,1,?,3,0
15	4,36,3,1,2,0
16	4,60,2,1,2,0
17	4,54,1,1,3,0
18	3,52,3,4,3,0
19	4,59,2,1,3,1
20	4,54,1,1,3,1
21	4,40,1,?,?,0
22	?,66,?,?,1,1
23	5,56,4,3,1,1

1. Buka R studio

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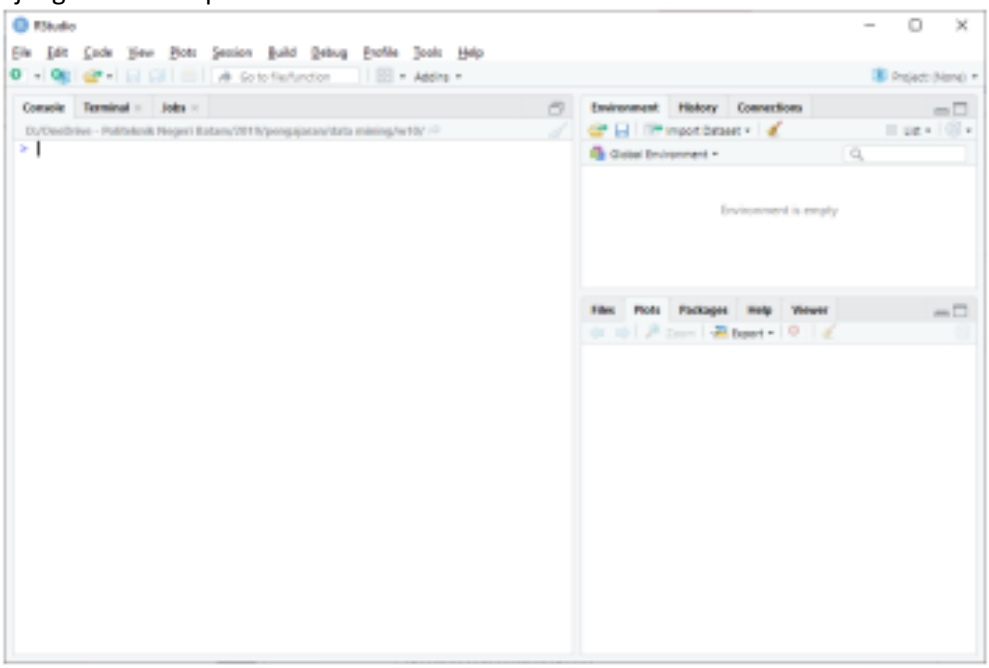

2. Buat script baru
3. Pengaturan untuk mengatur working directory

#set and get location
Getwd()
Setwd("D:/UAD_DM")

```
#set and get location
getwd()
setwd("D:/UAS_DM")
```

4. Instalasi dan penggunaan library

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

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

library(C50)
library(printr)

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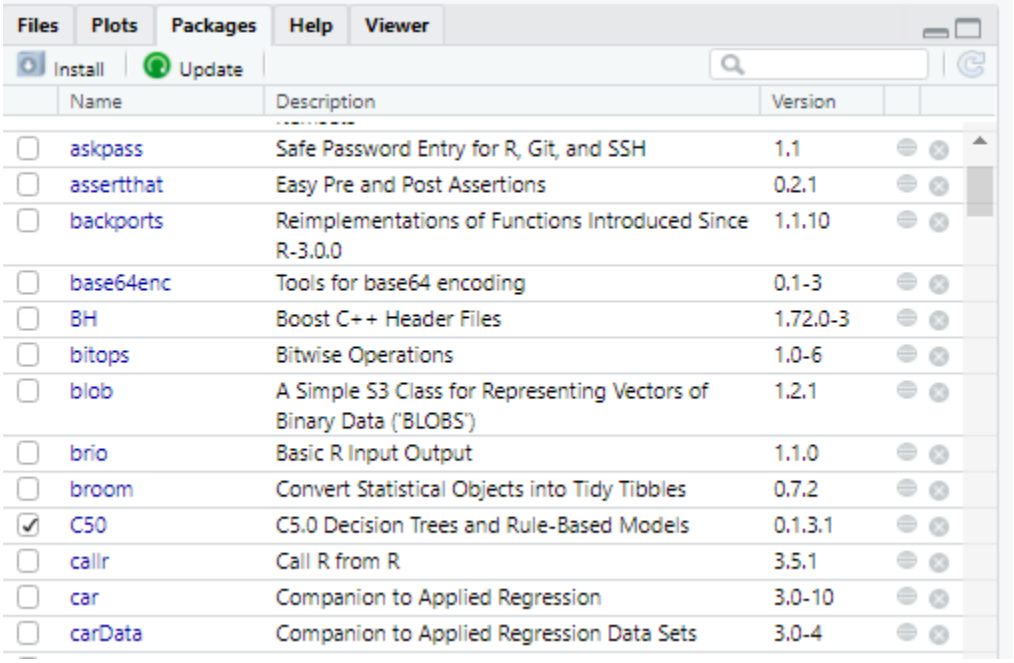
```
library(C50)
library(printr)
```

Melihat package yang sudah terinstall



5. Membaca dataset dari file .csv
   #Reading the file
   datasets <- read.csv("mass.csv",na,strings =”?”, sep = ",")

```
#reading the file
datasets <- read.csv("mass.csv",na.strings = "?", sep = ",")
```

#melihat struktur pada sebuah object
str(datasets)

```
> #melihat struktur pada sebuah object
> str(datasets)
'data.frame':   961 obs. of  6 variables:
 $ BI_RADS : int  5 4 5 4 5 4 4 5 5 5 ...
 $ age     : int  67 43 58 28 74 65 70 42 57 60 ...
 $ shape   : int  3 1 4 1 1 1 NA 1 1 NA ...
 $ margin  : int  5 1 5 1 5 NA NA NA 5 5 ...
 $ density : int  3 NA 3 3 NA 3 3 3 3 1 ...
 $ severity: int  1 1 1 0 1 0 0 0 1 1 ...
```

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#menghilangkan baris yang memiliki NA
datasets <- na.omit(datasets)
str(datasets)

```
#menghilangkan baris yang memiliki NA
datasets <- na.omit(datasets)
str(datasets)
```

```
> datasets <- na.omit(datasets)
> str(datasets)
'data.frame':   830 obs. of  6 variables:
 $ BI_RADS : int  5 5 4 5 5 3 4 4 4 3 ...
 $ age     : int  67 58 28 57 76 42 36 60 54 52 ...
 $ shape   : int  3 4 1 1 1 2 3 2 1 3 ...
 $ margin  : int  5 5 1 5 4 1 1 1 1 4 ...
 $ density : int  3 3 3 3 3 3 2 2 3 3 ...
 $ severity: int  1 1 0 1 1 1 0 0 0 0 ...
 - attr(*, "na.action")= 'omit' Named int [1:131] 2 5 6 7 8 10 13 20 21 23 ...
  ..- attr(*, "names")= chr [1:131] "2" "5" "6" "7" ...
```

6. Pembuatan model

#pembuatan model decision tree menggunakan algoritma C5.0

datasets$severity <- as.factor(datasets$severity)
model <- C5.0(severity ~., data=datasets)

```
#pembuatan model
datasets$severity <- as.factor(datasets$severity)
model <- C5.0(severity ~., data=datasets)
```

7. Melihat model

#melihat hasil model
model

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

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```
> model

Call:
C5.0.formula(formula = severity ~ ., data = datasets)

Classification Tree
Number of samples: 830
Number of predictors: 5

Tree size: 4

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

summary(model)

```
> summary(model)

Call:
C5.0.formula(formula = severity ~ ., data = datasets)


C5.0 [Release 2.07 GPL Edition]         Fri Jan 15 16:33:06 2021
-------------------------------

Class specified by attribute `outcome'

Read 830 cases (6 attributes) from undefined.data

Decision tree:

BI_RADS > 4: 1 (326/33)
BI_RADS <= 4:
:...shape <= 2: 0 (334/33)
    shape > 2:
    :...age <= 69: 0 (143/55)
        age > 69: 1 (27/5)


Evaluation on training data (830 cases):

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

            4  126(15.2%)   <<


          (a)   (b)    <-classified as
         ----  ----
          389    38    (a): class 0
           88   315    (b): class 1


        Attribute usage:

        100.00% BI_RADS
```

8. Gambar

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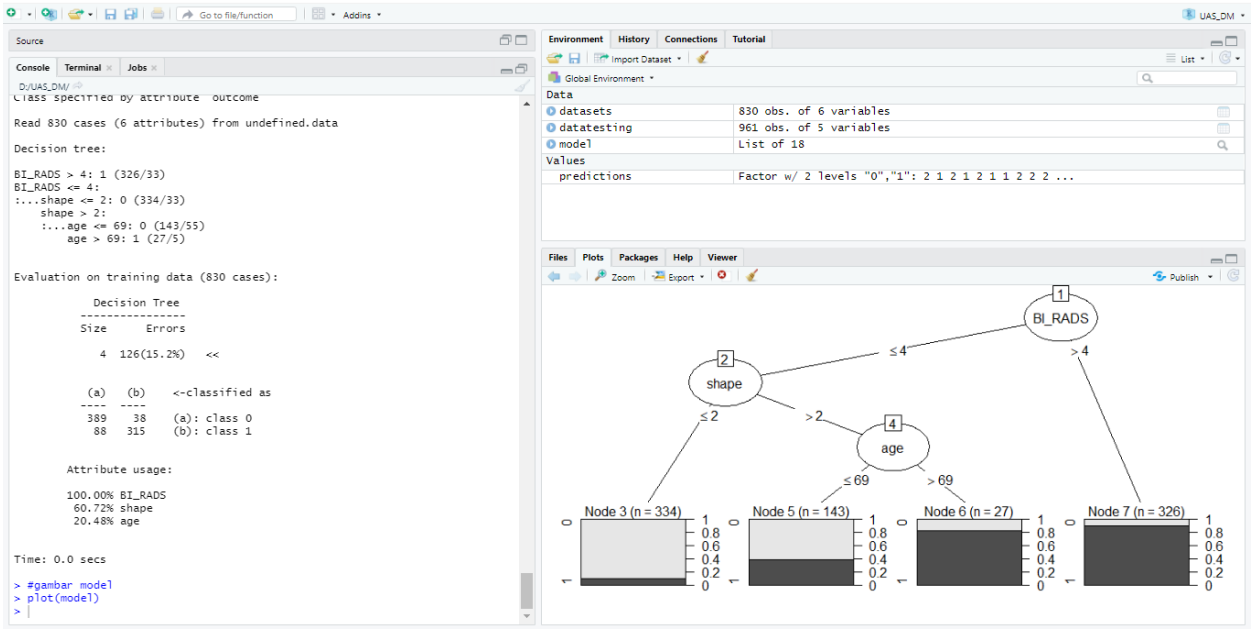
#gambar model
plot(model)

```
#gambar model
plot(model)
```



9. Membuat dataset

#membuat dataset
datatesting <- datasets[,1:5]

```
#membuat dataset
datatesting <- datasets[,1:5]
```

```
> #membuat dataset
> datatesting <- datasets[,1:5]
```

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10. Pridiksi

    #prediksi
    predictions <- predict(model, datatesting)

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

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

11. Membandingkan dataset

    #bandingkan hasil prediksi dengan dataset
    table(predictions, datasets$severity)

```
#bandingkan hasil prediksi dengan dataset
table(predictions, datasets$severity)
```

```
> #bandingkan hasil prediksi dengan dataset
> table(predictions, datasets$severity)

predictions   0   1
          0 389  88
          1  38 315
> |
```

12. Rules ynag dihasilkan

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

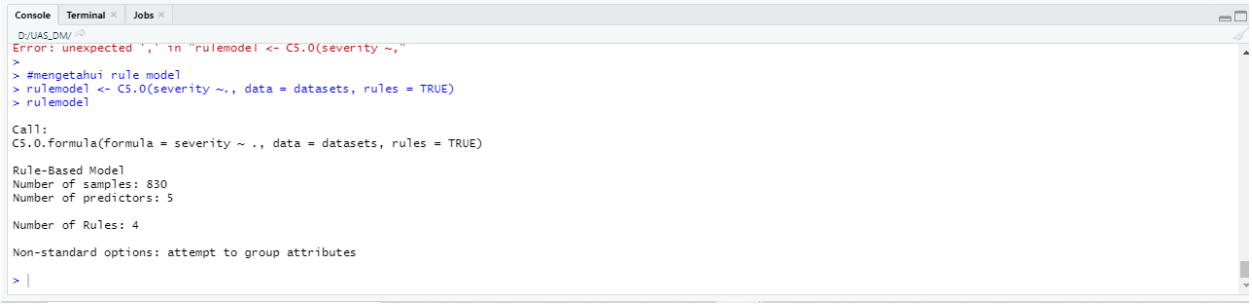
#gambar model
plot(model)

#membuat dataset
datatesting <- datasets[,1:5]

#prediksi
predictions <- predict(model, datatesting)

#bandingkan hasil prediksi dengan dataset
table(predictions, datasets$severity)

#mengetahui rule model
rulemodel <- C5.0(severity ~., data = datasets, rules = TRUE)
rulemodel
```



```
Error: unexpected ',' in "rulemodel <- C5.0(severity ~,"
>
> #mengetahui rule model
> rulemodel <- C5.0(severity ~., data = datasets, rules = TRUE)
> rulemodel

Call:
C5.0.formula(formula = severity ~ ., data = datasets, rules = TRUE)

Rule-Based Model
Number of samples: 830
Number of predictors: 5

Number of Rules: 4

Non-standard options: attempt to group attributes

>
```

```
> summary(rulemodel)

Call:
C5.0.formula(formula = severity ~ ., data = datasets, rules = TRUE)


C5.0 [Release 2.07 GPL Edition]         Fri Jan 15 16:51:20 2021
-------------------------------

Class specified by attribute `outcome'

Read 830 cases (6 attributes) from undefined.data

Rules:

Rule 1: (334/33, lift 1.7)
        BI_RADS <= 4
        shape <= 2
        ->  class 0  [0.899]

Rule 2: (460/84, lift 1.6)
        BI_RADS <= 4
        age <= 69
        ->  class 0  [0.816]

Rule 3: (115/10, lift 1.9)
        age > 69
        shape > 2
        ->  class 1  [0.906]

Rule 4: (326/33, lift 1.8)
        BI_RADS > 4
        ->  class 1  [0.896]

Default class: 0
```

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```
Evaluation on training data (830 cases):

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

        4  126(15.2%)   <<


      (a)   (b)    <-classified as
     ----  ----
      389    38    (a): class 0
       88   315    (b): class 1


    Attribute usage:

     96.75% BI_RADS
     69.28% age
     54.10% shape


Time: 0.1 secs
```

Rules yang di hasilkan

- ✓ **Rule 1 :**
  BI_RADS <= 4
  Shape <= 2
  Class -> 0 (benign)

- ✓ **Rule 2 :**
  BI_RADS <= 4
  age <= 69
  class -> 0 (benign)

- ✓ **Rule 3 :**
  age > 69
  shape > 2
  class -> 1 (malignant)

- ✓ **Rule 4 :**
  BI_RADS > 4
  -> class 1 (malignant)

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#melihat struktur pada sebuah object
str(datasets)

#pembuatan model
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```
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datasets <- na.omit(datasets)
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#melihat hasil model
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#gambar model
plot(model)

#membuat dataset
datatesting <- datasets[,1:5]

#prediksi
predictions <- predict(model, datatesting)

#bandingkan hasil prediksi dengan dataset
table(predictions, datasets$severity)
#mengetahui rule model
rulemodel <- C5.0(severity ~., data = datasets, rules = TRUE)
rulemodel

summary(rulemodel)
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