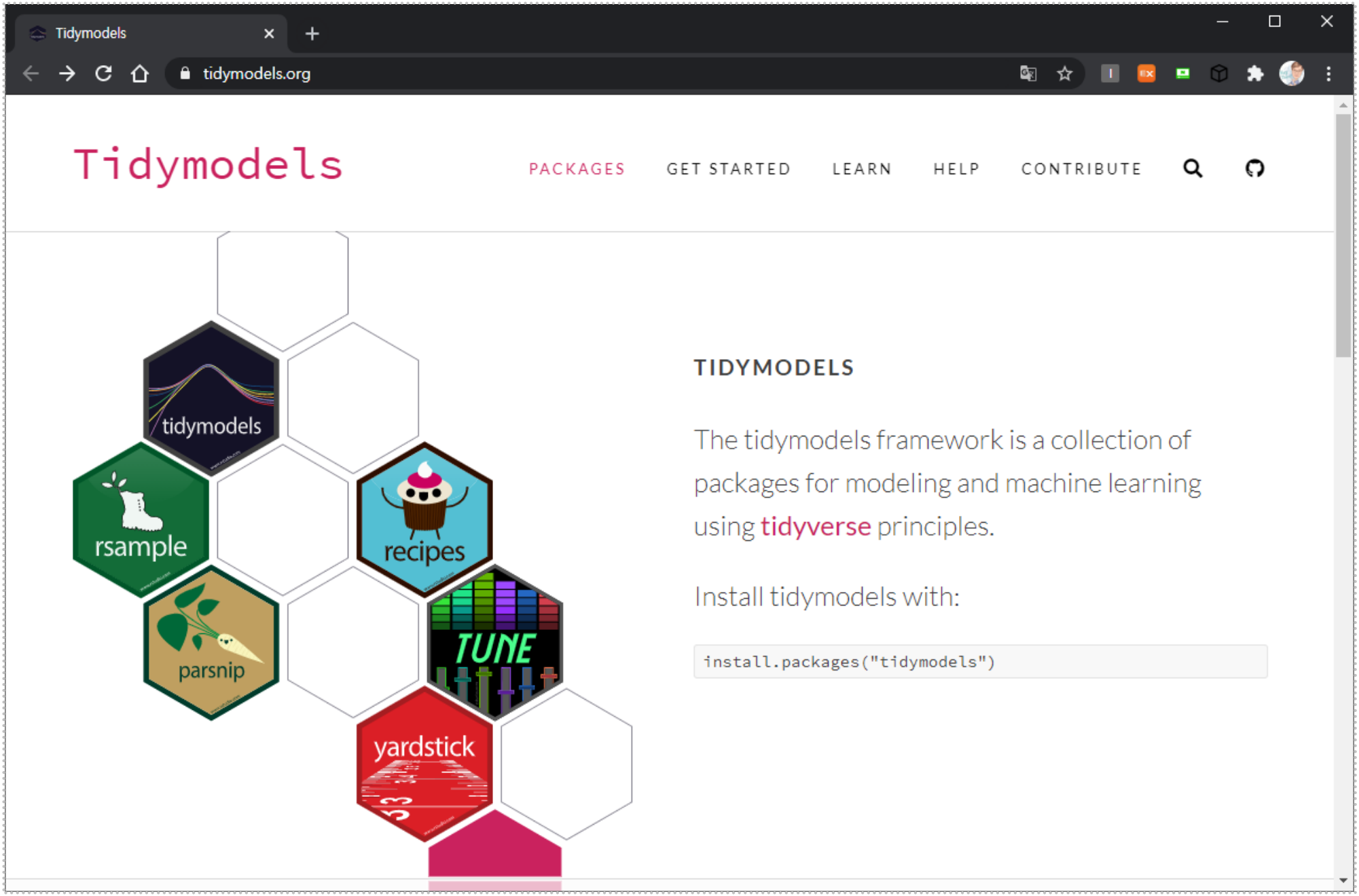
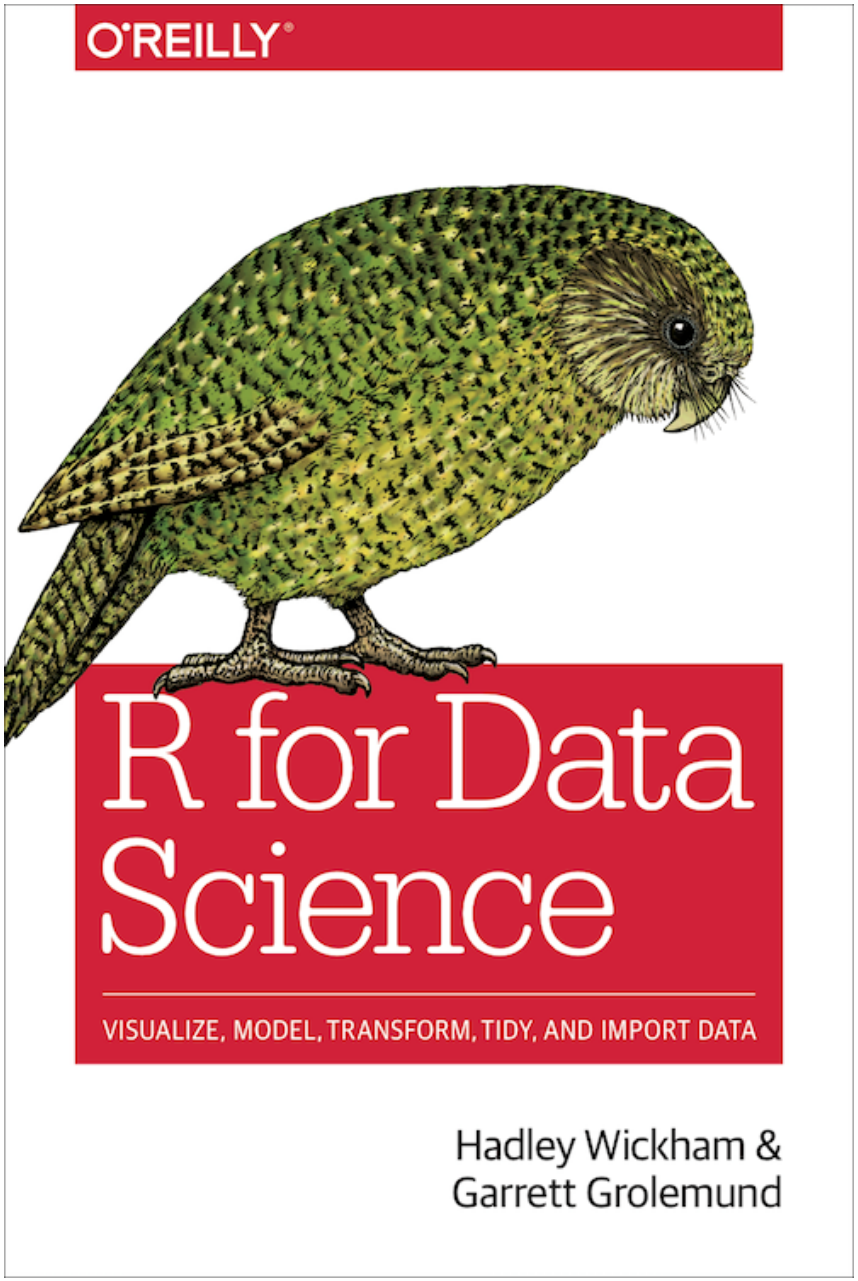
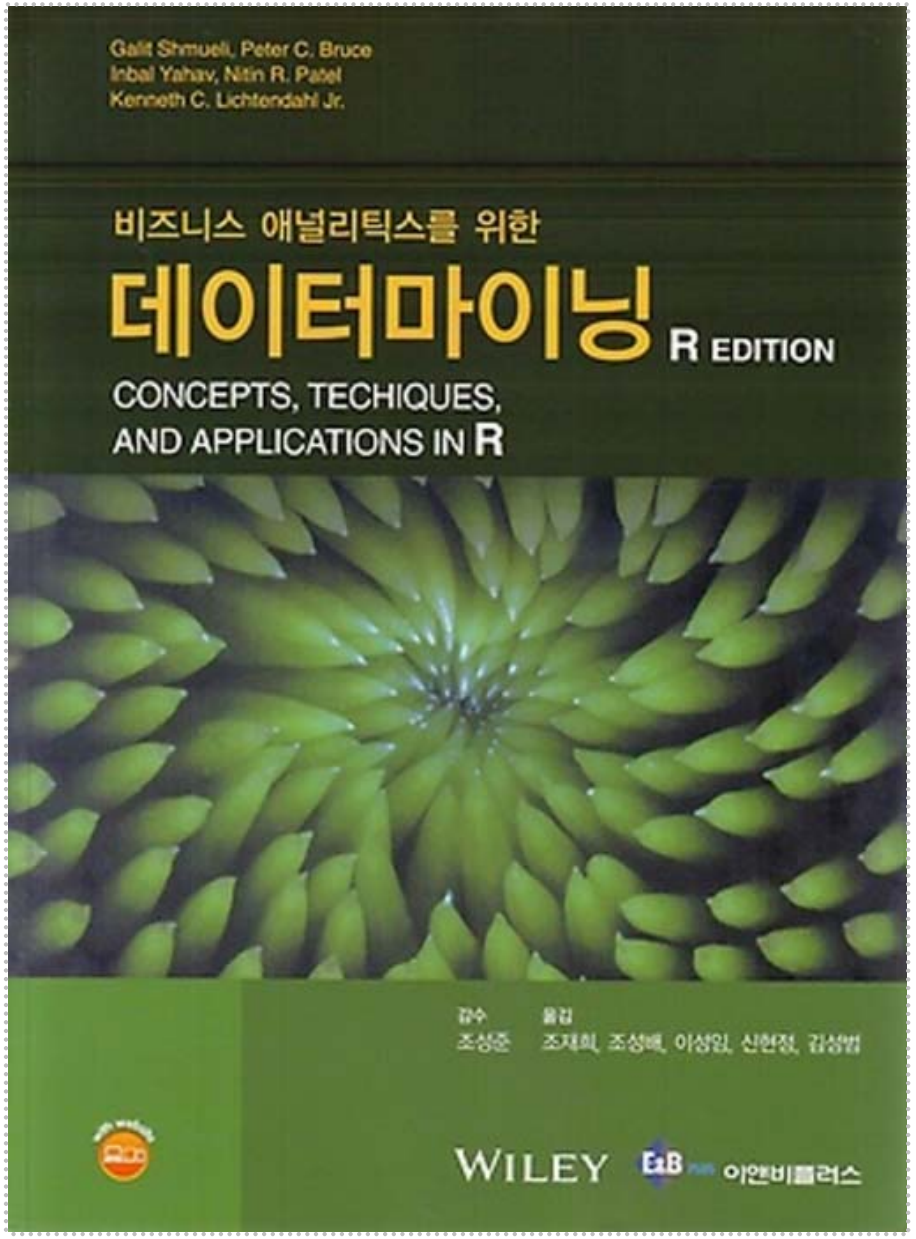
Ch10.연관규칙

교재


Tidymodels
tidymodels.org
Tidymodels
PACKAGES
GET STARTED
LEARN
HELP
CONTRIBUTE
tidymodels
rsample
recipes
parsnip
TUNE
yardstick
TIDYMODELS
The tidymodels framework is a collection of packages for modeling and machine learning using tidyverse principles.
Install tidymodels with:
install.packages("tidymodels")

교재





https://r4ds.had.co.nz/

학습목표

- R 프로그래밍 실습
- 실습: 북클럽 사례

북까페 사례

데이터형식

- 찰스 북클럽 사례
  - 4,000 거래
  - ChildBks: 어린이 (제거)
  - YouthBks: 청소년
  - CookBks: 요리 등

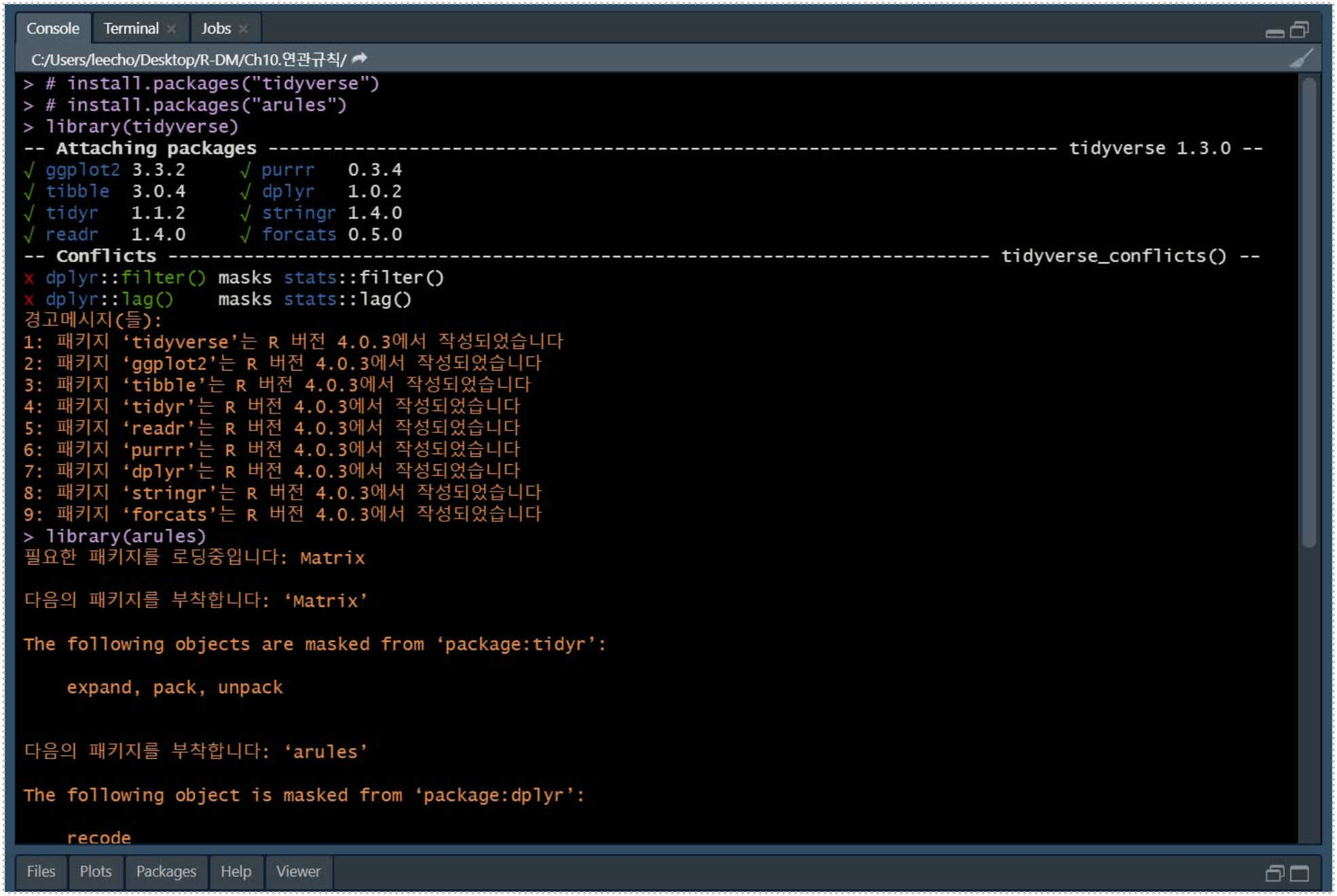
TABLE 14.7 SUBSET OF BOOK PURCHASE TRANSACTIONS IN BINARY MATRIX FORMAT

ChildBks	YouthBks	CookBks	DoItYBks	cefBks	ArtBks	GeogBks	ItalCook	ItalAtlas	ItalArt	Florence
0	1	0	1	0	0	1	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	1	1	0	1	0	1	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0
1	0	0	0	0	1	0	0	0	0	1
0	1	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0	0	0
1	1	1	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0

Package 설치

```
# 연관분석: Table 15.9



#########################################################
# tidyverse: ggplot2, purrr, tibble  3.0.3,             #
#            dplyr, tidyr, stringr, readr, forcats      #
#
#########################################################

# install.packages("tidyverse")
# install.packages("arules")
library(tidyverse)
library(arules)
```

Package 설치


Console
Terminal
Jobs
C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/
> # install.packages("tidyverse")
> # install.packages("arules")
> library(tidyverse)
-- Attaching packages ---------- tidyverse 1.3.0 --
√ ggplot2 3.3.2 √ purrr 0.3.4
√ tibble 3.0.4 √ dplyr 1.0.2
√ tidyr 1.1.2 √ stringr 1.4.0
√ readr 1.4.0 √ forcats 0.5.0
-- Conflicts ---------- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag() masks stats::lag()
경고메시지(들):
1: 패키지 'tidyverse'는 R 버전 4.0.3에서 작성되었습니다
2: 패키지 'ggplot2'는 R 버전 4.0.3에서 작성되었습니다
3: 패키지 'tibble'는 R 버전 4.0.3에서 작성되었습니다
4: 패키지 'tidyr'는 R 버전 4.0.3에서 작성되었습니다
5: 패키지 'readr'는 R 버전 4.0.3에서 작성되었습니다
6: 패키지 'purrr'는 R 버전 4.0.3에서 작성되었습니다
7: 패키지 'dplyr'는 R 버전 4.0.3에서 작성되었습니다
8: 패키지 'stringr'는 R 버전 4.0.3에서 작성되었습니다
9: 패키지 'forcats'는 R 버전 4.0.3에서 작성되었습니다
> library(arules)
필요한 패키지를 로딩중입니다: Matrix
다음의 패키지를 부착합니다: 'Matrix'
The following objects are masked from 'package:tidyr':
expand, pack, unpack
다음의 패키지를 부착합니다: 'arules'
The following object is masked from 'package:dplyr':
recode
Files
Plots
Packages
Help
Viewer

01.데이터 불러오기

```
# 01.데이터 불러오기
book_tb <- read_csv('CharlesBookClub.csv',
                    col_names = TRUE,
                    locale=locale('ko', encoding='euc-kr'),
                    na=".") %>% # csv 데이터 읽어오기
  mutate_if(is.character, as.factor)

str(book_tb)
head(book_tb)
```

01.데이터 불러오기

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
> # 01.데이터 불러오기
> book_tb <- read_csv('CharlesBookClub.csv',
+                     col_names = TRUE,
+                     locale=locale('ko', encoding='euc-kr'),
+                     na=".") %>% # csv 데이터 읽어오기
+   mutate_if(is.character, as.factor)

-- Column specification --------------------------------------------------------
cols(
  .default = col_double()
)
i Use `spec()` for the full column specifications.

> str(book_tb)
tibble [4,000 x 24] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ Seq#             : num [1:4000] 1 2 3 4 5 6 7 8 9 10 ...
 $ ID#              : num [1:4000] 25 29 46 47 51 60 61 79 81 90 ...
 $ Gender           : num [1:4000] 1 0 1 1 1 1 1 1 1 1 ...
 $ M                : num [1:4000] 297 128 138 228 257 145 190 187 252 240 ...
 $ R                : num [1:4000] 14 8 22 2 10 6 16 14 10 6 ...
 $ F                : num [1:4000] 2 2 7 1 1 2 1 1 1 3 ...
 $ FirstPurch       : num [1:4000] 22 10 56 2 10 12 16 14 10 20 ...
 $ ChildBks         : num [1:4000] 0 0 2 0 0 0 0 1 0 0 ...
 $ YouthBks         : num [1:4000] 1 0 1 0 0 0 0 0 0 0 ...
 $ CookBks          : num [1:4000] 1 0 2 0 0 0 0 0 0 1 ...
 $ DoItYBks         : num [1:4000] 0 0 0 0 0 0 0 0 0 0 ...
 $ RefBks           : num [1:4000] 0 0 1 0 0 0 0 0 0 0 ...
 $ ArtBks           : num [1:4000] 0 0 0 0 0 0 0 0 0 0 ...
 $ GeogBks          : num [1:4000] 0 0 1 0 0 0 1 0 0 0 ...
 $ ItalCook         : num [1:4000] 0 0 1 0 0 0 0 0 0 0 ...
 $ ItalAtlas        : num [1:4000] 0 0 0 0 0 0 0 0 0 0 ...
 $ ItalArt          : num [1:4000] 0 0 0 0 0 0 0 0 0 0 ...
 $ Florence         : num [1:4000] 0 0 0 0 0 0 0 0 0 0 ...
 $ Related Purchase: num [1:4000] 0 0 2 0 0 0 1 0 0 0 ...
 $ Mcode            : num [1:4000] 5 4 4 5 5 4 4 4 5 5 ...
 $ Rcode            : num [1:4000] 4 3 4 1 3 2 4 4 3 2 ...
```

Files | Plots | Packages | Help | Viewer

01.데이터 불러오기

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
  ..   M = col_double(),
  ..   R = col_double(),
  ..   F = col_double(),
  ..   FirstPurch = col_double(),
  ..   ChildBks = col_double(),
  ..   YouthBks = col_double(),
  ..   CookBks = col_double(),
  ..   DoItYBks = col_double(),
  ..   RefBks = col_double(),
  ..   ArtBks = col_double(),
  ..   GeogBks = col_double(),
  ..   ItalCook = col_double(),
  ..   ItalAtlas = col_double(),
  ..   ItalArt = col_double(),
  ..   Florence = col_double(),
  ..   `Related Purchase` = col_double(),
  ..   Mcode = col_double(),
  ..   Rcode = col_double(),
  ..   Fcode = col_double(),
  ..   Yes_Florence = col_double(),
  ..   No_Florence = col_double()
  .. )
> head(book_tb)
# A tibble: 6 x 24
  `Seq#` `ID#` Gender     M     R     F FirstPurch ChildBks YouthBks CookBks DoItYBks RefBks ArtBks GeogBks
   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>      <dbl>    <dbl>    <dbl>   <dbl>    <dbl>  <dbl>  <dbl>   <dbl>
1     1    25      1   297    14     2         22        0        1       1        0      0      0       0
2     2    29      0   128     8     2         10        0        0       0        0      0      0       0
3     3    46      1   138    22     7         56        2        1       2        0      1      0       1
4     4    47      1   228     2     1          2        0        0       0        0      0      0       0
5     5    51      1   257    10     1         10        0        0       0        0      0      0       0
6     6    60      1   145     6     2         12        0        0       0        0      0      0       0
# ... with 10 more variables: ItalCook <dbl>, ItalAtlas <dbl>, ItalArt <dbl>, Florence <dbl>, `Related
#   Purchase` <dbl>, Mcode <dbl>, Rcode <dbl>, Fcode <dbl>, Yes_Florence <dbl>, No_Florence <dbl>
>
```

Files | Plots | Packages | Help | Viewer

02.전리작업

```
# 02.전리작업: dataframe을 matrix 형식으로 변환

# 필요없는 변수 제거
book_count <-
  book_tb %>%
  select (c(8:18))

head(book_count)

# 1이상인 데이터를 1로 변환
# matrix형태로 자동 변환

book_count <-
  ifelse(book_count > 0, 1, 0)

head(book_count)
```

02.전리작업

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

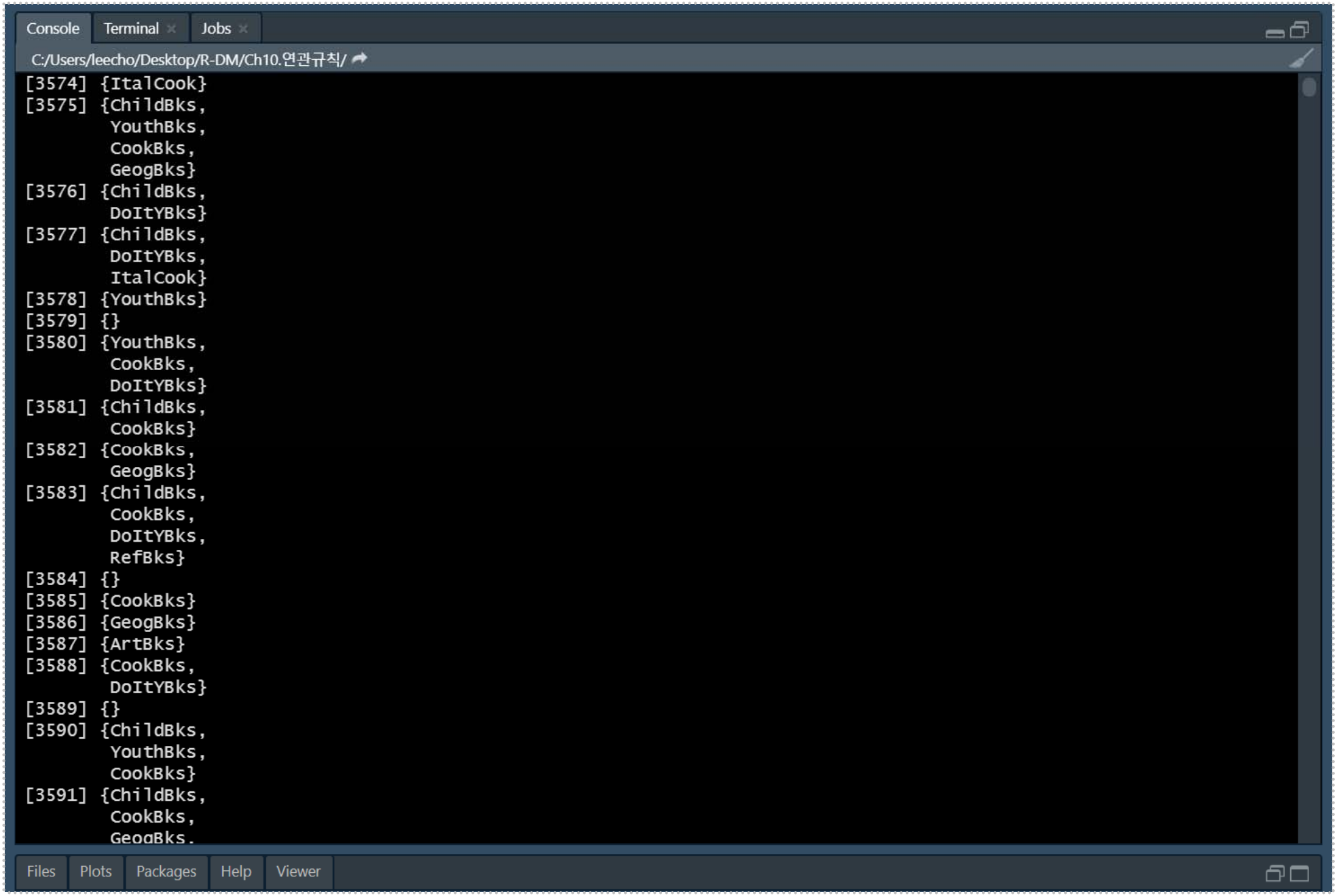
```
> # 필요없는 변수 제거
> book_count <-
+   book_tb %>%
+   select (c(8:18))
> head(book_count)
# A tibble: 6 x 11
  ChildBks YouthBks CookBks DoItYBks RefBks ArtBks GeogBks ItalCook ItalAtlas ItalArt Florence
     <db l>    <db l>   <db l>    <db l>  <db l>  <db l>   <db l>    <db l>    <db l>   <db l>
1        0         1        1         0       0       0        0         0         0        0
2        0         0        0         0       0       0        0         0         0        0
3        2         1        2         0       1       0        1         1         0        0
4        0         0        0         0       0       0        0         0         0        0
5        0         0        0         0       0       0        0         0         0        0
6        0         0        0         0       0       0        0         0         0        0
> book_count <-
+   ifelse(book_count > 0, 1, 0)
> head(book_count)
     ChildBks YouthBks CookBks DoItYBks RefBks ArtBks GeogBks ItalCook ItalAtlas ItalArt Florence
[1,]        0         1        1         0       0       0        0         0         0        0
[2,]        0         0        0         0       0       0        0         0         0        0
[3,]        1         1        1         0       1       0        1         1         0        0
[4,]        0         0        0         0       0       0        0         0         0        0
[5,]        0         0        0         0       0       0        0         0         0        0
[6,]        0         0        0         0       0       0        0         0         0        0
>
```

Files | Plots | Packages | Help | Viewer

03.Transactions으로 변환

```
# 03.바이너리 코드를 transactions으로 변환
books_trans <-
  book_count %>%
  as("transactions")

inspect(books_trans)
```

03.Transactions으로 변환



04.연관규칙 실행

```
# 04.연관규칙 실행
# 그래프 확인
itemFrequencyPlot(books_trans,
                  support = 0.1,
                  topN = 30)

# apriori(data, minimum support, minimum confidence, and target)
books_rules <-
  apriori(books_trans,
          parameter = list(supp= 200/4000,
                           conf = 0.5,
                           target = "rules"))

books_rules
```

04.연관규칙 실행

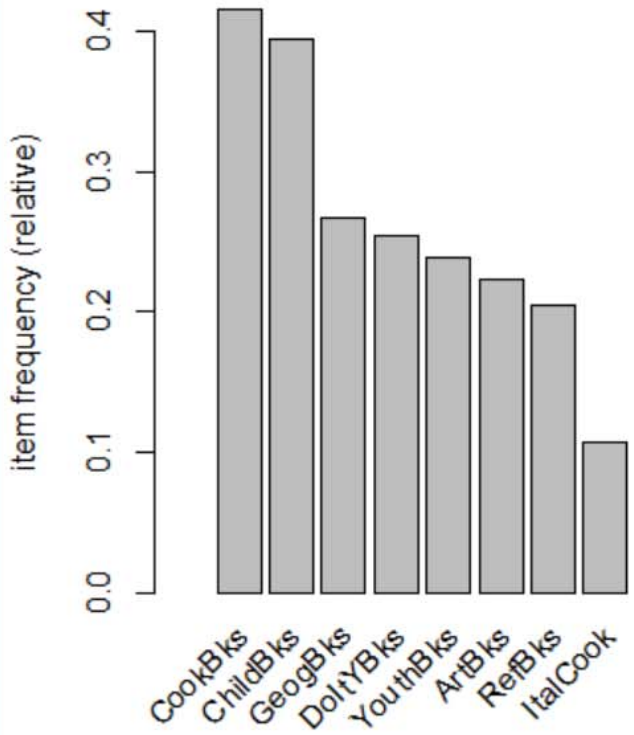
Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
> # 04.연관규칙 실행
> # 그래프 확인
> itemFrequencyPlot(books_trans,
+                   support = 0.1,
+                   topN = 30)
>
```

Files | Plots | Packages | Help | Viewer

Zoom | Export | Publish



04.연관규칙 실행

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
> # apriori(data, minimum support, minimum confidence, and target)
> books_rules <-
+   apriori(books_trans,
+           parameter = list(supp= 200/4000,
+                            conf = 0.5,
+                            target = "rules"))
Apriori

Parameter specification:
 confidence minval smax arem  aval originalSupport maxtime support minlen maxlen target  ext
        0.5    0.1    1 none FALSE            TRUE       5    0.05      1     10  rules TRUE

Algorithmic control:
 filter tree heap memopt load sort verbose
    0.1 TRUE TRUE  FALSE TRUE    2    TRUE

Absolute minimum support count: 200

set item appearances ...[0 item(s)] done [0.00s].
set transactions ...[11 item(s), 4000 transaction(s)] done [0.00s].
sorting and recoding items ... [9 item(s)] done [0.00s].
creating transaction tree ... done [0.00s].
checking subsets of size 1 2 3 4 done [0.00s].
writing ... [72 rule(s)] done [0.00s].
creating S4 object  ... done [0.00s].
> books_rules
set of 72 rules
>
```

Files | Plots | Packages | Help | Viewer

05.연관규칙확인

```
# 05.규칙확인: lift가 높은 순서로 sorting
# rules을 테이블 형태로 저장
rules_tbl <-
  books_rules %>%
  inspect() %>%
  as_tibble(.name_repair = "unique")

str(rules_tbl)



# 특정 조건에 맞는 규칙 찾기

rules_tbl %>%
  arrange(desc(lift)) %>%
  filter (support >= 0.1,
          confidence >= 0.5,
          lift >=1)
```

05.연관규칙확인

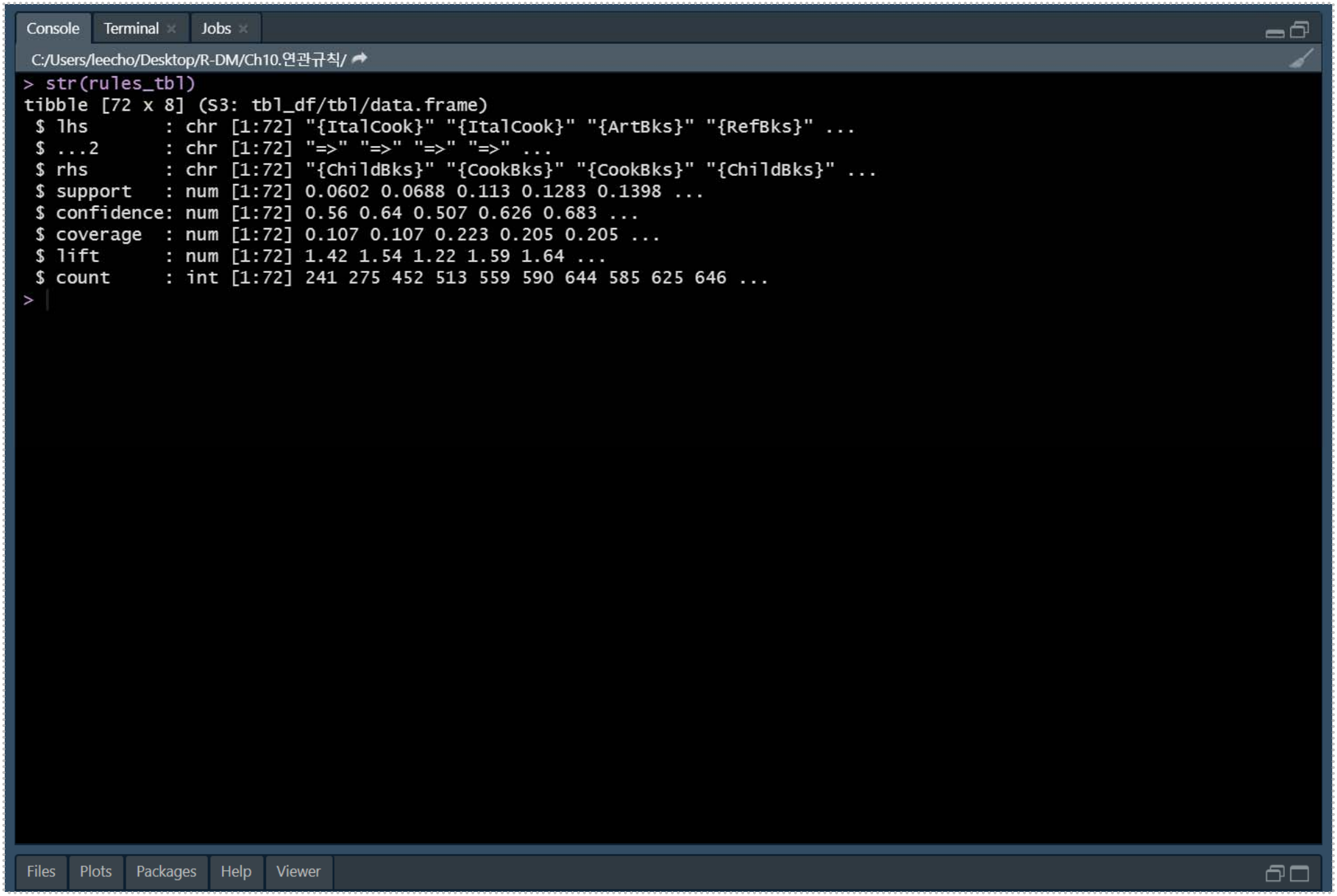
Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
> # 05.규칙확인: lift가 높은 순서로 sorting
> # rules 확
> rules_tbl <-
+   books_rules %>%
+   inspect() %>%
+   as_tibble(.name_repair = "unique")
     lhs                          rhs         support confidence coverage lift     count
[1]  {ItalCook}                => {ChildBks} 0.06025 0.5604651  0.10750  1.422500 241
[2]  {ItalCook}                => {CookBks}  0.06875 0.6395349  0.10750  1.539193 275
[3]  {ArtBks}                  => {CookBks}  0.11300 0.5067265  0.22300  1.219558 452
[4]  {RefBks}                  => {ChildBks} 0.12825 0.6263736  0.20475  1.589781 513
[5]  {RefBks}                  => {CookBks}  0.13975 0.6825397  0.20475  1.642695 559
[6]  {YouthBks}                => {ChildBks} 0.14750 0.6190976  0.23825  1.571314 590
[7]  {YouthBks}                => {CookBks}  0.16100 0.6757608  0.23825  1.626380 644
[8]  {GeogBks}                 => {ChildBks} 0.14625 0.5482662  0.26675  1.391538 585
[9]  {GeogBks}                 => {CookBks}  0.15625 0.5857545  0.26675  1.409758 625
[10] {DoItYBks}                => {ChildBks} 0.16150 0.6339549  0.25475  1.609022 646
[11] {DoItYBks}                => {CookBks}  0.16875 0.6624141  0.25475  1.594258 675
[12] {ChildBks}                => {CookBks}  0.24200 0.6142132  0.39400  1.478251 968
[13] {CookBks}                 => {ChildBks} 0.24200 0.5824308  0.41550  1.478251 968
[14] {YouthBks,ArtBks}         => {CookBks}  0.05150 0.7410072  0.06950  1.783411 206
[15] {ArtBks,GeogBks}          => {ChildBks} 0.05100 0.6276923  0.08125  1.593128 204
[16] {ArtBks,GeogBks}          => {CookBks}  0.05525 0.6800000  0.08125  1.636582 221
[17] {DoItYBks,ArtBks}         => {ChildBks} 0.05375 0.7214765  0.07450  1.831159 215
[18] {ChildBks,ArtBks}         => {DoItYBks} 0.05375 0.5106888  0.10525  2.004667 215
[19] {DoItYBks,ArtBks}         => {CookBks}  0.05300 0.7114094  0.07450  1.712177 212
[20] {ChildBks,ArtBks}         => {CookBks}  0.07325 0.6959620  0.10525  1.674999 293
[21] {CookBks,ArtBks}          => {ChildBks} 0.07325 0.6482301  0.11300  1.645254 293
[22] {YouthBks,RefBks}         => {ChildBks} 0.06200 0.7630769  0.08125  1.936743 248
[23] {YouthBks,RefBks}         => {CookBks}  0.06825 0.8400000  0.08125  2.021661 273
[24] {RefBks,GeogBks}          => {ChildBks} 0.05925 0.7247706  0.08175  1.839519 237
[25] {RefBks,GeogBks}          => {CookBks}  0.06450 0.7889908  0.08175  1.898895 258
[26] {DoItYBks,RefBks}         => {ChildBks} 0.07100 0.7675676  0.09250  1.948141 284
[27] {ChildBks,RefBks}         => {DoItYBks} 0.07100 0.5536062  0.12825  2.173135 284
[28] {DoItYBks,RefBks}         => {CookBks}  0.07450 0.8054054  0.09250  1.938400 298
[29] {CookBks,RefBks}          => {DoItYBks} 0.07450 0.5330948  0.13975  2.092619 298
```

Files | Plots | Packages | Help | Viewer

05.연관규칙확인


Console
Terminal
Jobs
C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/
> str(rules_tbl)
tibble [72 x 8] (S3: tbl_df/tbl/data.frame)
 $ lhs   : chr [1:72] "{ItalCook}" "{ItalCook}" "{ArtBks}" "{RefBks}" ...
 $ ...2   : chr [1:72] "=>" "=>" "=>" "=>" ...
 $ rhs   : chr [1:72] "{ChildBks}" "{CookBks}" "{CookBks}" "{ChildBks}" ...
 $ support   : num [1:72] 0.0602 0.0688 0.113 0.1283 0.1398 ...
 $ confidence: num [1:72] 0.56 0.64 0.507 0.626 0.683 ...
 $ coverage : num [1:72] 0.107 0.107 0.223 0.205 0.205 ...
 $ lift   : num [1:72] 1.42 1.54 1.22 1.59 1.64 ...
 $ count   : int [1:72] 241 275 452 513 559 590 644 585 625 646 ...
>
Files
Plots
Packages
Help
Viewer

05.연관규칙확인

```
# 특정 조건에 맞는 규칙 찾기

rules_tbl %>%
  arrange(desc(lift)) %>%
  filter (support >= 0.1,
          confidence >= 0.5,
          lift >=1)

# 특정 items 찾기

rules_tbl %>%
  arrange(desc(lift)) %>%
  filter(rhs == "{YouthBks}")
```

05.연관규칙확인

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

```
> rules_tbl %>%
+   arrange(desc(lift)) %>%
+   filter (support >= 0.1,
+           confidence >= 0.5,
+           lift >=1)
# A tibble: 20 x 8
   lhs                  ...2  rhs         support confidence coverage  lift count
   <chr>                <chr> <chr>         <dbl>      <dbl>    <dbl> <dbl> <int>
 1 {ChildBks,CookBks}   =>    {DoItYBks}    0.128      0.528    0.242  2.07   511
 2 {ChildBks,YouthBks}  =>    {CookBks}     0.12       0.814    0.148  1.96   480
 3 {ChildBks,RefBks}    =>    {CookBks}     0.104      0.807    0.128  1.94   414
 4 {CookBks,DoItYBks}   =>    {ChildBks}    0.128      0.757    0.169  1.92   511
 5 {ChildBks,DoItYBks}  =>    {CookBks}     0.128      0.791    0.162  1.90   511
 6 {YouthBks,CookBks}   =>    {ChildBks}    0.12       0.745    0.161  1.89   480
 7 {CookBks,RefBks}     =>    {ChildBks}    0.104      0.741    0.140  1.88   414
 8 {ChildBks,GeogBks}   =>    {CookBks}     0.110      0.749    0.146  1.80   438
 9 {CookBks,GeogBks}    =>    {ChildBks}    0.110      0.701    0.156  1.78   438
10 {RefBks}             =>    {CookBks}     0.140      0.683    0.205  1.64   559
11 {YouthBks}           =>    {CookBks}     0.161      0.676    0.238  1.63   644
12 {DoItYBks}           =>    {ChildBks}    0.162      0.634    0.255  1.61   646
13 {DoItYBks}           =>    {CookBks}     0.169      0.662    0.255  1.59   675
14 {RefBks}             =>    {ChildBks}    0.128      0.626    0.205  1.59   513
15 {YouthBks}           =>    {ChildBks}    0.148      0.619    0.238  1.57   590
16 {CookBks}            =>    {ChildBks}    0.242      0.582    0.416  1.48   968
17 {ChildBks}           =>    {CookBks}     0.242      0.614    0.394  1.48   968
18 {GeogBks}            =>    {CookBks}     0.156      0.586    0.267  1.41   625
19 {GeogBks}            =>    {ChildBks}    0.146      0.548    0.267  1.39   585
20 {ArtBks}             =>    {CookBks}     0.113      0.507    0.223  1.22   452
>
```

Files | Plots | Packages | Help | Viewer

05.연관규칙확인

Console | Terminal | Jobs

C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/

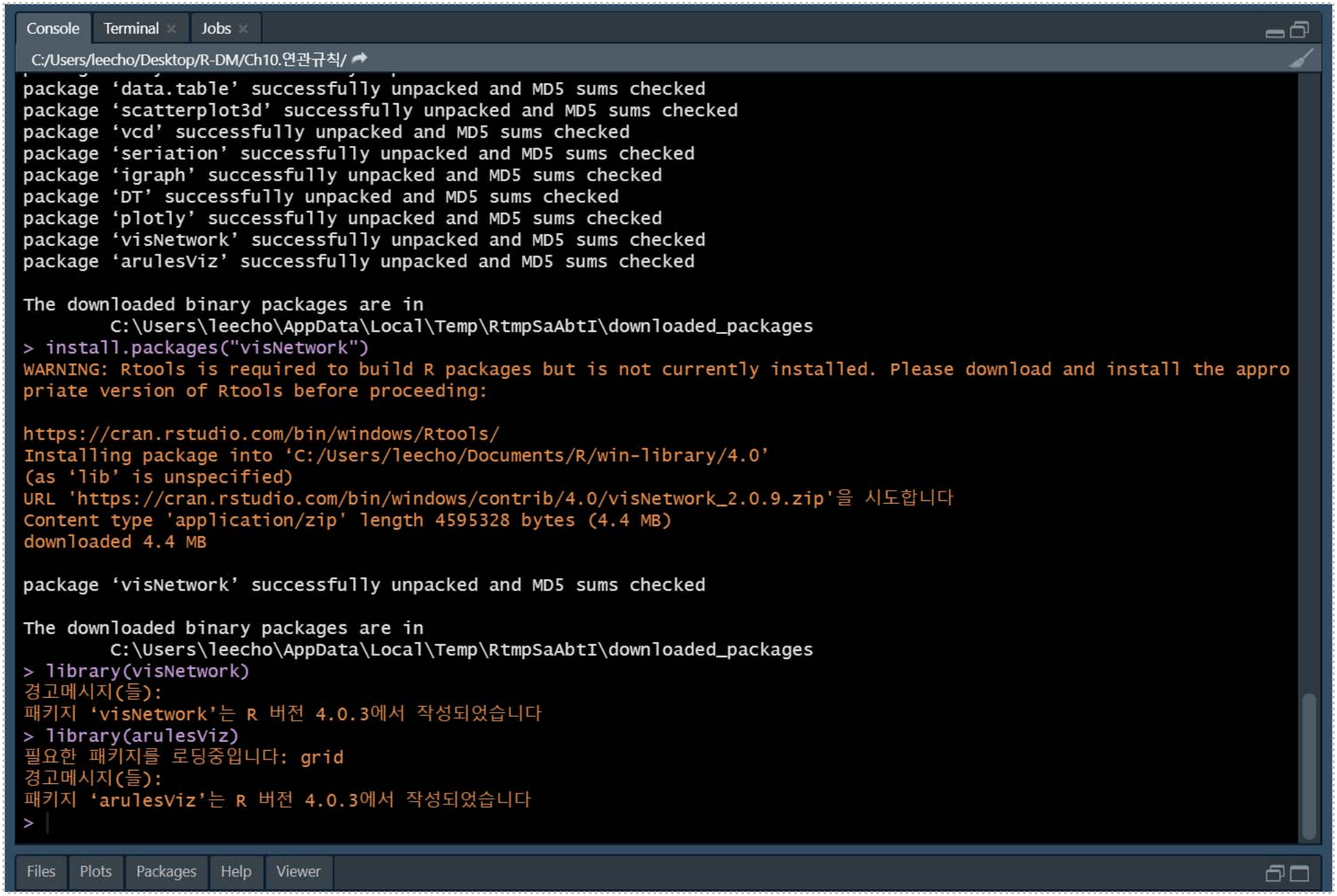
```
> rules_tbl %>%
+   arrange(desc(lift)) %>%
+   filter(rhs == "{YouthBks}")
# A tibble: 6 x 8
  lhs                       ...2  rhs        support confidence coverage  lift count
  <chr>                     <chr> <chr>        <dbl>      <dbl>    <dbl> <dbl> <int>
1 {ChildBks,CookBks,GeogBks} =>    {YouthBks}  0.0632      0.578    0.109  2.42   253
2 {DoItYBks,GeogBks}         =>    {YouthBks}  0.0545      0.540    0.101  2.26   218
3 {ChildBks,CookBks,RefBks}  =>    {YouthBks}  0.0552      0.534    0.104  2.24   221
4 {ChildBks,CookBks,DoItYBks} =>   {YouthBks}  0.067       0.524    0.128  2.20   268
5 {ChildBks,GeogBks}         =>    {YouthBks}  0.0755      0.516    0.146  2.17   302
6 {CookBks,GeogBks}          =>    {YouthBks}  0.0802      0.514    0.156  2.16   321
>
```

Files | Plots | Packages | Help | Viewer

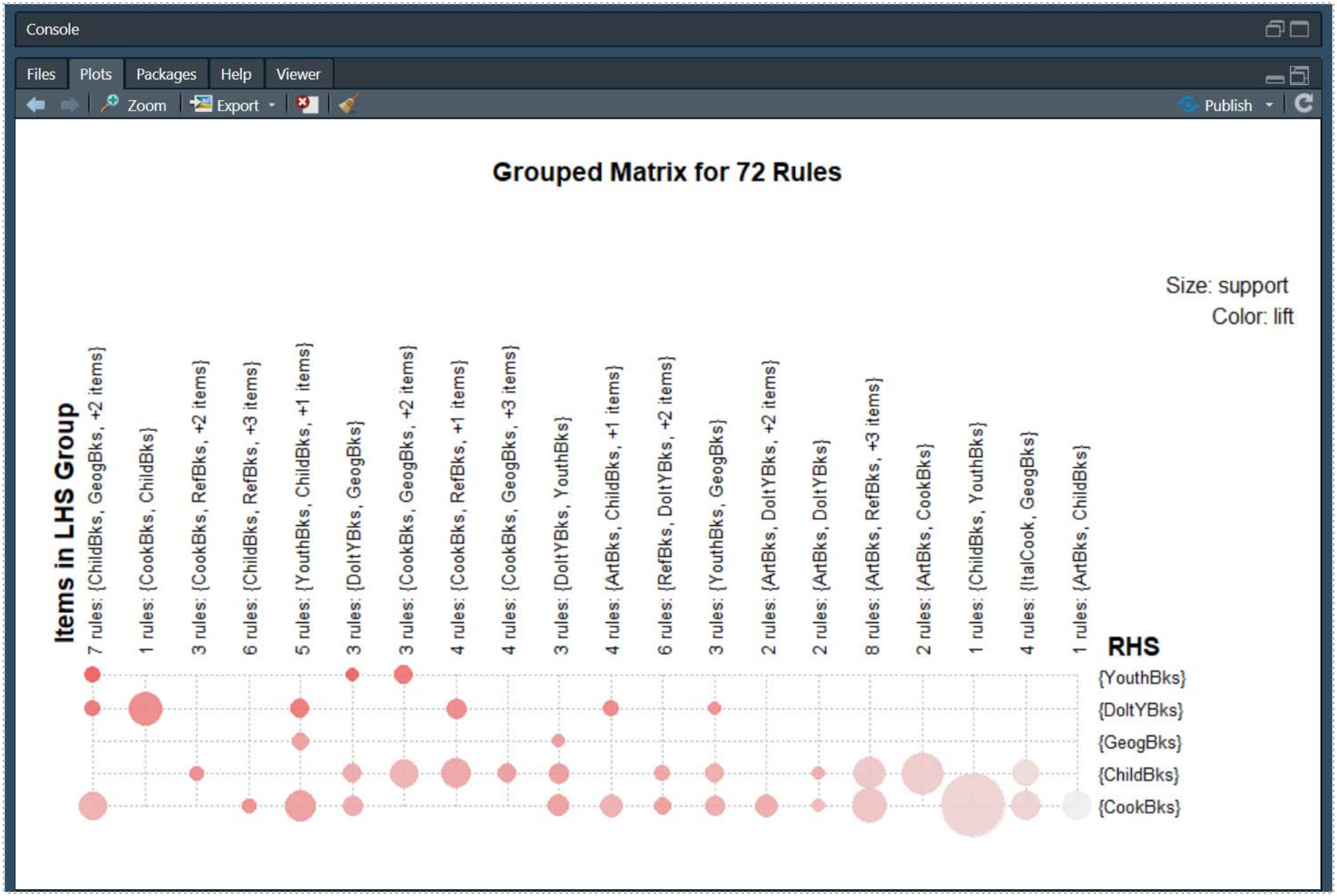
06.그래프 그리기

```
# 06.그래프 그리기

# install.packages("arulesViz")
# install.packages("visNetwork")
library(visNetwork)
library(arulesViz)

plot(sort(books_rules,
          by = "support"),
          method = "grouped")

# {item} → {item}: 지지도(support)
# color: 향상도(Lift)
plot(sort(books_rules,
          by = "lift")[1:20],
     method = "graph",
     engine = "htmlwidget")
```

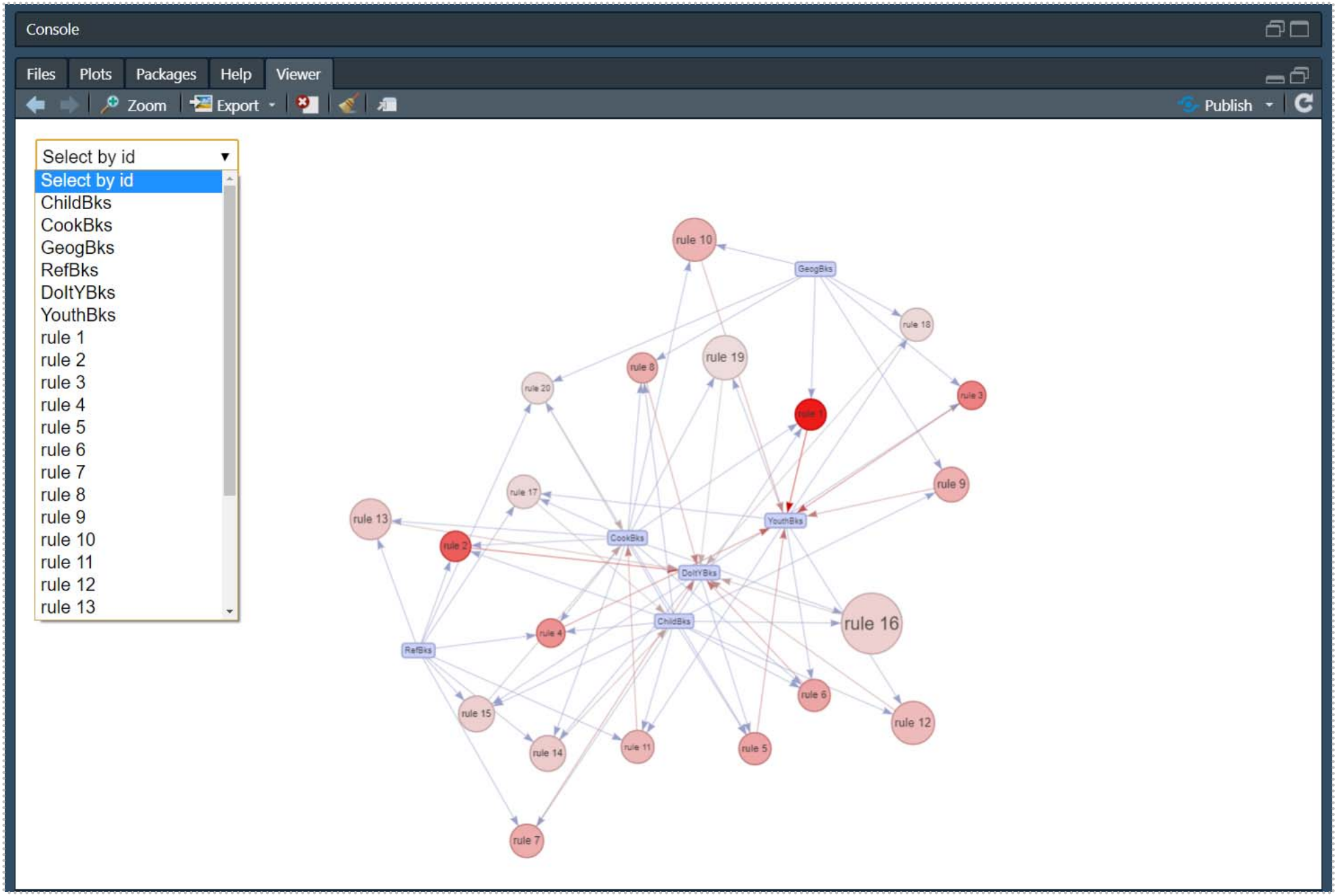
06.그래프 그리기


Console
Terminal
Jobs
C:/Users/leecho/Desktop/R-DM/Ch10.연관규칙/
package 'data.table' successfully unpacked and MD5 sums checked
package 'scatterplot3d' successfully unpacked and MD5 sums checked
package 'vcd' successfully unpacked and MD5 sums checked
package 'seriation' successfully unpacked and MD5 sums checked
package 'igraph' successfully unpacked and MD5 sums checked
package 'DT' successfully unpacked and MD5 sums checked
package 'plotly' successfully unpacked and MD5 sums checked
package 'visNetwork' successfully unpacked and MD5 sums checked
package 'arulesViz' successfully unpacked and MD5 sums checked
The downloaded binary packages are in
C:\Users\leecho\AppData\Local\Temp\RtmpSaAbtI\downloaded_packages
> install.packages("visNetwork")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appro
priate version of Rtools before proceeding:
https://cran.rstudio.com/bin/windows/Rtools/
Installing package into 'C:/Users/leecho/Documents/R/win-library/4.0'
(as 'lib' is unspecified)
URL 'https://cran.rstudio.com/bin/windows/contrib/4.0/visNetwork_2.0.9.zip'을 시도합니다
Content type 'application/zip' length 4595328 bytes (4.4 MB)
downloaded 4.4 MB
package 'visNetwork' successfully unpacked and MD5 sums checked
The downloaded binary packages are in
C:\Users\leecho\AppData\Local\Temp\RtmpSaAbtI\downloaded_packages
> library(visNetwork)
경고메시지(들):
패키지 'visNetwork'는 R 버전 4.0.3에서 작성되었습니다
> library(arulesViz)
필요한 패키지를 로딩중입니다: grid
경고메시지(들):
패키지 'arulesViz'는 R 버전 4.0.3에서 작성되었습니다
>
Files
Plots
Packages
Help
Viewer

06.그래프 그리기


Console
Files
Plots
Packages
Help
Viewer
Zoom
Export
Publish
Grouped Matrix for 72 Rules
Size: support
Color: lift
Items in LHS Group
7 rules: {ChildBks, GeogBks, +2 items}
1 rules: {CookBks, ChildBks}
3 rules: {CookBks, RefBks, +2 items}
6 rules: {ChildBks, RefBks, +3 items}
5 rules: {YouthBks, ChildBks, +1 items}
3 rules: {DoltYBks, GeogBks}
3 rules: {CookBks, GeogBks, +2 items}
4 rules: {CookBks, RefBks, +1 items}
4 rules: {CookBks, GeogBks, +3 items}
3 rules: {DoltYBks, YouthBks}
4 rules: {ArtBks, ChildBks, +1 items}
6 rules: {RefBks, DoltYBks, +2 items}
3 rules: {YouthBks, GeogBks}
2 rules: {ArtBks, DoltYBks, +2 items}
2 rules: {ArtBks, DoltYBks}
8 rules: {ArtBks, RefBks, +3 items}
2 rules: {ArtBks, CookBks}
1 rules: {ChildBks, YouthBks}
4 rules: {ItalCook, GeogBks}
1 rules: {ArtBks, ChildBks}
RHS
{YouthBks}
{DoltYBks}
{GeogBks}
{ChildBks}
{CookBks}

06.그래프 그리기


Console
Files
Plots
Packages
Help
Viewer
Zoom
Export
Publish
Select by id
Select by id
ChildBks
CookBks
GeogBks
RefBks
DoItYBks
YouthBks
rule 1
rule 2
rule 3
rule 4
rule 5
rule 6
rule 7
rule 8
rule 9
rule 10
rule 11
rule 12
rule 13
rule 10
GeogBks
rule 18
rule 19
rule 8
rule 20
rule 1
rule 3
rule 9
rule 17
rule 13
YouthBks
CookBks
rule 2
DoItYBks
ChildBks
rule 16
rule 4
RefBks
rule 6
rule 15
rule 12
rule 14
rule 11
rule 5
rule 7

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