Anly501 ARM

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```
data <- read.transactions("news_transaction.csv", sep =",",
                                format("basket"),  rm.duplicates = TRUE)
```

```
## distribution of transactions with duplicates:
## items
##  1  2  3  4  5  6  7
## 11 10  6  1  1  2  1
```

```
rules = arules::apriori(data,
        parameter = list(support=.06, conf=1, minlen=2))
```

```
## Apriori
##
## Parameter specification:
##  confidence minval smax arem  aval originalSupport maxtime support minlen
##           1    0.1    1 none FALSE            TRUE       5    0.06      2
##  maxlen target  ext
##      10  rules TRUE
##
## Algorithmic control:
##  filter tree heap memopt load sort verbose
##     0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## Absolute minimum support count: 3
##
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[598 item(s), 57 transaction(s)] done [0.00s].
## sorting and recoding items ... [39 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 3 4 done [0.00s].
## writing ... [74 rule(s)] done [0.00s].
## creating S4 object  ... done [0.00s].
```

```
inspect(rules[1:20])
```

```
##      lhs           rhs         support    confidence coverage   lift      count
## [1]  {ending}   => {world}     0.07017544 1          0.07017544  6.333333 4
## [2]  {ending}   => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [3]  {spoilers} => {shang}     0.08771930 1          0.08771930  4.071429 5
## [4]  {anything} => {cinematic} 0.07017544 1          0.07017544  3.352941 4
## [5]  {anything} => {universe}  0.07017544 1          0.07017544  1.900000 4
## [6]  {anything} => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [7]  {many}     => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [8]  {spider}   => {sony}      0.07017544 1          0.07017544 11.400000 4
## [9]  {spider}   => {universe}  0.07017544 1          0.07017544  1.900000 4
## [10] {spider}   => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [11] {their}    => {universe}  0.07017544 1          0.07017544  1.900000 4
## [12] {their}    => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [13] {like}     => {marvel}    0.08771930 1          0.08771930  1.295455 5
## [14] {sony}     => {universe}  0.08771930 1          0.08771930  1.900000 5
## [15] {sony}     => {marvel}    0.08771930 1          0.08771930  1.295455 5
## [16] {rings}    => {legend}    0.12280702 1          0.12280702  8.142857 7
## [17] {legend}   => {rings}     0.12280702 1          0.12280702  8.142857 7
## [18] {rings}    => {shang}     0.12280702 1          0.12280702  4.071429 7
## [19] {legend}   => {shang}     0.12280702 1          0.12280702  4.071429 7
## [20] {been}     => {marvel}    0.10526316 1          0.10526316  1.295455 6
```

```
##  Sort by Conf
sort_conf <- sort(rules, by="confidence", decreasing=TRUE)
inspect(sort_conf[1:15])
```

```
##      lhs           rhs         support    confidence coverage   lift      count
## [1]  {ending}   => {world}     0.07017544 1          0.07017544  6.333333 4
## [2]  {ending}   => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [3]  {spoilers} => {shang}     0.08771930 1          0.08771930  4.071429 5
## [4]  {anything} => {cinematic} 0.07017544 1          0.07017544  3.352941 4
## [5]  {anything} => {universe}  0.07017544 1          0.07017544  1.900000 4
## [6]  {anything} => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [7]  {many}     => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [8]  {spider}   => {sony}      0.07017544 1          0.07017544 11.400000 4
## [9]  {spider}   => {universe}  0.07017544 1          0.07017544  1.900000 4
## [10] {spider}   => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [11] {their}    => {universe}  0.07017544 1          0.07017544  1.900000 4
## [12] {their}    => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [13] {like}     => {marvel}    0.08771930 1          0.08771930  1.295455 5
## [14] {sony}     => {universe}  0.08771930 1          0.08771930  1.900000 5
## [15] {sony}     => {marvel}    0.08771930 1          0.08771930  1.295455 5
```

```
## Sort by Sup
sort_sup <- sort(rules, by="support", decreasing=TRUE)
inspect(sort_sup[1:15])
```

```
##      lhs                     rhs      support   confidence coverage  lift
## [1]  {universe}           => {marvel} 0.5263158 1          0.5263158 1.295455
## [2]  {cinematic}          => {marvel} 0.2982456 1          0.2982456 1.295455
## [3]  {cinematic,universe} => {marvel} 0.2807018 1          0.2807018 1.295455
## [4]  {from}               => {marvel} 0.1578947 1          0.1578947 1.295455
## [5]  {rings}              => {legend} 0.1228070 1          0.1228070 8.142857
## [6]  {legend}             => {rings}  0.1228070 1          0.1228070 8.142857
## [7]  {rings}              => {shang}  0.1228070 1          0.1228070 4.071429
## [8]  {legend}             => {shang}  0.1228070 1          0.1228070 4.071429
## [9]  {comics}             => {marvel} 0.1228070 1          0.1228070 1.295455
## [10] {first}              => {marvel} 0.1228070 1          0.1228070 1.295455
## [11] {legend,rings}       => {shang}  0.1228070 1          0.1228070 4.071429
## [12] {rings,shang}        => {legend} 0.1228070 1          0.1228070 8.142857
## [13] {legend,shang}       => {rings}  0.1228070 1          0.1228070 8.142857
## [14] {been}               => {marvel} 0.1052632 1          0.1052632 1.295455
## [15] {about}              => {marvel} 0.1052632 1          0.1052632 1.295455
##      count
## [1]  30
## [2]  17
## [3]  16
## [4]   9
## [5]   7
## [6]   7
## [7]   7
## [8]   7
## [9]   7
## [10]  7
## [11]  7
## [12]  7
## [13]  7
## [14]  6
## [15]  6
```

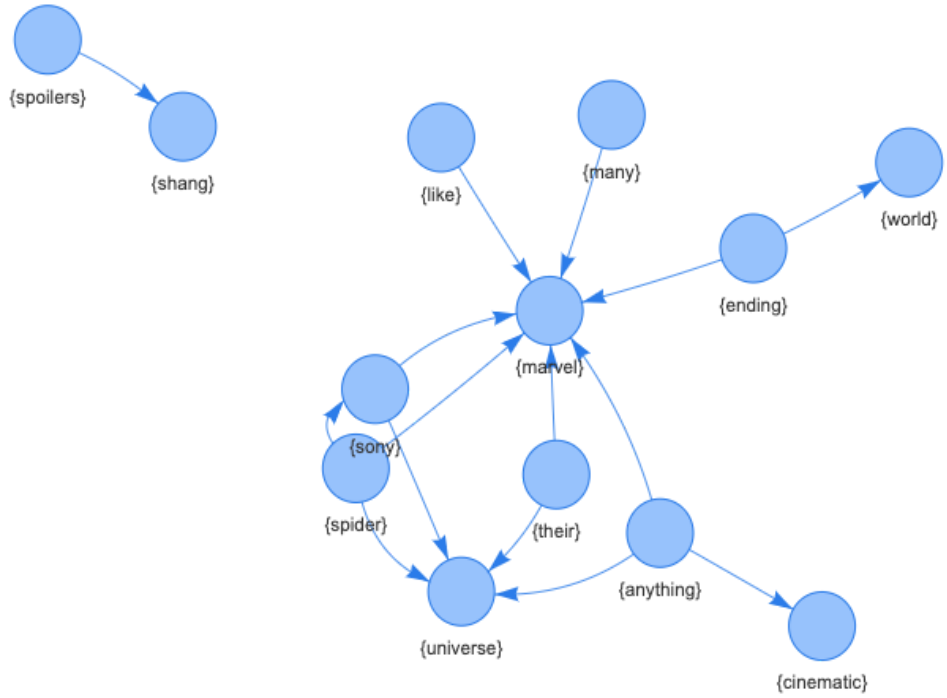
```
## Sort by Lift
sort_lift <- sort(rules, by="lift", decreasing=TRUE)
inspect(sort_lift[1:15])
```

```
##      lhs                          rhs      support    confidence coverage
## [1]  {spider}                  => {sony}   0.07017544 1          0.07017544
## [2]  {spider,universe}         => {sony}   0.07017544 1          0.07017544
## [3]  {marvel,spider}           => {sony}   0.07017544 1          0.07017544
## [4]  {marvel,spider,universe} => {sony}   0.07017544 1          0.07017544
## [5]  {rings}                   => {legend} 0.12280702 1          0.12280702
## [6]  {legend}                  => {rings}  0.12280702 1          0.12280702
## [7]  {rings,shang}             => {legend} 0.12280702 1          0.12280702
## [8]  {legend,shang}            => {rings}  0.12280702 1          0.12280702
## [9]  {marvel,rings}            => {legend} 0.07017544 1          0.07017544
## [10] {legend,marvel}           => {rings}  0.07017544 1          0.07017544
## [11] {marvel,rings,shang}      => {legend} 0.07017544 1          0.07017544
## [12] {legend,marvel,shang}     => {rings}  0.07017544 1          0.07017544
## [13] {ending}                  => {world}  0.07017544 1          0.07017544
## [14] {ending,marvel}           => {world}  0.07017544 1          0.07017544
## [15] {spoilers}                => {shang}  0.08771930 1          0.08771930
##      lift      count
## [1]  11.400000 4
## [2]  11.400000 4
## [3]  11.400000 4
## [4]  11.400000 4
## [5]   8.142857 7
## [6]   8.142857 7
## [7]   8.142857 7
## [8]   8.142857 7
## [9]   8.142857 4
## [10]  8.142857 4
## [11]  8.142857 4
## [12]  8.142857 4
## [13]  6.333333 4
## [14]  6.333333 4
## [15]  4.071429 5
```

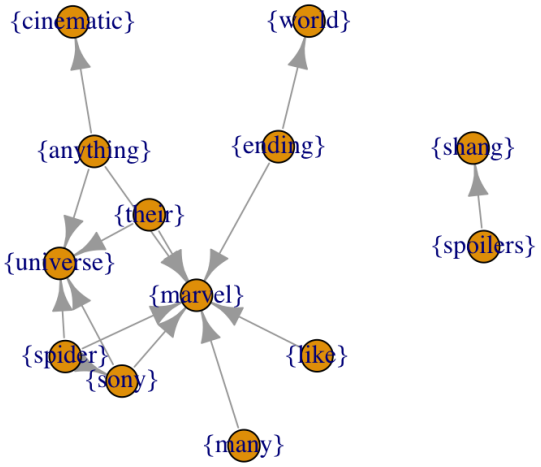
```
# visNetwork for confidence
subrules <- head(sort_conf, n = 15,by='confidence')
subrules <- inspect(subrules)
```

```
##      lhs            rhs          support    confidence coverage   lift      count
## [1]  {ending}    => {world}     0.07017544 1          0.07017544  6.333333 4
## [2]  {ending}    => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [3]  {spoilers}  => {shang}     0.08771930 1          0.08771930  4.071429 5
## [4]  {anything}  => {cinematic} 0.07017544 1          0.07017544  3.352941 4
## [5]  {anything}  => {universe}  0.07017544 1          0.07017544  1.900000 4
## [6]  {anything}  => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [7]  {many}      => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [8]  {spider}    => {sony}      0.07017544 1          0.07017544 11.400000 4
## [9]  {spider}    => {universe}  0.07017544 1          0.07017544  1.900000 4
## [10] {spider}    => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [11] {their}     => {universe}  0.07017544 1          0.07017544  1.900000 4
## [12] {their}     => {marvel}    0.07017544 1          0.07017544  1.295455 4
## [13] {like}      => {marvel}    0.08771930 1          0.08771930  1.295455 5
## [14] {sony}      => {universe}  0.08771930 1          0.08771930  1.900000 5
## [15] {sony}      => {marvel}    0.08771930 1          0.08771930  1.295455 5
```

```
node<-data.frame(id=unique(c(subrules$lhs,subrules$rhs)),label=unique(c(subrules$lhs,subrules$rhs)))
edge<-data.frame(from=subrules$lhs,to=subrules$rhs,arrows='to')
visNetwork(node, edge, width = "100%")
```



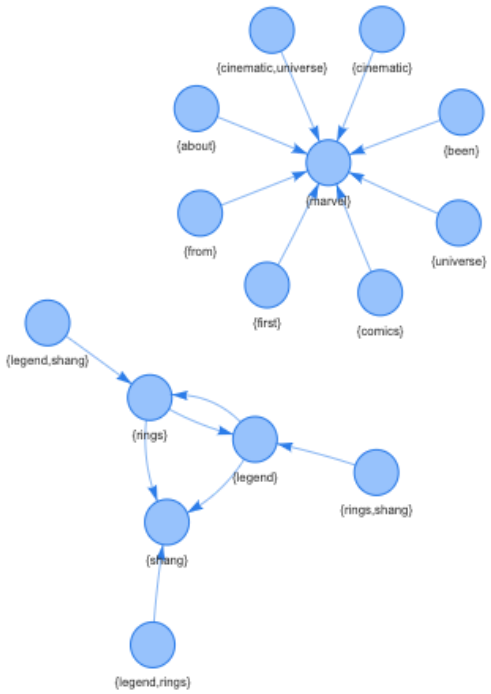

```
# igraph for confidence
plot(graph_from_data_frame(d=edge, vertices=node, directed = TRUE))
```



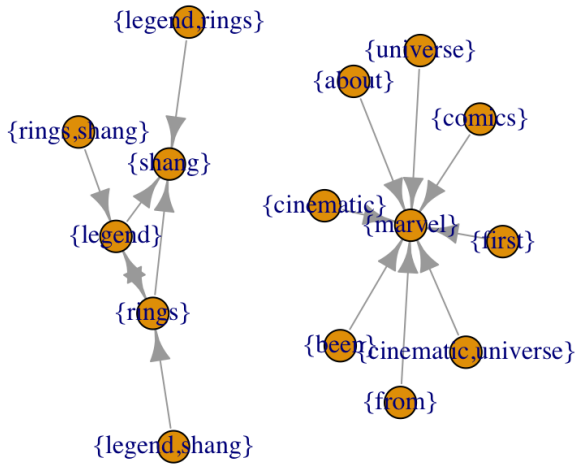

```
# visNetwork for support
subrules <- head(sort_sup, n = 15,by='sup')
subrules <- inspect(subrules)
```

```
##      lhs                     rhs      support   confidence coverage  lift
## [1]  {universe}           => {marvel} 0.5263158 1          0.5263158 1.295455
## [2]  {cinematic}          => {marvel} 0.2982456 1          0.2982456 1.295455
## [3]  {cinematic,universe} => {marvel} 0.2807018 1          0.2807018 1.295455
## [4]  {from}               => {marvel} 0.1578947 1          0.1578947 1.295455
## [5]  {rings}              => {legend} 0.1228070 1          0.1228070 8.142857
## [6]  {legend}             => {rings}  0.1228070 1          0.1228070 8.142857
## [7]  {rings}              => {shang}  0.1228070 1          0.1228070 4.071429
## [8]  {legend}             => {shang}  0.1228070 1          0.1228070 4.071429
## [9]  {comics}             => {marvel} 0.1228070 1          0.1228070 1.295455
## [10] {first}              => {marvel} 0.1228070 1          0.1228070 1.295455
## [11] {legend,rings}       => {shang}  0.1228070 1          0.1228070 4.071429
## [12] {rings,shang}        => {legend} 0.1228070 1          0.1228070 8.142857
## [13] {legend,shang}       => {rings}  0.1228070 1          0.1228070 8.142857
## [14] {been}               => {marvel} 0.1052632 1          0.1052632 1.295455
## [15] {about}              => {marvel} 0.1052632 1          0.1052632 1.295455
##      count
## [1]  30
## [2]  17
## [3]  16
## [4]   9
## [5]   7
## [6]   7
## [7]   7
## [8]   7
## [9]   7
## [10]  7
## [11]  7
## [12]  7
## [13]  7
## [14]  6
## [15]  6
```

```
node<-data.frame(id=unique(c(subrules$lhs,subrules$rhs)),label=unique(c(subrules$lhs,subrules$rhs)))
edge<-data.frame(from=subrules$lhs,to=subrules$rhs,arrows='to')
visNetwork(node, edge, width = "100%")
```



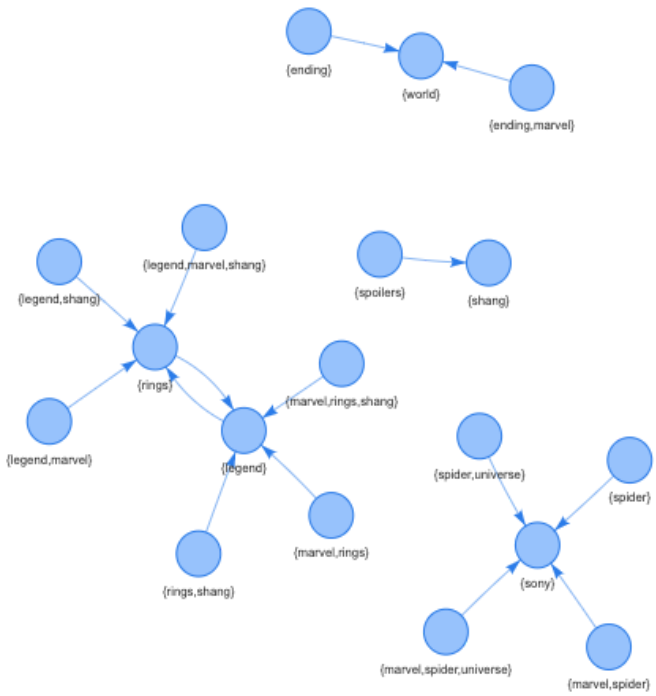
```
# igraph for support
plot(graph_from_data_frame(d=edge, vertices=node, directed = TRUE))
```



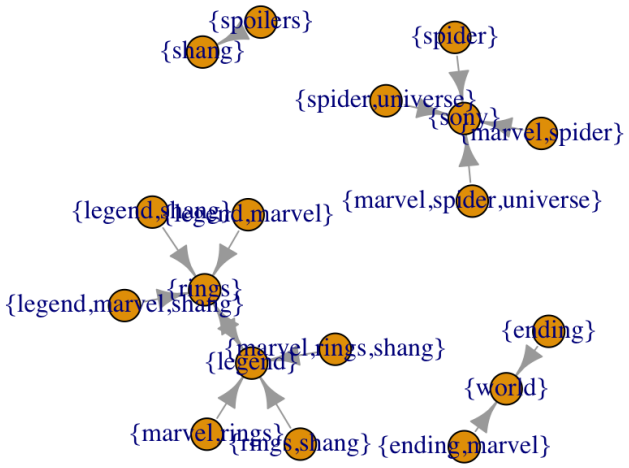

```
# visNetwork for lift
subrules <- head(sort_lift, n = 15,by='lift')
subrules <- inspect(subrules)
```

```
##      lhs                           rhs      support    confidence coverage
## [1]  {spider}                   => {sony}   0.07017544 1          0.07017544
## [2]  {spider,universe}          => {sony}   0.07017544 1          0.07017544
## [3]  {marvel,spider}            => {sony}   0.07017544 1          0.07017544
## [4]  {marvel,spider,universe}   => {sony}   0.07017544 1          0.07017544
## [5]  {rings}                    => {legend} 0.12280702 1          0.12280702
## [6]  {legend}                   => {rings}  0.12280702 1          0.12280702
## [7]  {rings,shang}              => {legend} 0.12280702 1          0.12280702
## [8]  {legend,shang}             => {rings}  0.12280702 1          0.12280702
## [9]  {marvel,rings}             => {legend} 0.07017544 1          0.07017544
## [10] {legend,marvel}            => {rings}  0.07017544 1          0.07017544
## [11] {marvel,rings,shang}       => {legend} 0.07017544 1          0.07017544
## [12] {legend,marvel,shang}      => {rings}  0.07017544 1          0.07017544
## [13] {ending}                   => {world}  0.07017544 1          0.07017544
## [14] {ending,marvel}            => {world}  0.07017544 1          0.07017544
## [15] {spoilers}                 => {shang}  0.08771930 1          0.08771930
##      lift      count
## [1]  11.400000 4
## [2]  11.400000 4
## [3]  11.400000 4
## [4]  11.400000 4
## [5]   8.142857 7
## [6]   8.142857 7
## [7]   8.142857 7
## [8]   8.142857 7
## [9]   8.142857 4
## [10]  8.142857 4
## [11]  8.142857 4
## [12]  8.142857 4
## [13]  6.333333 4
## [14]  6.333333 4
## [15]  4.071429 5
```

```
node<-data.frame(id=unique(c(subrules$lhs,subrules$rhs)),label=unique(c(subrules$lhs,subrules$rhs)))
edge<-data.frame(from=subrules$lhs,to=subrules$rhs,arrows='to')
visNetwork(node, edge, width = "100%")
```



```
# igraph for lift
plot(graph_from_data_frame(d=edge, vertices=node, directed = TRUE))
```




```
Rules_DF2<-DATAFRAME(rules, separate = TRUE)
(head(Rules_DF2))
```

```
##          LHS         RHS    support confidence   coverage     lift count
## 1   {ending}     {world} 0.07017544          1 0.07017544 6.333333     4
## 2   {ending}    {marvel} 0.07017544          1 0.07017544 1.295455     4
## 3 {spoilers}     {shang} 0.08771930          1 0.08771930 4.071429     5
## 4 {anything} {cinematic} 0.07017544          1 0.07017544 3.352941     4
## 5 {anything}  {universe} 0.07017544          1 0.07017544 1.900000     4
## 6 {anything}    {marvel} 0.07017544          1 0.07017544 1.295455     4
```

```
str(Rules_DF2)
```

```
## 'data.frame':    74 obs. of  7 variables:
##  $ LHS       : Factor w/ 56 levels "{ending}","{spoilers}",..: 1 1 2 3 3 3 4 5 5 5 ...
##  $ RHS       : Factor w/ 8 levels "{world}","{marvel}",..: 1 2 3 4 5 2 2 6 5 2 ...
##  $ support   : num  0.0702 0.0702 0.0877 0.0702 0.0702 ...
##  $ confidence: num  1 1 1 1 1 1 1 1 1 1 ...
##  $ coverage  : num  0.0702 0.0702 0.0877 0.0702 0.0702 ...
##  $ lift      : num  6.33 1.3 4.07 3.35 1.9 ...
##  $ count     : int  4 4 5 4 4 4 4 4 4 4 ...
```

```
## Convert to char
Rules_DF2$LHS<-as.character(Rules_DF2$LHS)
Rules_DF2$RHS<-as.character(Rules_DF2$RHS)

## Remove all {}
Rules_DF2[] <- lapply(Rules_DF2, gsub, pattern='[{]', replacement='')
Rules_DF2[] <- lapply(Rules_DF2, gsub, pattern='[}]', replacement='')

Rules_DF2
```

```
##                            LHS       RHS            support confidence
## 1                       ending     world 0.0701754385964912          1
## 2                       ending    marvel 0.0701754385964912          1
## 3                     spoilers     shang  0.087719298245614          1
## 4                     anything cinematic 0.0701754385964912          1
## 5                     anything  universe 0.0701754385964912          1
## 6                     anything    marvel 0.0701754385964912          1
## 7                         many    marvel 0.0701754385964912          1
## 8                       spider      sony 0.0701754385964912          1
## 9                       spider  universe 0.0701754385964912          1
## 10                      spider    marvel 0.0701754385964912          1
## 11                       their  universe 0.0701754385964912          1
## 12                       their    marvel 0.0701754385964912          1
## 13                        like    marvel  0.087719298245614          1
## 14                        sony  universe  0.087719298245614          1
## 15                        sony    marvel  0.087719298245614          1
## 16                       rings    legend   0.12280701754386          1
## 17                      legend     rings   0.12280701754386          1
## 18                       rings     shang   0.12280701754386          1
## 19                      legend     shang   0.12280701754386          1
## 20                        been    marvel  0.105263157894737          1
## 21                       about    marvel  0.105263157894737          1
## 22                        they    marvel  0.105263157894737          1
## 23                      comics    marvel   0.12280701754386          1
## 24                       first    marvel   0.12280701754386          1
## 25                        from    marvel  0.157894736842105          1
## 26                   cinematic    marvel  0.298245614035088          1
## 27                    universe    marvel  0.526315789473684          1
## 28                ending,world    marvel 0.0701754385964912          1
## 29               ending,marvel     world 0.0701754385964912          1
## 30              spoilers,world     shang 0.0701754385964912          1
## 31          anything,cinematic  universe 0.0701754385964912          1
## 32           anything,universe cinematic 0.0701754385964912          1
## 33          anything,cinematic    marvel 0.0701754385964912          1
## 34             anything,marvel cinematic 0.0701754385964912          1
## 35           anything,universe    marvel 0.0701754385964912          1
## 36             anything,marvel  universe 0.0701754385964912          1
## 37                 sony,spider  universe 0.0701754385964912          1
## 38             spider,universe      sony 0.0701754385964912          1
## 39                 sony,spider    marvel 0.0701754385964912          1
## 40               marvel,spider      sony 0.0701754385964912          1
## 41             spider,universe    marvel 0.0701754385964912          1
## 42               marvel,spider  universe 0.0701754385964912          1
## 43              their,universe    marvel 0.0701754385964912          1
## 44                marvel,their  universe 0.0701754385964912          1
## 45               like,universe    marvel 0.0701754385964912          1
## 46               sony,universe    marvel  0.087719298245614          1
## 47                 marvel,sony  universe  0.087719298245614          1
## 48             heroes,universe    marvel  0.087719298245614          1
## 49         characters,universe    marvel  0.087719298245614          1
## 50                legend,rings     shang   0.12280701754386          1
## 51                 rings,shang    legend   0.12280701754386          1
## 52                legend,shang     rings   0.12280701754386          1
## 53                marvel,rings    legend 0.0701754385964912          1
## 54               legend,marvel     rings 0.0701754385964912          1
## 55                marvel,rings     shang 0.0701754385964912          1
## 56               legend,marvel     shang 0.0701754385964912          1
## 57               they,universe    marvel 0.0701754385964912          1
## 58              first,universe    marvel  0.087719298245614          1
## 59               universe,will    marvel  0.087719298245614          1
## 60              cinematic,from  universe  0.087719298245614          1
## 61              cinematic,from    marvel  0.087719298245614          1
## 62                from,universe    marvel  0.105263157894737          1
## 63           cinematic,universe    marvel  0.280701754385965          1
## 64 anything,cinematic,universe    marvel 0.0701754385964912          1
## 65   anything,cinematic,marvel  universe 0.0701754385964912          1
```

```
## 66    anything,marvel,universe cinematic 0.0701754385964912          1
## 67        sony,spider,universe    marvel 0.0701754385964912          1
## 68          marvel,sony,spider  universe 0.0701754385964912          1
## 69      marvel,spider,universe      sony 0.0701754385964912          1
## 70         legend,marvel,rings     shang 0.0701754385964912          1
## 71          marvel,rings,shang    legend 0.0701754385964912          1
## 72         legend,marvel,shang     rings 0.0701754385964912          1
## 73     cinematic,from,universe    marvel  0.087719298245614          1
## 74       cinematic,from,marvel  universe  0.087719298245614          1
##              coverage             lift count
## 1  0.0701754385964912 6.33333333333333     4
## 2  0.0701754385964912 1.29545454545455     4
## 3   0.087719298245614 4.07142857142857     5
## 4  0.0701754385964912 3.35294117647059     4
## 5  0.0701754385964912              1.9     4
## 6  0.0701754385964912 1.29545454545455     4
## 7  0.0701754385964912 1.29545454545455     4
## 8  0.0701754385964912             11.4     4
## 9  0.0701754385964912              1.9     4
## 10 0.0701754385964912 1.29545454545455     4
## 11 0.0701754385964912              1.9     4
## 12 0.0701754385964912 1.29545454545455     4
## 13  0.087719298245614 1.29545454545455     5
## 14  0.087719298245614              1.9     5
## 15  0.087719298245614 1.29545454545455     5
## 16   0.12280701754386 8.14285714285714     7
## 17   0.12280701754386 8.14285714285714     7
## 18   0.12280701754386 4.07142857142857     7
## 19   0.12280701754386 4.07142857142857     7
## 20  0.105263157894737 1.29545454545455     6
## 21  0.105263157894737 1.29545454545455     6
## 22  0.105263157894737 1.29545454545455     6
## 23   0.12280701754386 1.29545454545455     7
## 24   0.12280701754386 1.29545454545455     7
## 25  0.157894736842105 1.29545454545455     9
## 26  0.298245614035088 1.29545454545455    17
## 27  0.526315789473684 1.29545454545455    30
## 28 0.0701754385964912 1.29545454545455     4
## 29 0.0701754385964912 6.33333333333333     4
## 30 0.0701754385964912 4.07142857142857     4
## 31 0.0701754385964912              1.9     4
## 32 0.0701754385964912 3.35294117647059     4
## 33 0.0701754385964912 1.29545454545455     4
## 34 0.0701754385964912 3.35294117647059     4
## 35 0.0701754385964912 1.29545454545455     4
## 36 0.0701754385964912              1.9     4
## 37 0.0701754385964912              1.9     4
## 38 0.0701754385964912             11.4     4
## 39 0.0701754385964912 1.29545454545455     4
## 40 0.0701754385964912             11.4     4
## 41 0.0701754385964912 1.29545454545455     4
## 42 0.0701754385964912              1.9     4
## 43 0.0701754385964912 1.29545454545455     4
## 44 0.0701754385964912              1.9     4
## 45 0.0701754385964912 1.29545454545455     4
## 46  0.087719298245614 1.29545454545455     5
## 47  0.087719298245614              1.9     5
## 48  0.087719298245614 1.29545454545455     5
## 49  0.087719298245614 1.29545454545455     5
## 50   0.12280701754386 4.07142857142857     7
## 51   0.12280701754386 8.14285714285714     7
## 52   0.12280701754386 8.14285714285714     7
## 53 0.0701754385964912 8.14285714285714     4
## 54 0.0701754385964912 8.14285714285714     4
## 55 0.0701754385964912 4.07142857142857     4
## 56 0.0701754385964912 4.07142857142857     4
## 57 0.0701754385964912 1.29545454545455     4
```

```
## 58  0.087719298245614 1.29545454545455     5
## 59  0.087719298245614 1.29545454545455     5
## 60  0.087719298245614              1.9     5
## 61  0.087719298245614 1.29545454545455     5
## 62  0.105263157894737 1.29545454545455     6
## 63  0.280701754385965 1.29545454545455    16
## 64 0.0701754385964912 1.29545454545455     4
## 65 0.0701754385964912              1.9     4
## 66 0.0701754385964912 3.35294117647059     4
## 67 0.0701754385964912 1.29545454545455     4
## 68 0.0701754385964912              1.9     4
## 69 0.0701754385964912             11.4     4
## 70 0.0701754385964912 4.07142857142857     4
## 71 0.0701754385964912 8.14285714285714     4
## 72 0.0701754385964912 8.14285714285714     4
## 73  0.087719298245614 1.29545454545455     5
## 74  0.087719298245614              1.9     5
```

```
## USING LIFT
Rules_L<-Rules_DF2[c(1,2,5)]
names(Rules_L) <- c("SourceName", "TargetName", "Weight")
head(Rules_L,14)
```

```
##    SourceName TargetName             Weight
## 1      ending      world 0.0701754385964912
## 2      ending     marvel 0.0701754385964912
## 3    spoilers      shang  0.087719298245614
## 4    anything  cinematic 0.0701754385964912
## 5    anything   universe 0.0701754385964912
## 6    anything     marvel 0.0701754385964912
## 7        many     marvel 0.0701754385964912
## 8      spider       sony 0.0701754385964912
## 9      spider   universe 0.0701754385964912
## 10     spider     marvel 0.0701754385964912
## 11      their   universe 0.0701754385964912
## 12      their     marvel 0.0701754385964912
## 13       like     marvel  0.087719298245614
## 14       sony   universe  0.087719298245614
```

```
## USING SUP
Rules_S<-Rules_DF2[c(1,2,3)]
names(Rules_S) <- c("SourceName", "TargetName", "Weight")
head(Rules_S,15)
```

```
##    SourceName TargetName             Weight
## 1      ending      world 0.0701754385964912
## 2      ending     marvel 0.0701754385964912
## 3    spoilers      shang  0.087719298245614
## 4    anything  cinematic 0.0701754385964912
## 5    anything   universe 0.0701754385964912
## 6    anything     marvel 0.0701754385964912
## 7        many     marvel 0.0701754385964912
## 8      spider       sony 0.0701754385964912
## 9      spider   universe 0.0701754385964912
## 10     spider     marvel 0.0701754385964912
## 11      their   universe 0.0701754385964912
## 12      their     marvel 0.0701754385964912
## 13       like     marvel  0.087719298245614
## 14       sony   universe  0.087719298245614
## 15       sony     marvel  0.087719298245614
```

```
## USING CONF
Rules_C<-Rules_DF2[c(1,2,4)]
names(Rules_C) <- c("SourceName", "TargetName", "Weight")
head(Rules_C,15)
```

```
##    SourceName TargetName Weight
## 1      ending      world      1
## 2      ending     marvel      1
## 3    spoilers      shang      1
## 4    anything  cinematic      1
## 5    anything   universe      1
## 6    anything     marvel      1
## 7        many     marvel      1
## 8      spider       sony      1
## 9      spider   universe      1
## 10     spider     marvel      1
## 11      their   universe      1
## 12      their     marvel      1
## 13       like     marvel      1
## 14       sony   universe      1
## 15       sony     marvel      1
```

```
## CHoose and set
Rules_Sup<-Rules_L
```

```
# prepare for network D3
(edgeList<-Rules_Sup)
```

```
##                     SourceName TargetName             Weight
## 1                       ending      world 0.0701754385964912
## 2                       ending     marvel 0.0701754385964912
## 3                     spoilers      shang  0.087719298245614
## 4                     anything  cinematic 0.0701754385964912
## 5                     anything   universe 0.0701754385964912
## 6                     anything     marvel 0.0701754385964912
## 7                         many     marvel 0.0701754385964912
## 8                       spider       sony 0.0701754385964912
## 9                       spider   universe 0.0701754385964912
## 10                      spider     marvel 0.0701754385964912
## 11                       their   universe 0.0701754385964912
## 12                       their     marvel 0.0701754385964912
## 13                        like     marvel  0.087719298245614
## 14                        sony   universe  0.087719298245614
## 15                        sony     marvel  0.087719298245614
## 16                       rings     legend   0.12280701754386
## 17                      legend      rings   0.12280701754386
## 18                       rings      shang   0.12280701754386
## 19                      legend      shang   0.12280701754386
## 20                        been     marvel  0.105263157894737
## 21                       about     marvel  0.105263157894737
## 22                        they     marvel  0.105263157894737
## 23                      comics     marvel   0.12280701754386
## 24                       first     marvel   0.12280701754386
## 25                        from     marvel  0.157894736842105
## 26                   cinematic     marvel  0.298245614035088
## 27                    universe     marvel  0.526315789473684
## 28                ending,world     marvel 0.0701754385964912
## 29               ending,marvel      world 0.0701754385964912
## 30              spoilers,world      shang 0.0701754385964912
## 31          anything,cinematic   universe 0.0701754385964912
## 32           anything,universe  cinematic 0.0701754385964912
## 33          anything,cinematic     marvel 0.0701754385964912
## 34             anything,marvel  cinematic 0.0701754385964912
## 35           anything,universe     marvel 0.0701754385964912
## 36             anything,marvel   universe 0.0701754385964912
## 37                 sony,spider   universe 0.0701754385964912
## 38              spider,universe       sony 0.0701754385964912
## 39                 sony,spider     marvel 0.0701754385964912
## 40               marvel,spider       sony 0.0701754385964912
## 41              spider,universe     marvel 0.0701754385964912
## 42               marvel,spider   universe 0.0701754385964912
## 43              their,universe     marvel 0.0701754385964912
## 44                marvel,their   universe 0.0701754385964912
## 45               like,universe     marvel 0.0701754385964912
## 46               sony,universe     marvel  0.087719298245614
## 47                 marvel,sony   universe  0.087719298245614
## 48              heroes,universe     marvel  0.087719298245614
## 49         characters,universe     marvel  0.087719298245614
## 50                legend,rings      shang   0.12280701754386
## 51                 rings,shang     legend   0.12280701754386
## 52                legend,shang      rings   0.12280701754386
## 53                marvel,rings     legend 0.0701754385964912
## 54               legend,marvel      rings 0.0701754385964912
## 55                marvel,rings      shang 0.0701754385964912
## 56               legend,marvel      shang 0.0701754385964912
## 57               they,universe     marvel 0.0701754385964912
## 58              first,universe     marvel  0.087719298245614
## 59               universe,will     marvel  0.087719298245614
## 60              cinematic,from   universe  0.087719298245614
## 61              cinematic,from     marvel  0.087719298245614
## 62                from,universe     marvel  0.105263157894737
## 63           cinematic,universe     marvel  0.280701754385965
## 64 anything,cinematic,universe     marvel 0.0701754385964912
## 65   anything,cinematic,marvel   universe 0.0701754385964912
```

```
## 66    anything,marvel,universe  cinematic 0.0701754385964912
## 67        sony,spider,universe     marvel 0.0701754385964912
## 68          marvel,sony,spider   universe 0.0701754385964912
## 69      marvel,spider,universe       sony 0.0701754385964912
## 70         legend,marvel,rings      shang 0.0701754385964912
## 71          marvel,rings,shang     legend 0.0701754385964912
## 72         legend,marvel,shang      rings 0.0701754385964912
## 73     cinematic,from,universe     marvel  0.087719298245614
## 74       cinematic,from,marvel   universe  0.087719298245614
```

```
(MyGraph <- igraph::simplify(igraph::graph.data.frame(edgeList, directed=TRUE)))
```

```
## IGRAPH 98c813d DN-- 59 74 --
## + attr: name (v/c)
## + edges from 98c813d (vertex names):
##  [1] ending   ->world     ending   ->marvel    spoilers ->shang
##  [4] anything ->cinematic anything ->universe  anything ->marvel
##  [7] many     ->marvel    spider   ->sony      spider   ->universe
## [10] spider   ->marvel    their    ->universe  their    ->marvel
## [13] like     ->marvel    sony     ->universe  sony     ->marvel
## [16] rings    ->legend    rings    ->shang     legend   ->rings
## [19] legend   ->shang     been     ->marvel    about    ->marvel
## [22] they     ->marvel    comics   ->marvel    first    ->marvel
## + ... omitted several edges
```

```
nodeList <- data.frame(ID = c(0:(igraph::vcount(MyGraph) - 1)),
                       nName = igraph::V(MyGraph)$name)
## Node Degree
(nodeList <- cbind(nodeList, nodeDegree=igraph::degree(MyGraph,
                     v = igraph::V(MyGraph), mode = "all")))
```

```
##                                ID                        nName nodeDegree
## ending                          0                       ending          2
## spoilers                        1                     spoilers          1
## anything                        2                     anything          3
## many                            3                         many          1
## spider                          4                       spider          3
## their                           5                        their          2
## like                            6                         like          1
## sony                            7                         sony          6
## rings                           8                        rings          6
## legend                          9                       legend          6
## been                           10                         been          1
## about                          11                        about          1
## they                           12                         they          1
## comics                         13                       comics          1
## first                          14                        first          1
## from                           15                         from          1
## cinematic                      16                    cinematic          5
## universe                       17                     universe         15
## ending,world                   18                 ending,world          1
## ending,marvel                  19                ending,marvel          1
## spoilers,world                 20               spoilers,world          1
## anything,cinematic             21           anything,cinematic          2
## anything,universe              22            anything,universe          2
## anything,marvel                23              anything,marvel          2
## sony,spider                    24                 sony,spider          2
## spider,universe                25              spider,universe          2
## marvel,spider                  26                marvel,spider          2
## their,universe                 27               their,universe          1
## marvel,their                   28                marvel,their          1
## like,universe                  29                like,universe          1
## sony,universe                  30                sony,universe          1
## marvel,sony                    31                  marvel,sony          1
## heroes,universe                32              heroes,universe          1
## characters,universe            33          characters,universe          1
## legend,rings                   34                 legend,rings          1
## rings,shang                    35                  rings,shang          1
## legend,shang                   36                 legend,shang          1
## marvel,rings                   37                 marvel,rings          2
## legend,marvel                  38                legend,marvel          2
## they,universe                  39                they,universe          1
## first,universe                 40               first,universe          1
## universe,will                  41                universe,will          1
## cinematic,from                 42               cinematic,from          2
## from,universe                  43                from,universe          1
## cinematic,universe             44           cinematic,universe          1
## anything,cinematic,universe    45 anything,cinematic,universe          1
## anything,cinematic,marvel      46   anything,cinematic,marvel          1
## anything,marvel,universe       47    anything,marvel,universe          1
## sony,spider,universe           48         sony,spider,universe          1
## marvel,sony,spider             49           marvel,sony,spider          1
## marvel,spider,universe         50       marvel,spider,universe          1
## legend,marvel,rings            51          legend,marvel,rings          1
## marvel,rings,shang             52           marvel,rings,shang          1
## legend,marvel,shang            53          legend,marvel,shang          1
## cinematic,from,universe        54      cinematic,from,universe          1
## cinematic,from,marvel          55        cinematic,from,marvel          1
## world                          56                       world          2
## marvel                         57                      marvel         34
## shang                          58                       shang          8
```

```
## Betweenness
BetweenNess <- igraph::betweenness(MyGraph,
      v = igraph::V(MyGraph),
      directed = TRUE)

(nodeList <- cbind(nodeList, nodeBetweenness=BetweenNess))
```

```
##                                ID                        nName nodeDegree
## ending                          0                       ending          2
## spoilers                        1                     spoilers          1
## anything                        2                     anything          3
## many                            3                         many          1
## spider                          4                       spider          3
## their                           5                        their          2
## like                            6                         like          1
## sony                            7                         sony          6
## rings                           8                        rings          6
## legend                          9                       legend          6
## been                           10                         been          1
## about                          11                        about          1
## they                           12                         they          1
## comics                         13                       comics          1
## first                          14                        first          1
## from                           15                         from          1
## cinematic                      16                    cinematic          5
## universe                       17                     universe         15
## ending,world                   18                 ending,world          1
## ending,marvel                  19                ending,marvel          1
## spoilers,world                 20              spoilers,world          1
## anything,cinematic             21           anything,cinematic          2
## anything,universe              22            anything,universe          2
## anything,marvel                23              anything,marvel          2
## sony,spider                    24                 sony,spider          2
## spider,universe                25              spider,universe          2
## marvel,spider                  26                marvel,spider          2
## their,universe                 27               their,universe          1
## marvel,their                   28                 marvel,their          1
## like,universe                  29                like,universe          1
## sony,universe                  30                sony,universe          1
## marvel,sony                    31                  marvel,sony          1
## heroes,universe                32              heroes,universe          1
## characters,universe            33          characters,universe          1
## legend,rings                   34                 legend,rings          1
## rings,shang                    35                  rings,shang          1
## legend,shang                   36                 legend,shang          1
## marvel,rings                   37                 marvel,rings          2
## legend,marvel                  38                legend,marvel          2
## they,universe                  39                they,universe          1
## first,universe                 40               first,universe          1
## universe,will                  41                universe,will          1
## cinematic,from                 42               cinematic,from          2
## from,universe                  43                from,universe          1
## cinematic,universe             44           cinematic,universe          1
## anything,cinematic,universe    45 anything,cinematic,universe          1
## anything,cinematic,marvel      46   anything,cinematic,marvel          1
## anything,marvel,universe       47    anything,marvel,universe          1
## sony,spider,universe           48         sony,spider,universe          1
## marvel,sony,spider             49           marvel,sony,spider          1
## marvel,spider,universe         50       marvel,spider,universe          1
## legend,marvel,rings            51          legend,marvel,rings          1
## marvel,rings,shang             52           marvel,rings,shang          1
## legend,marvel,shang            53          legend,marvel,shang          1
## cinematic,from,universe        54      cinematic,from,universe          1
## cinematic,from,marvel          55        cinematic,from,marvel          1
## world                          56                       world          2
## marvel                         57                      marvel         34
## shang                          58                       shang          8
##                                nodeBetweenness
## ending                                     0.0
## spoilers                                   0.0
## anything                                   0.0
## many                                       0.0
## spider                                     0.0
```

```
## their                              0.0
## like                               0.0
## sony                               3.5
## rings                              5.0
## legend                             5.0
## been                               0.0
## about                              0.0
## they                               0.0
## comics                             0.0
## first                              0.0
## from                               0.0
## cinematic                          1.5
## universe                           6.0
## ending,world                       0.0
## ending,marvel                      0.0
## spoilers,world                     0.0
## anything,cinematic                 0.0
## anything,universe                  0.0
## anything,marvel                    0.0
## sony,spider                        0.0
## spider,universe                    0.0
## marvel,spider                      0.0
## their,universe                     0.0
## marvel,their                       0.0
## like,universe                      0.0
## sony,universe                      0.0
## marvel,sony                        0.0
## heroes,universe                    0.0
## characters,universe                0.0
## legend,rings                       0.0
## rings,shang                        0.0
## legend,shang                       0.0
## marvel,rings                       0.0
## legend,marvel                      0.0
## they,universe                      0.0
## first,universe                     0.0
## universe,will                      0.0
## cinematic,from                     0.0
## from,universe                      0.0
## cinematic,universe                 0.0
## anything,cinematic,universe        0.0
## anything,cinematic,marvel          0.0
## anything,marvel,universe           0.0
## sony,spider,universe               0.0
## marvel,sony,spider                 0.0
## marvel,spider,universe             0.0
## legend,marvel,rings                0.0
## marvel,rings,shang                 0.0
## legend,marvel,shang                0.0
## cinematic,from,universe            0.0
## cinematic,from,marvel              0.0
## world                              0.0
## marvel                             0.0
## shang                              0.0
```

```
getNodeID <- function(x){
  which(x == igraph::V(MyGraph)$name) - 1
}

(getNodeID("marvel"))
```

```
## [1] 57
```

```
edgeList <- plyr::ddply(
  Rules_Sup, .variables = c("SourceName", "TargetName" , "Weight"),
  function (x) data.frame(SourceID = getNodeID(x$SourceName),
                          TargetID = getNodeID(x$TargetName)))

head(edgeList)
```

```
##           SourceName TargetName             Weight SourceID TargetID
## 1              about     marvel  0.105263157894737       11       57
## 2           anything  cinematic 0.0701754385964912        2       16
## 3           anything     marvel 0.0701754385964912        2       57
## 4           anything   universe 0.0701754385964912        2       17
## 5 anything,cinematic     marvel 0.0701754385964912       21       57
## 6 anything,cinematic   universe 0.0701754385964912       21       17
```

```
nrow(edgeList)
```

```
## [1] 74
```

```
DiceSim <- igraph::similarity.dice(MyGraph, vids = igraph::V(MyGraph), mode = "all")
head(DiceSim)
```

```
##           [,1] [,2]      [,3]      [,4]      [,5]      [,6]      [,7]      [,8]
## [1,] 1.0000000    0 0.4000000 0.6666667 0.4000000 0.5000000 0.6666667 0.2500000
## [2,] 0.0000000    1 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.4000000    0 1.0000000 0.5000000 0.6666667 0.8000000 0.5000000 0.4444444
## [4,] 0.6666667    0 0.5000000 1.0000000 0.5000000 0.6666667 1.0000000 0.2857143
## [5,] 0.4000000    0 0.6666667 0.5000000 1.0000000 0.8000000 0.5000000 0.4444444
## [6,] 0.5000000    0 0.8000000 0.6666667 0.8000000 1.0000000 0.6666667 0.5000000
##           [,9]     [,10]     [,11]     [,12]     [,13]     [,14]     [,15]
## [1,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
## [2,] 0.3333333 0.3333333 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [4,] 0.0000000 0.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## [5,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [6,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
##          [,16]     [,17]     [,18]     [,19]     [,20] [,21]     [,22]
## [1,] 0.6666667 0.2857143 0.1176471 0.6666667 0.6666667     0 0.5000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000     1 0.0000000
## [3,] 0.5000000 0.2500000 0.1111111 0.5000000 0.0000000     0 0.8000000
## [4,] 1.0000000 0.3333333 0.1250000 1.0000000 0.0000000     0 0.6666667
## [5,] 0.5000000 0.2500000 0.2222222 0.5000000 0.0000000     0 0.8000000
## [6,] 0.6666667 0.2857143 0.1176471 0.6666667 0.0000000     0 1.0000000
##          [,23] [,24]     [,25]     [,26] [,27]     [,28]     [,29]     [,30]
## [1,] 0.5000000   0.0 0.5000000 0.5000000   0.0 0.6666667 0.0000000 0.6666667
## [2,] 0.0000000   0.0 0.0000000 0.0000000   0.0 0.0000000 0.0000000 0.0000000
## [3,] 0.8000000   0.8 0.8000000 0.4000000   0.4 0.5000000 0.5000000 0.5000000
## [4,] 0.6666667   0.0 0.6666667 0.6666667   0.0 1.0000000 0.0000000 1.0000000
## [5,] 0.4000000   0.4 0.8000000 0.8000000   0.8 0.5000000 0.5000000 0.5000000
## [6,] 0.5000000   0.5 1.0000000 0.5000000   0.5 0.6666667 0.6666667 0.6666667
##          [,31]     [,32]     [,33]     [,34] [,35] [,36] [,37]     [,38]
## [1,] 0.6666667 0.0000000 0.6666667 0.6666667     0     0     0 0.0000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000     1     0     0 0.6666667
## [3,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [4,] 1.0000000 0.0000000 1.0000000 1.0000000     0     0     0 0.0000000
## [5,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [6,] 0.6666667 0.6666667 0.6666667 0.6666667     0     0     0 0.0000000
##          [,39]     [,40]     [,41]     [,42]     [,43]     [,44]     [,45]
## [1,] 0.0000000 0.6666667 0.6666667 0.6666667 0.5000000 0.6666667 0.6666667
## [2,] 0.6666667 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [4,] 0.0000000 1.0000000 1.0000000 1.0000000 0.6666667 1.0000000 1.0000000
## [5,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [6,] 0.0000000 0.6666667 0.6666667 0.6666667 1.0000000 0.6666667 0.6666667
##          [,46]     [,47] [,48]     [,49]     [,50] [,51] [,52] [,53] [,54]
## [1,] 0.6666667 0.0000000   0.0 0.6666667 0.0000000   0.0     0     0     0
## [2,] 0.0000000 0.0000000   0.0 0.0000000 0.0000000   0.0     1     0     0
## [3,] 0.5000000 0.5000000   0.5 0.5000000 0.5000000   0.0     0     0     0
## [4,] 1.0000000 0.0000000   0.0 1.0000000 0.0000000   0.0     0     0     0
## [5,] 0.5000000 0.5000000   0.0 0.5000000 0.5000000   0.5     0     0     0
## [6,] 0.6666667 0.6666667   0.0 0.6666667 0.6666667   0.0     0     0     0
##          [,55]     [,56] [,57]      [,58] [,59]
## [1,] 0.6666667 0.0000000     0 0.00000000     0
## [2,] 0.0000000 0.0000000     0 0.00000000     0
## [3,] 0.5000000 0.5000000     0 0.10810811     0
## [4,] 1.0000000 0.0000000     0 0.00000000     0
## [5,] 0.5000000 0.5000000     0 0.10810811     0
## [6,] 0.6666667 0.6666667     0 0.05555556     0
```

```
F1 <- function(x) {data.frame(diceSim = DiceSim[x$SourceID +1, x$TargetID + 1])}
head(edgeList)
```

```
##           SourceName TargetName             Weight SourceID TargetID
## 1              about     marvel  0.105263157894737       11       57
## 2           anything  cinematic 0.0701754385964912        2       16
## 3           anything     marvel 0.0701754385964912        2       57
## 4           anything   universe 0.0701754385964912        2       17
## 5 anything,cinematic     marvel 0.0701754385964912       21       57
## 6 anything,cinematic   universe 0.0701754385964912       21       17
```

```
edgeList <- plyr::ddply(edgeList,
                        .variables=c("SourceName", "TargetName", "Weight",
                                                "SourceID", "TargetID"),
                        function(x) data.frame(F1(x)))
head(edgeList)
```

```
##           SourceName TargetName             Weight SourceID TargetID    diceSim
## 1              about     marvel  0.105263157894737       11       57 0.00000000
## 2           anything  cinematic 0.0701754385964912        2       16 0.25000000
## 3           anything     marvel 0.0701754385964912        2       57 0.10810811
## 4           anything   universe 0.0701754385964912        2       17 0.11111111
## 5 anything,cinematic     marvel 0.0701754385964912       21       57 0.05555556
## 6 anything,cinematic   universe 0.0701754385964912       21       17 0.11764706
```

```
# lift D3 network
D3_network_lift <- networkD3::forceNetwork(
  Links = edgeList,
  Nodes = nodeList,
  Source = "SourceID",
  Target = "TargetID",
  Value = "Weight",
  NodeID = "nName",
  Nodesize = "nodeBetweenness",
  Group = "nodeDegree",
  height = 700,
  width = 900,
  fontSize = 20,
  linkDistance = networkD3::JS("function(d) { return d.value*1000; }"),
  linkWidth = networkD3::JS("function(d) { return d.value*5; }"),
  opacity = 5,
  zoom = TRUE,
  opacityNoHover = 5,
  linkColour = "red"
)
# Plot network
D3_network_lift
```

```
networkD3::saveNetwork(D3_network_lift,
                       "lift_network.html", selfcontained = TRUE)
```

```
Rules_Sup<-Rules_S
# prepare for network D3
(edgeList<-Rules_Sup)
```

```
##                     SourceName TargetName             Weight
## 1                       ending      world 0.0701754385964912
## 2                       ending     marvel 0.0701754385964912
## 3                     spoilers      shang  0.087719298245614
## 4                     anything  cinematic 0.0701754385964912
## 5                     anything   universe 0.0701754385964912
## 6                     anything     marvel 0.0701754385964912
## 7                         many     marvel 0.0701754385964912
## 8                       spider       sony 0.0701754385964912
## 9                       spider   universe 0.0701754385964912
## 10                      spider     marvel 0.0701754385964912
## 11                       their   universe 0.0701754385964912
## 12                       their     marvel 0.0701754385964912
## 13                        like     marvel  0.087719298245614
## 14                        sony   universe  0.087719298245614
## 15                        sony     marvel  0.087719298245614
## 16                       rings     legend   0.12280701754386
## 17                      legend      rings   0.12280701754386
## 18                       rings      shang   0.12280701754386
## 19                      legend      shang   0.12280701754386
## 20                        been     marvel  0.105263157894737
## 21                       about     marvel  0.105263157894737
## 22                        they     marvel  0.105263157894737
## 23                      comics     marvel   0.12280701754386
## 24                       first     marvel   0.12280701754386
## 25                        from     marvel  0.157894736842105
## 26                   cinematic     marvel  0.298245614035088
## 27                    universe     marvel  0.526315789473684
## 28                ending,world     marvel 0.0701754385964912
## 29               ending,marvel      world 0.0701754385964912
## 30              spoilers,world      shang 0.0701754385964912
## 31          anything,cinematic   universe 0.0701754385964912
## 32           anything,universe  cinematic 0.0701754385964912
## 33          anything,cinematic     marvel 0.0701754385964912
## 34             anything,marvel  cinematic 0.0701754385964912
## 35           anything,universe     marvel 0.0701754385964912
## 36             anything,marvel   universe 0.0701754385964912
## 37                 sony,spider   universe 0.0701754385964912
## 38              spider,universe       sony 0.0701754385964912
## 39                 sony,spider     marvel 0.0701754385964912
## 40               marvel,spider       sony 0.0701754385964912
## 41              spider,universe     marvel 0.0701754385964912
## 42               marvel,spider   universe 0.0701754385964912
## 43               their,universe     marvel 0.0701754385964912
## 44                 marvel,their   universe 0.0701754385964912
## 45                like,universe     marvel 0.0701754385964912
## 46                sony,universe     marvel  0.087719298245614
## 47                  marvel,sony   universe  0.087719298245614
## 48              heroes,universe     marvel  0.087719298245614
## 49         characters,universe     marvel  0.087719298245614
## 50                legend,rings      shang   0.12280701754386
## 51                 rings,shang     legend   0.12280701754386
## 52                legend,shang      rings   0.12280701754386
## 53                marvel,rings     legend 0.0701754385964912
## 54               legend,marvel      rings 0.0701754385964912
## 55                marvel,rings      shang 0.0701754385964912
## 56               legend,marvel      shang 0.0701754385964912
## 57               they,universe     marvel 0.0701754385964912
## 58              first,universe     marvel  0.087719298245614
## 59               universe,will     marvel  0.087719298245614
## 60              cinematic,from   universe  0.087719298245614
## 61              cinematic,from     marvel  0.087719298245614
## 62                from,universe     marvel  0.105263157894737
## 63           cinematic,universe     marvel  0.280701754385965
## 64 anything,cinematic,universe     marvel 0.0701754385964912
## 65   anything,cinematic,marvel   universe 0.0701754385964912
```

```
## 66    anything,marvel,universe  cinematic 0.0701754385964912
## 67        sony,spider,universe     marvel 0.0701754385964912
## 68          marvel,sony,spider   universe 0.0701754385964912
## 69      marvel,spider,universe       sony 0.0701754385964912
## 70         legend,marvel,rings      shang 0.0701754385964912
## 71          marvel,rings,shang     legend 0.0701754385964912
## 72         legend,marvel,shang      rings 0.0701754385964912
## 73     cinematic,from,universe     marvel  0.087719298245614
## 74       cinematic,from,marvel   universe  0.087719298245614
```

```
(MyGraph <- igraph::simplify(igraph::graph.data.frame(edgeList, directed=TRUE)))
```

```
## IGRAPH 3164d2f DN-- 59 74 --
## + attr: name (v/c)
## + edges from 3164d2f (vertex names):
##  [1] ending   ->world     ending   ->marvel    spoilers ->shang
##  [4] anything ->cinematic anything ->universe  anything ->marvel
##  [7] many     ->marvel    spider   ->sony      spider   ->universe
## [10] spider   ->marvel    their    ->universe  their    ->marvel
## [13] like     ->marvel    sony     ->universe  sony     ->marvel
## [16] rings    ->legend    rings    ->shang     legend   ->rings
## [19] legend   ->shang     been     ->marvel    about    ->marvel
## [22] they     ->marvel    comics   ->marvel    first    ->marvel
## + ... omitted several edges
```

```
nodeList <- data.frame(ID = c(0:(igraph::vcount(MyGraph) - 1)),
                       nName = igraph::V(MyGraph)$name)
## Node Degree
(nodeList <- cbind(nodeList, nodeDegree=igraph::degree(MyGraph,
                     v = igraph::V(MyGraph), mode = "all")))
```

```
##                                ID                        nName nodeDegree
## ending                          0                       ending          2
## spoilers                        1                     spoilers          1
## anything                        2                     anything          3
## many                            3                         many          1
## spider                          4                       spider          3
## their                           5                        their          2
## like                            6                         like          1
## sony                            7                         sony          6
## rings                           8                        rings          6
## legend                          9                       legend          6
## been                           10                         been          1
## about                          11                        about          1
## they                           12                         they          1
## comics                         13                       comics          1
## first                          14                        first          1
## from                           15                         from          1
## cinematic                      16                    cinematic          5
## universe                       17                     universe         15
## ending,world                   18                 ending,world          1
## ending,marvel                  19                ending,marvel          1
## spoilers,world                 20               spoilers,world          1
## anything,cinematic             21           anything,cinematic          2
## anything,universe              22            anything,universe          2
## anything,marvel                23              anything,marvel          2
## sony,spider                    24                 sony,spider          2
## spider,universe                25              spider,universe          2
## marvel,spider                  26                marvel,spider          2
## their,universe                 27               their,universe          1
## marvel,their                   28                marvel,their          1
## like,universe                  29                like,universe          1
## sony,universe                  30                sony,universe          1
## marvel,sony                    31                  marvel,sony          1
## heroes,universe                32              heroes,universe          1
## characters,universe            33          characters,universe          1
## legend,rings                   34                 legend,rings          1
## rings,shang                    35                  rings,shang          1
## legend,shang                   36                 legend,shang          1
## marvel,rings                   37                 marvel,rings          2
## legend,marvel                  38                legend,marvel          2
## they,universe                  39                they,universe          1
## first,universe                 40               first,universe          1
## universe,will                  41                universe,will          1
## cinematic,from                 42               cinematic,from          2
## from,universe                  43                from,universe          1
## cinematic,universe             44           cinematic,universe          1
## anything,cinematic,universe    45 anything,cinematic,universe          1
## anything,cinematic,marvel      46   anything,cinematic,marvel          1
## anything,marvel,universe       47    anything,marvel,universe          1
## sony,spider,universe           48         sony,spider,universe          1
## marvel,sony,spider             49           marvel,sony,spider          1
## marvel,spider,universe         50       marvel,spider,universe          1
## legend,marvel,rings            51          legend,marvel,rings          1
## marvel,rings,shang             52           marvel,rings,shang          1
## legend,marvel,shang            53          legend,marvel,shang          1
## cinematic,from,universe        54      cinematic,from,universe          1
## cinematic,from,marvel          55        cinematic,from,marvel          1
## world                          56                       world          2
## marvel                         57                      marvel         34
## shang                          58                       shang          8
```

```
## Betweenness
BetweenNess <- igraph::betweenness(MyGraph,
      v = igraph::V(MyGraph),
      directed = TRUE)

nodeList <- cbind(nodeList, nodeBetweenness=BetweenNess)

getNodeID <- function(x){
  which(x == igraph::V(MyGraph)$name) - 1
}

(getNodeID("marvel"))
```

```
## [1] 57
```

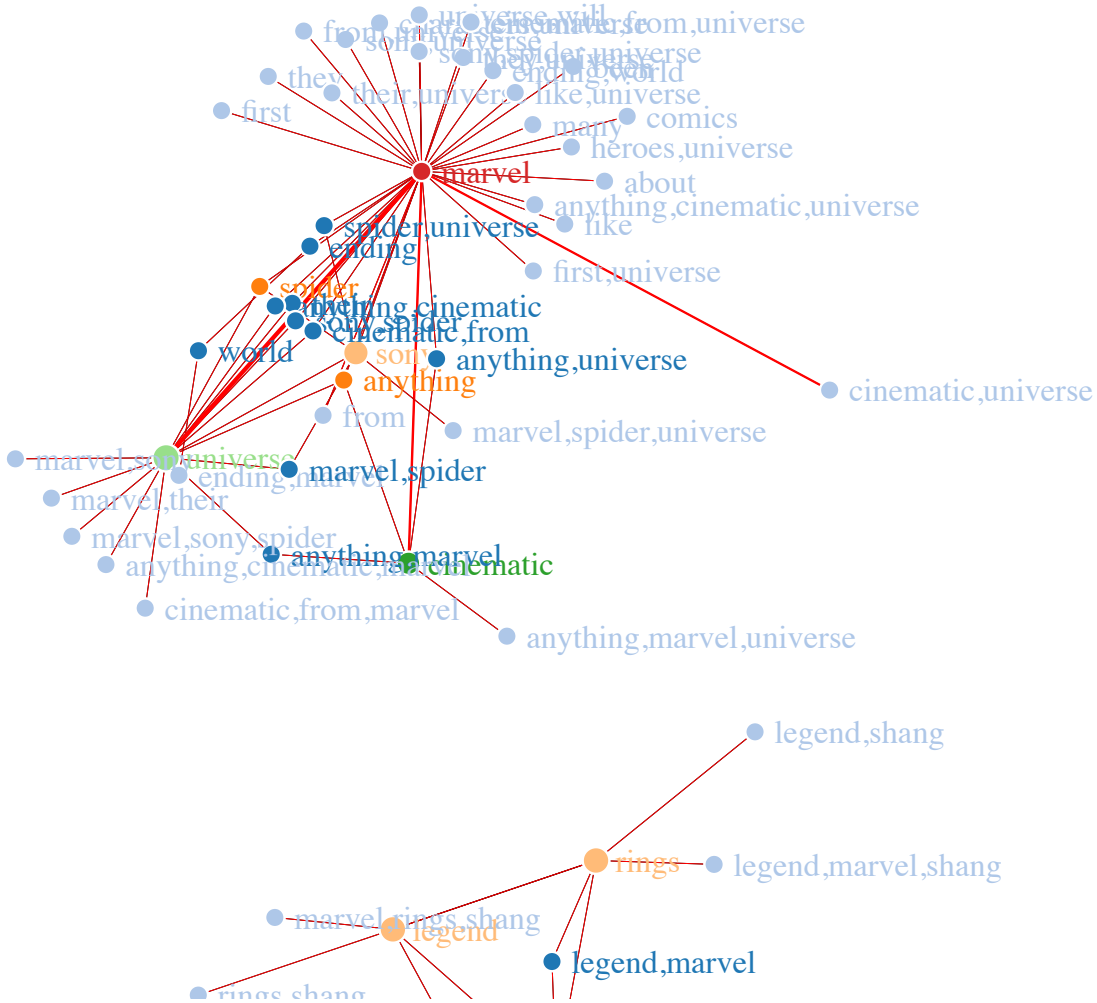
```
edgeList <- plyr::ddply(
  Rules_Sup, .variables = c("SourceName", "TargetName" , "Weight"),
  function (x) data.frame(SourceID = getNodeID(x$SourceName),
                          TargetID = getNodeID(x$TargetName)))

DiceSim <- igraph::similarity.dice(MyGraph, vids = igraph::V(MyGraph), mode = "all")
head(DiceSim)
```

```
##           [,1] [,2]      [,3]      [,4]      [,5]      [,6]      [,7]      [,8]
## [1,] 1.0000000    0 0.4000000 0.6666667 0.4000000 0.5000000 0.6666667 0.2500000
## [2,] 0.0000000    1 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.4000000    0 1.0000000 0.5000000 0.6666667 0.8000000 0.5000000 0.4444444
## [4,] 0.6666667    0 0.5000000 1.0000000 0.5000000 0.6666667 1.0000000 0.2857143
## [5,] 0.4000000    0 0.6666667 0.5000000 1.0000000 0.8000000 0.5000000 0.4444444
## [6,] 0.5000000    0 0.8000000 0.6666667 0.8000000 1.0000000 0.6666667 0.5000000
##           [,9]     [,10]     [,11]     [,12]     [,13]     [,14]     [,15]
## [1,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
## [2,] 0.3333333 0.3333333 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [4,] 0.0000000 0.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## [5,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [6,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
##          [,16]     [,17]     [,18]     [,19]     [,20] [,21]     [,22]
## [1,] 0.6666667 0.2857143 0.1176471 0.6666667 0.6666667     0 0.5000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000     1 0.0000000
## [3,] 0.5000000 0.2500000 0.1111111 0.5000000 0.0000000     0 0.8000000
## [4,] 1.0000000 0.3333333 0.1250000 1.0000000 0.0000000     0 0.6666667
## [5,] 0.5000000 0.2500000 0.2222222 0.5000000 0.0000000     0 0.8000000
## [6,] 0.6666667 0.2857143 0.1176471 0.6666667 0.0000000     0 1.0000000
##          [,23] [,24]     [,25]     [,26] [,27]     [,28]     [,29]     [,30]
## [1,] 0.5000000   0.0 0.5000000 0.5000000   0.0 0.6666667 0.0000000 0.6666667
## [2,] 0.0000000   0.0 0.0000000 0.0000000   0.0 0.0000000 0.0000000 0.0000000
## [3,] 0.8000000   0.8 0.8000000 0.4000000   0.4 0.5000000 0.5000000 0.5000000
## [4,] 0.6666667   0.0 0.6666667 0.6666667   0.0 1.0000000 0.0000000 1.0000000
## [5,] 0.4000000   0.4 0.8000000 0.8000000   0.8 0.5000000 0.5000000 0.5000000
## [6,] 0.5000000   0.5 1.0000000 0.5000000   0.5 0.6666667 0.6666667 0.6666667
##          [,31]     [,32]     [,33]     [,34] [,35] [,36] [,37]     [,38]
## [1,] 0.6666667 0.0000000 0.6666667 0.6666667     0     0     0 0.0000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000     1     0     0 0.6666667
## [3,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [4,] 1.0000000 0.0000000 1.0000000 1.0000000     0     0     0 0.0000000
## [5,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [6,] 0.6666667 0.6666667 0.6666667 0.6666667     0     0     0 0.0000000
##          [,39]     [,40]     [,41]     [,42]     [,43]     [,44]     [,45]
## [1,] 0.0000000 0.6666667 0.6666667 0.6666667 0.5000000 0.6666667 0.6666667
## [2,] 0.6666667 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [4,] 0.0000000 1.0000000 1.0000000 1.0000000 0.6666667 1.0000000 1.0000000
## [5,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [6,] 0.0000000 0.6666667 0.6666667 0.6666667 1.0000000 0.6666667 0.6666667
##          [,46]     [,47] [,48]     [,49]     [,50] [,51] [,52] [,53] [,54]
## [1,] 0.6666667 0.0000000   0.0 0.6666667 0.0000000   0.0     0     0     0
## [2,] 0.0000000 0.0000000   0.0 0.0000000 0.0000000   0.0     1     0     0
## [3,] 0.5000000 0.5000000   0.5 0.5000000 0.5000000   0.0     0     0     0
## [4,] 1.0000000 0.0000000   0.0 1.0000000 0.0000000   0.0     0     0     0
## [5,] 0.5000000 0.5000000   0.0 0.5000000 0.5000000   0.5     0     0     0
## [6,] 0.6666667 0.6666667   0.0 0.6666667 0.6666667   0.0     0     0     0
##          [,55]     [,56] [,57]      [,58] [,59]
## [1,] 0.6666667 0.0000000     0 0.00000000     0
## [2,] 0.0000000 0.0000000     0 0.00000000     0
## [3,] 0.5000000 0.5000000     0 0.10810811     0
## [4,] 1.0000000 0.0000000     0 0.00000000     0
## [5,] 0.5000000 0.5000000     0 0.10810811     0
## [6,] 0.6666667 0.6666667     0 0.05555556     0
```

```
F1 <- function(x) {data.frame(diceSim = DiceSim[x$SourceID +1, x$TargetID + 1])}
head(edgeList)
```

```
##           SourceName TargetName             Weight SourceID TargetID
## 1              about     marvel  0.105263157894737       11       57
## 2           anything  cinematic 0.0701754385964912        2       16
## 3           anything     marvel 0.0701754385964912        2       57
## 4           anything   universe 0.0701754385964912        2       17
## 5 anything,cinematic     marvel 0.0701754385964912       21       57
## 6 anything,cinematic   universe 0.0701754385964912       21       17
```

```
edgeList <- plyr::ddply(edgeList,
                        .variables=c("SourceName", "TargetName", "Weight",
                                                "SourceID", "TargetID"),
                        function(x) data.frame(F1(x)))
D3_network_support <- networkD3::forceNetwork(
  Links = edgeList,
  Nodes = nodeList,
  Source = "SourceID",
  Target = "TargetID",
  Value = "Weight",
  NodeID = "nName",
  Nodesize = "nodeBetweenness",
  Group = "nodeDegree",
  height = 700,
  width = 900,
  fontSize = 20,
  linkDistance = networkD3::JS("function(d) { return d.value*1000; }"),
  linkWidth = networkD3::JS("function(d) { return d.value*5; }"),
  opacity = 5,
  zoom = TRUE,
  opacityNoHover = 5,
  linkColour = "red"
)
# Plot network
D3_network_support
```




```
networkD3::saveNetwork(D3_network_support,
                       "support_network.html", selfcontained = TRUE)
```

```
Rules_Sup<-Rules_C
# prepare for network D3
(edgeList<-Rules_Sup)
```

```
##                     SourceName TargetName Weight
## 1                       ending      world      1
## 2                       ending     marvel      1
## 3                     spoilers      shang      1
## 4                     anything  cinematic      1
## 5                     anything   universe      1
## 6                     anything     marvel      1
## 7                         many     marvel      1
## 8                       spider       sony      1
## 9                       spider   universe      1
## 10                      spider     marvel      1
## 11                       their   universe      1
## 12                       their     marvel      1
## 13                        like     marvel      1
## 14                        sony   universe      1
## 15                        sony     marvel      1
## 16                       rings     legend      1
## 17                      legend      rings      1
## 18                       rings      shang      1
## 19                      legend      shang      1
## 20                        been     marvel      1
## 21                       about     marvel      1
## 22                        they     marvel      1
## 23                      comics     marvel      1
## 24                       first     marvel      1
## 25                        from     marvel      1
## 26                   cinematic     marvel      1
## 27                    universe     marvel      1
## 28                ending,world     marvel      1
## 29               ending,marvel      world      1
## 30              spoilers,world      shang      1
## 31          anything,cinematic   universe      1
## 32           anything,universe  cinematic      1
## 33          anything,cinematic     marvel      1
## 34             anything,marvel  cinematic      1
## 35           anything,universe     marvel      1
## 36             anything,marvel   universe      1
## 37                 sony,spider   universe      1
## 38              spider,universe       sony      1
## 39                 sony,spider     marvel      1
## 40               marvel,spider       sony      1
## 41              spider,universe     marvel      1
## 42                marvel,spider   universe      1
## 43               their,universe     marvel      1
## 44                 marvel,their   universe      1
## 45                like,universe     marvel      1
## 46                sony,universe     marvel      1
## 47                  marvel,sony   universe      1
## 48              heroes,universe     marvel      1
## 49         characters,universe     marvel      1
## 50                legend,rings      shang      1
## 51                 rings,shang     legend      1
## 52                legend,shang      rings      1
## 53                marvel,rings     legend      1
## 54               legend,marvel      rings      1
## 55                marvel,rings      shang      1
## 56               legend,marvel      shang      1
## 57               they,universe     marvel      1
## 58              first,universe     marvel      1
## 59               universe,will     marvel      1
## 60              cinematic,from   universe      1
## 61              cinematic,from     marvel      1
## 62                from,universe     marvel      1
## 63           cinematic,universe     marvel      1
## 64 anything,cinematic,universe     marvel      1
## 65   anything,cinematic,marvel   universe      1
```

```
## 66    anything,marvel,universe  cinematic      1
## 67        sony,spider,universe     marvel      1
## 68          marvel,sony,spider   universe      1
## 69      marvel,spider,universe       sony      1
## 70         legend,marvel,rings      shang      1
## 71          marvel,rings,shang     legend      1
## 72         legend,marvel,shang      rings      1
## 73     cinematic,from,universe     marvel      1
## 74       cinematic,from,marvel   universe      1
```

```
(MyGraph <- igraph::simplify(igraph::graph.data.frame(edgeList, directed=TRUE)))
```

```
## IGRAPH 5a0568a DN-- 59 74 --
## + attr: name (v/c)
## + edges from 5a0568a (vertex names):
##  [1] ending   ->world     ending   ->marvel    spoilers ->shang
##  [4] anything ->cinematic anything ->universe  anything ->marvel
##  [7] many     ->marvel    spider   ->sony      spider   ->universe
## [10] spider   ->marvel    their    ->universe  their    ->marvel
## [13] like     ->marvel    sony     ->universe  sony     ->marvel
## [16] rings    ->legend    rings    ->shang     legend   ->rings
## [19] legend   ->shang     been     ->marvel    about    ->marvel
## [22] they     ->marvel    comics   ->marvel    first    ->marvel
## + ... omitted several edges
```

```
nodeList <- data.frame(ID = c(0:(igraph::vcount(MyGraph) - 1)),
                       nName = igraph::V(MyGraph)$name)
## Node Degree
(nodeList <- cbind(nodeList, nodeDegree=igraph::degree(MyGraph,
                     v = igraph::V(MyGraph), mode = "all")))
```

```
##                                ID                        nName nodeDegree
## ending                          0                       ending          2
## spoilers                        1                     spoilers          1
## anything                        2                     anything          3
## many                            3                         many          1
## spider                          4                       spider          3
## their                           5                        their          2
## like                            6                         like          1
## sony                            7                         sony          6
## rings                           8                        rings          6
## legend                          9                       legend          6
## been                           10                         been          1
## about                          11                        about          1
## they                           12                         they          1
## comics                         13                       comics          1
## first                          14                        first          1
## from                           15                         from          1
## cinematic                      16                    cinematic          5
## universe                       17                     universe         15
## ending,world                   18                 ending,world          1
## ending,marvel                  19                ending,marvel          1
## spoilers,world                 20               spoilers,world          1
## anything,cinematic             21           anything,cinematic          2
## anything,universe              22            anything,universe          2
## anything,marvel                23              anything,marvel          2
## sony,spider                    24                 sony,spider          2
## spider,universe                25              spider,universe          2
## marvel,spider                  26                marvel,spider          2
## their,universe                 27               their,universe          1
## marvel,their                   28                marvel,their          1
## like,universe                  29                like,universe          1
## sony,universe                  30                sony,universe          1
## marvel,sony                    31                  marvel,sony          1
## heroes,universe                32              heroes,universe          1
## characters,universe            33          characters,universe          1
## legend,rings                   34                 legend,rings          1
## rings,shang                    35                  rings,shang          1
## legend,shang                   36                 legend,shang          1
## marvel,rings                   37                 marvel,rings          2
## legend,marvel                  38                legend,marvel          2
## they,universe                  39                they,universe          1
## first,universe                 40               first,universe          1
## universe,will                  41                universe,will          1
## cinematic,from                 42               cinematic,from          2
## from,universe                  43                from,universe          1
## cinematic,universe             44           cinematic,universe          1
## anything,cinematic,universe    45 anything,cinematic,universe          1
## anything,cinematic,marvel      46   anything,cinematic,marvel          1
## anything,marvel,universe       47    anything,marvel,universe          1
## sony,spider,universe           48         sony,spider,universe          1
## marvel,sony,spider             49           marvel,sony,spider          1
## marvel,spider,universe         50       marvel,spider,universe          1
## legend,marvel,rings            51          legend,marvel,rings          1
## marvel,rings,shang             52           marvel,rings,shang          1
## legend,marvel,shang            53          legend,marvel,shang          1
## cinematic,from,universe        54      cinematic,from,universe          1
## cinematic,from,marvel          55        cinematic,from,marvel          1
## world                          56                       world          2
## marvel                         57                      marvel         34
## shang                          58                       shang          8
```

```
## Betweenness
BetweenNess <- igraph::betweenness(MyGraph,
      v = igraph::V(MyGraph),
      directed = TRUE)

nodeList <- cbind(nodeList, nodeBetweenness=BetweenNess)

getNodeID <- function(x){
  which(x == igraph::V(MyGraph)$name) - 1
}

(getNodeID("marvel"))
```

```
## [1] 57
```

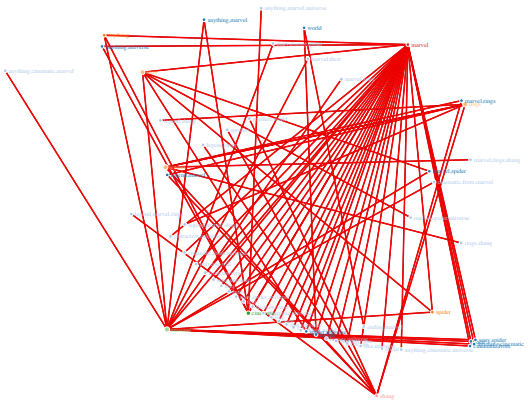
```
edgeList <- plyr::ddply(
  Rules_Sup, .variables = c("SourceName", "TargetName" , "Weight"),
  function (x) data.frame(SourceID = getNodeID(x$SourceName),
                          TargetID = getNodeID(x$TargetName)))

DiceSim <- igraph::similarity.dice(MyGraph, vids = igraph::V(MyGraph), mode = "all")
head(DiceSim)
```

```
##           [,1] [,2]      [,3]      [,4]      [,5]      [,6]      [,7]      [,8]
## [1,] 1.0000000    0 0.4000000 0.6666667 0.4000000 0.5000000 0.6666667 0.2500000
## [2,] 0.0000000    1 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.4000000    0 1.0000000 0.5000000 0.6666667 0.8000000 0.5000000 0.4444444
## [4,] 0.6666667    0 0.5000000 1.0000000 0.5000000 0.6666667 1.0000000 0.2857143
## [5,] 0.4000000    0 0.6666667 0.5000000 1.0000000 0.8000000 0.5000000 0.4444444
## [6,] 0.5000000    0 0.8000000 0.6666667 0.8000000 1.0000000 0.6666667 0.5000000
##           [,9]     [,10]     [,11]     [,12]     [,13]     [,14]     [,15]
## [1,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
## [2,] 0.3333333 0.3333333 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [4,] 0.0000000 0.0000000 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## [5,] 0.0000000 0.0000000 0.5000000 0.5000000 0.5000000 0.5000000 0.5000000
## [6,] 0.0000000 0.0000000 0.6666667 0.6666667 0.6666667 0.6666667 0.6666667
##          [,16]     [,17]     [,18]     [,19]     [,20] [,21]     [,22]
## [1,] 0.6666667 0.2857143 0.1176471 0.6666667 0.6666667     0 0.5000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000     1 0.0000000
## [3,] 0.5000000 0.2500000 0.1111111 0.5000000 0.0000000     0 0.8000000
## [4,] 1.0000000 0.3333333 0.1250000 1.0000000 0.0000000     0 0.6666667
## [5,] 0.5000000 0.2500000 0.2222222 0.5000000 0.0000000     0 0.8000000
## [6,] 0.6666667 0.2857143 0.1176471 0.6666667 0.0000000     0 1.0000000
##          [,23] [,24]     [,25]     [,26] [,27]     [,28]     [,29]     [,30]
## [1,] 0.5000000   0.0 0.5000000 0.5000000   0.0 0.6666667 0.0000000 0.6666667
## [2,] 0.0000000   0.0 0.0000000 0.0000000   0.0 0.0000000 0.0000000 0.0000000
## [3,] 0.8000000   0.8 0.8000000 0.4000000   0.4 0.5000000 0.5000000 0.5000000
## [4,] 0.6666667   0.0 0.6666667 0.6666667   0.0 1.0000000 0.0000000 1.0000000
## [5,] 0.4000000   0.4 0.8000000 0.8000000   0.8 0.5000000 0.5000000 0.5000000
## [6,] 0.5000000   0.5 1.0000000 0.5000000   0.5 0.6666667 0.6666667 0.6666667
##          [,31]     [,32]     [,33]     [,34] [,35] [,36] [,37]     [,38]
## [1,] 0.6666667 0.0000000 0.6666667 0.6666667     0     0     0 0.0000000
## [2,] 0.0000000 0.0000000 0.0000000 0.0000000     1     0     0 0.6666667
## [3,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [4,] 1.0000000 0.0000000 1.0000000 1.0000000     0     0     0 0.0000000
## [5,] 0.5000000 0.5000000 0.5000000 0.5000000     0     0     0 0.0000000
## [6,] 0.6666667 0.6666667 0.6666667 0.6666667     0     0     0 0.0000000
##          [,39]     [,40]     [,41]     [,42]     [,43]     [,44]     [,45]
## [1,] 0.0000000 0.6666667 0.6666667 0.6666667 0.5000000 0.6666667 0.6666667
## [2,] 0.6666667 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
## [3,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [4,] 0.0000000 1.0000000 1.0000000 1.0000000 0.6666667 1.0000000 1.0000000
## [5,] 0.0000000 0.5000000 0.5000000 0.5000000 0.8000000 0.5000000 0.5000000
## [6,] 0.0000000 0.6666667 0.6666667 0.6666667 1.0000000 0.6666667 0.6666667
##          [,46]     [,47] [,48]     [,49]     [,50] [,51] [,52] [,53] [,54]
## [1,] 0.6666667 0.0000000   0.0 0.6666667 0.0000000   0.0     0     0     0
## [2,] 0.0000000 0.0000000   0.0 0.0000000 0.0000000   0.0     1     0     0
## [3,] 0.5000000 0.5000000   0.5 0.5000000 0.5000000   0.0     0     0     0
## [4,] 1.0000000 0.0000000   0.0 1.0000000 0.0000000   0.0     0     0     0
## [5,] 0.5000000 0.5000000   0.0 0.5000000 0.5000000   0.5     0     0     0
## [6,] 0.6666667 0.6666667   0.0 0.6666667 0.6666667   0.0     0     0     0
##          [,55]     [,56] [,57]      [,58] [,59]
## [1,] 0.6666667 0.0000000     0 0.00000000     0
## [2,] 0.0000000 0.0000000     0 0.00000000     0
## [3,] 0.5000000 0.5000000     0 0.10810811     0
## [4,] 1.0000000 0.0000000     0 0.00000000     0
## [5,] 0.5000000 0.5000000     0 0.10810811     0
## [6,] 0.6666667 0.6666667     0 0.05555556     0
```

```
F1 <- function(x) {data.frame(diceSim = DiceSim[x$SourceID +1, x$TargetID + 1])}
head(edgeList)
```

```
##           SourceName TargetName Weight SourceID TargetID
## 1              about     marvel      1       11       57
## 2           anything  cinematic      1        2       16
## 3           anything     marvel      1        2       57
## 4           anything   universe      1        2       17
## 5 anything,cinematic     marvel      1       21       57
## 6 anything,cinematic   universe      1       21       17
```

```
edgeList <- plyr::ddply(edgeList,
                        .variables=c("SourceName", "TargetName", "Weight",
                                                  "SourceID", "TargetID"),
                        function(x) data.frame(F1(x)))
D3_network_con <- networkD3::forceNetwork(
  Links = edgeList,
  Nodes = nodeList,
  Source = "SourceID",
  Target = "TargetID",
  Value = "Weight",
  NodeID = "nName",
  Nodesize = "nodeBetweenness",
  Group = "nodeDegree",
  height = 700,
  width = 900,
  fontSize = 20,
  linkDistance = networkD3::JS("function(d) { return d.value*1000; }"),
  linkWidth = networkD3::JS("function(d) { return d.value*5; }"),
  opacity = 5,
  zoom = TRUE,
  opacityNoHover = 5,
  linkColour = "red"
)
# Plot network
D3_network_con
```




```
networkD3::saveNetwork(D3_network_con,
                       "confidence_network.html", selfcontained = TRUE)
```