alex-hw2-html.rmd

```
netStr <- "[A][S][E|A:S][O|E][R|E][T|O:R]"
net <- model2network(netStr)
d_sep <- bnlearn:::dseparation
d_sep(bn = net, x = ’A’, y = ’E’, z = c(’R’, ’T’))
```

```
## [1] FALSE
```

```
vars <- nodes(net)
pairs <- combn(x = vars, 2, list)
arg_sets <- list()
for(pair in pairs) {
  others <- setdiff(vars, pair)
  conditioning_sets <- unlist(lapply(0:4, function(.x) combn(others, .x, list)), recursive = F)
  for(set in conditioning_sets) {
    args <- list(x = pair[1], y = pair[2], z = set)
    arg_sets <- c(arg_sets, list(args))
  }
}
```

Question 1: D-separation and global Markov property assumption 1.a True d-separation statements (4 points) Create a new list. Iterate through the list of argument sets and evaluate if the d-separation statement is true. If a statement is true, add it to the list. Show code. Print an element from the list and write out the d-separation statement in English.

```
d_seps <- list()
for (arg_set in arg_sets) {
    if (d_sep(bn=net, x=arg_set$x, y=arg_set$y, z=arg_set$z)) {
      d_seps <- c(d_seps, arg_set)
    }
}
print(d_seps)
```

```
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E"
##
## $x
## [1] "A"
##
```

```
## $y
## [1] "O"
##
## $z
## [1] "E" "R"
##
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E" "R" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E" "R" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "O"
##
## $z
## [1] "E" "S" "T"
##
## $x
## [1] "A"
##
```

```
## $y
## [1] "O"
##
## $z
## [1] "E" "R" "S" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "O"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "O" "S"
##
## $x
## [1] "A"
##
```

```
## $y
## [1] "R"
##
## $z
## [1] "E" "O" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "S" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "R"
##
## $z
## [1] "E" "O" "S" "T"
##
## $x
## [1] "A"
##
## $y
## [1] "S"
##
## $z
## character(0)
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "O"
##
## $x
## [1] "A"
##
```

```
## $y
## [1] "T"
##
## $z
## [1] "E" "R"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
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## $z
## [1] "O" "R"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "O" "R"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "O" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "R" "S"
##
## $x
## [1] "A"
##
```

```
## $y
## [1] "T"
##
## $z
## [1] "O" "R" "S"
##
## $x
## [1] "A"
##
## $y
## [1] "T"
##
## $z
## [1] "E" "O" "R" "S"
##
## $x
## [1] "E"
##
## $y
## [1] "T"
##
## $z
## [1] "O" "R"
##
## $x
## [1] "E"
##
## $y
## [1] "T"
##
## $z
## [1] "A" "O" "R"
##
## $x
## [1] "E"
##
## $y
## [1] "T"
##
## $z
## [1] "O" "R" "S"
##
## $x
## [1] "E"
##
## $y
## [1] "T"
##
## $z
## [1] "A" "O" "R" "S"
##
## $x
## [1] "O"
##
```

```
## $y
## [1] "R"
##
## $z
## [1] "E"
##
## $x
## [1] "O"
##
## $y
## [1] "R"
##
## $z
## [1] "A" "E"
##
## $x
## [1] "O"
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## $y
## [1] "R"
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## $z
## [1] "E" "S"
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## $x
## [1] "O"
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## $y
## [1] "R"
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## [1] "A" "E" "S"
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## $x
## [1] "O"
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## $y
## [1] "S"
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## $z
## [1] "E"
##
## $x
## [1] "O"
##
## $y
## [1] "S"
##
## $z
## [1] "A" "E"
##
## $x
## [1] "O"
##
```

```
## $y
## [1] "S"
##
## $z
## [1] "E" "R"
##
## $x
## [1] "O"
##
## $y
## [1] "S"
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## $z
## [1] "E" "T"
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## $x
## [1] "O"
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## $y
## [1] "S"
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## $z
## [1] "A" "E" "R"
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## $x
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## $y
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## $z
## [1] "A" "E" "T"
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## $x
## [1] "O"
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## $y
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## $z
## [1] "E" "R" "T"
##
## $x
## [1] "O"
##
## $y
## [1] "S"
##
## $z
## [1] "A" "E" "R" "T"
##
## $x
## [1] "R"
##
```

```
## $y
## [1] "S"
##
## $z
## [1] "E"
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## $x
## [1] "R"
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## [1] "E" "T"
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## $x
## [1] "R"
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## [1] "A" "E" "O"
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## $x
## [1] "R"
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## $y
## [1] "S"
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## $z
## [1] "A" "E" "T"
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## $x
## [1] "R"
##
```

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## $y
## [1] "S"
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## $z
## [1] "E" "O" "T"
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## $x
## [1] "R"
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## $y
## [1] "S"
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## $z
## [1] "A" "E" "O" "T"
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## $x
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## [1] "E" "R"
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## $x
## [1] "S"
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```

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## $y
## [1] "T"
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## $z
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## [1] "S"
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## [1] "T"
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## [1] "E" "O" "R"
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## $x
## [1] "S"
##
## $y
## [1] "T"
##
## $z
## [1] "A" "E" "O" "R"
```

graphviz.plot(net)