

Practical:

Estimate MGM on Symptom Data

RStudio Server:

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Load Package & Data

```
library(mgm) # Loading the mgm package

# Subset Mood variables and two behavioral variables
symptom_data_short <- symptom_data
selection_ind <- c(which(symptom_data$groups == "Mood"),
                  which(symptom_data$colnames %in% c("Action", "Who with"))))

symptom_data_short$data <- symptom_data_short$data[,selection_ind]
symptom_data_short$data <- as.matrix(symptom_data_short$data)
symptom_data_short$type <- symptom_data_short$type[selection_ind]
symptom_data_short$level <- symptom_data_short$level[selection_ind]
symptom_data_short$colnames <- symptom_data_short$colnames[selection_ind]
symptom_data_short$groups <- symptom_data_short$groups[selection_ind]
```

Look at Data

```
# Look at first 3 rows
```

```
symptom_data_short$data[1:3, ]
```

```
##      mood_relaxed mood_down mood_irritat mood_satisfi mood_lonely
## [1,]           5         -1           1           5          -1
## [2,]           4           0           3           3           0
## [3,]           4           0           2           3           0
##      mood_anxious mood_enthus mood_suspici mood_cheerf mood_guilty
## [1,]          -1           4           1           5          -1
## [2,]           0           3           1           4           0
## [3,]           0           4           1           4           0
##      mood_doubt mood_strong soc_who1 act_what1
## [1,]           1           5          10          88
## [2,]           1           4           0          10
## [3,]           2           4          19          45
```

```
# Look at type of variables
```

```
symptom_data_short$type # 12 continuous ("g"), 2 categorical ("c")
```

```
## [1] "g" "g" "g" "g" "g" "g" "g" "g" "g" "g" "g" "g" "c" "c"
```

```
# Look at levels of variables
```

```
symptom_data_short$level # 1 for continuous variables; >1 for categoricals
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 5 8
```

Specify Mixed Graphical Model

```
set.seed(1)

mgm_obj <- mgm(data = symptom_data_short$data,
              type = symptom_data_short$type,
              level = symptom_data_short$level,
              lambdaSel = "CV",
              lambdaFolds = 10,
              k = 2,
              pbar = FALSE,
              scale = TRUE)
```

Note that the sign of parameter estimates is stored separately; see ?mgm

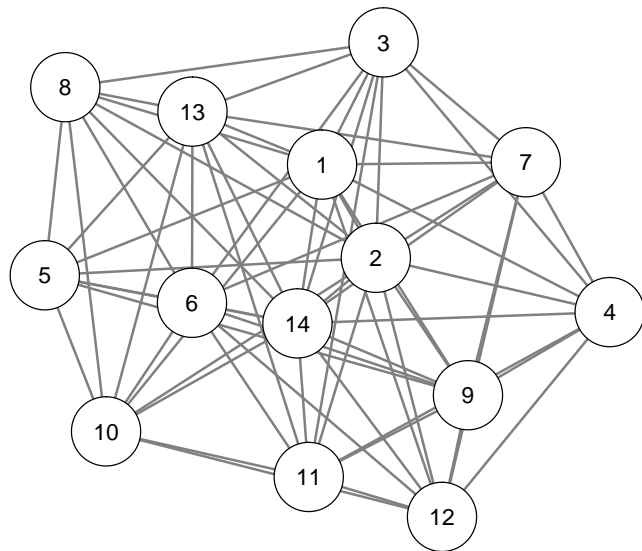
Look at Markov Random Field (MRF) / Graph structure

```
((mgm_obj$pairwise$wadj!=0)*1)[1:10, 1:10] # for first 10 variables
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
## [1,]    0    1    1    1    1    0    1    1    1    1
## [2,]    1    0    1    1    1    0    1    1    1    1
## [3,]    1    1    0    1    0    1    1    1    0    0
## [4,]    1    1    1    0    0    0    1    0    1    0
## [5,]    1    1    0    0    0    1    0    1    1    1
## [6,]    0    0    1    0    1    0    1    1    1    1
## [7,]    1    1    1    1    0    1    0    0    1    0
## [8,]    1    1    1    0    1    1    0    0    0    1
## [9,]    1    1    0    1    1    1    1    0    0    0
## [10,]   1    1    0    0    1    1    0    1    0    0
```

Visualize Markov Random Field (MRF) / Graph structure

```
library(qgraph) # Load qgraph package
qgraph(input = (mgm_obj$pairwise$wadj!=0)*1,
       nodeNames = symptom_data_short$colnames)
```



- 1: Relaxed
- 2: Down
- 3: Irritated
- 4: Satisfied
- 5: Lonely
- 6: Anxious
- 7: Enthusiastic
- 8: Suspicious
- 9: Cheerful
- 10: Guilty
- 11: Doubt
- 12: Strong
- 13: Who with
- 14: Action

Continuous-continuous interaction

Down (2) and *Lonely* (5):

```
showInteraction(object = mgm_obj, int = c(2,5))$parameters
```

```
## $Predict_2
##          5
## 2 0.3866794
##
## $Predict_5
##          2
## 5 0.4040478
```

Continuous-categorical interaction

Irritated (3) and *Last Action* (14).

Categories of *Last Action* (14): nothing=0, 10=work/studies, 21=caring for others, 27=taking care of oneself, 43=active relaxation, 45=passive relaxation, 60=eating/drinking, 88=traveling.

```
showInteraction(object = mgm_obj, int = c(3, 14))$parameters
```

```
## $Predict_3
## 14.0 14.10 14.21 14.27 14.43 14.45 14.60 14.88
## 3 NA 0.8484131 0.772714 0.5602026 0.4477085 0.459833 0.5208793 0.2668128
##
## $Predict_14
## 3
## 14.0 -0.8248142
## 14.10 0.7134387
## 14.21 0.6542777
## 14.27 0.1986054
## 14.43 0.0000000
## 14.45 0.0000000
## 14.60 0.0000000
## 14.88 0.0000000
```


Categorical-categorical interaction

Who with (3) and *Last Action* (14).

Categories of *Last Action* (14): nothing=0, 10=work/studies, 21=caring for others, 27=taking care of oneself, 43=active relaxation, 45=passive relaxation, 60=eating/drinking, 88=traveling.

Categories *Who with* (13): 0=nobody, 10=partner, 19=roommates, 30=friends, 50=strangers/others.

```
showInteraction(object = mgm_obj, int = c(13, 14))$parameters[[1]]
```

```
##           14.0           14.10           14.21           14.27           14.43           14.45
## 13.0      NA  2.1483572  0.0000000  0.4552087 -0.5407292  0.0000000
## 13.10     NA -0.2688649 -1.5835358 -0.9120958  0.0000000 -0.63604979
## 13.19     NA  0.0000000  0.0000000  0.0000000 -0.2622710  0.02627762
## 13.30     NA  0.0000000 -0.5694113 -0.2180608  2.1276136  0.71148079
## 13.50     NA  0.0000000  2.9326213  0.6280661  0.5893984  0.0000000
##           14.60           14.88
## 13.0     -0.5660629  0.0000000
## 13.10     0.0000000  0.0000000
## 13.19     0.0000000 -0.08250101
## 13.30     0.0000000  0.0000000
## 13.50    -0.2013538  3.22228897
```

Visualize as much of MGM as possible

```
qgraph(input = mgm_obj$pairwise$wadj, # now weighted adjacency matrix  
       layout = "spring",  
       nodeNames = symptom_data_short$colnames,  
       edge.color = mgm_obj$pairwise$edgecolor) # incorporate sign as color
```

