

Predictability in Psychopathological Network Models

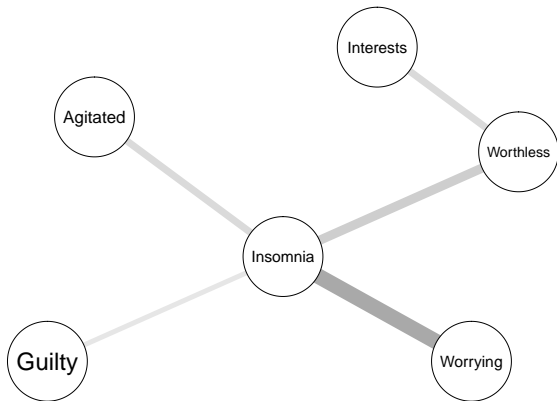
Jonas Haslbeck

*Psychosystems lab
University of Amsterdam, the Netherlands*

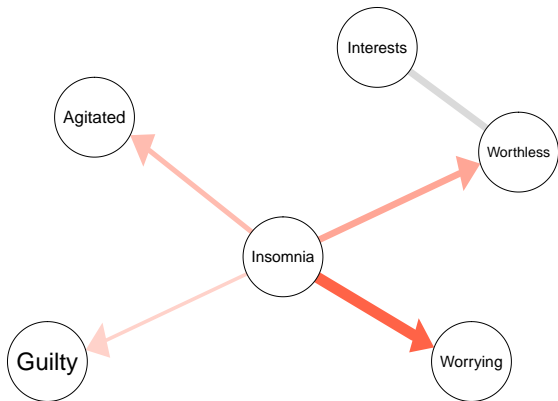
APS 2017

Boston, May 28th

Psychopathological Symptom Network

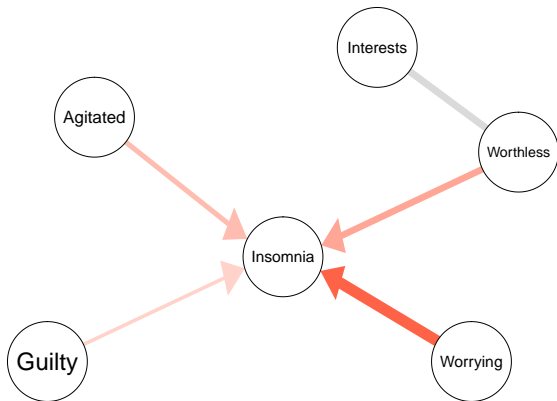


Psychopathological Symptom Network



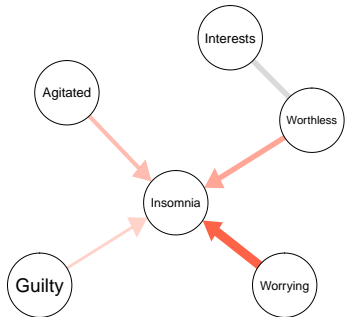
Detect most *influential* node

Psychopathological Symptom Network

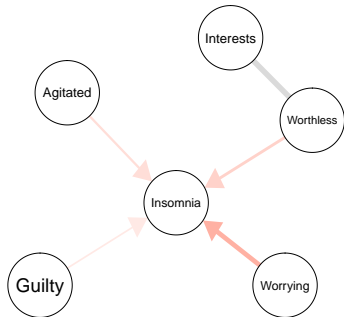


Detect most *determined* node

Intervention on Insomnia via Network?

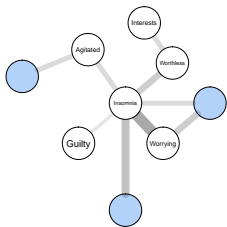


Patient A

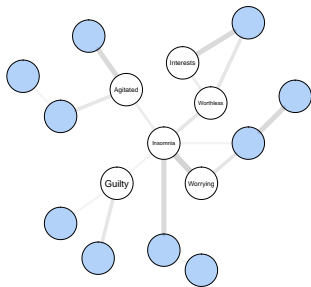


Patient B

How self-determined is a Symptom Network?

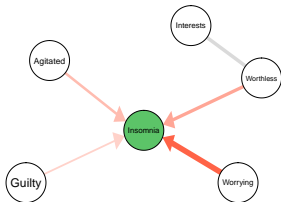


Small External Field



Large External Field

Nodewise Predictability

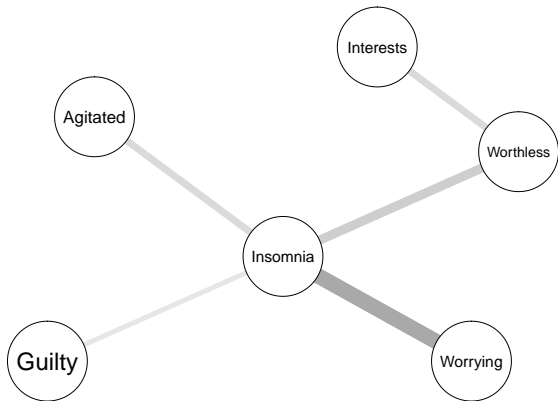


Predictability of node A is the extent to which we can predict A by its neighbors $N(A)$

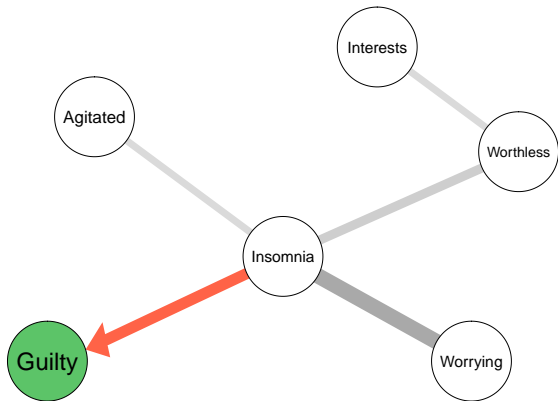
Two steps:

1. Make predictions
 $\hat{A} = f(N(A))$
2. Compute prediction error
 $error(A, \hat{A})$

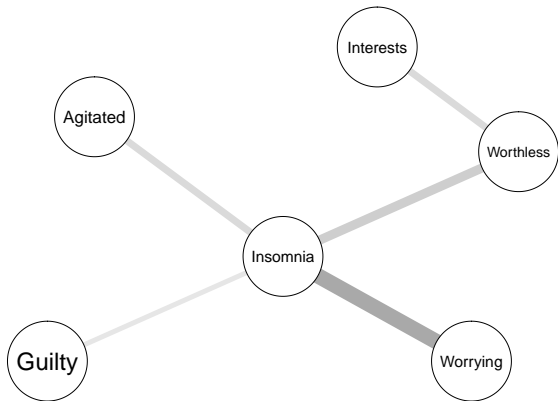
Computing Nodewise Predictability



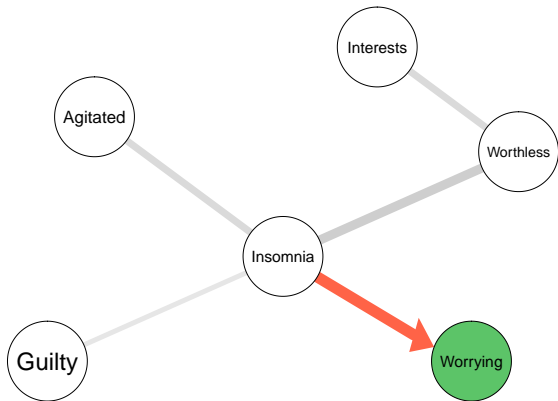
Computing Nodewise Predictability



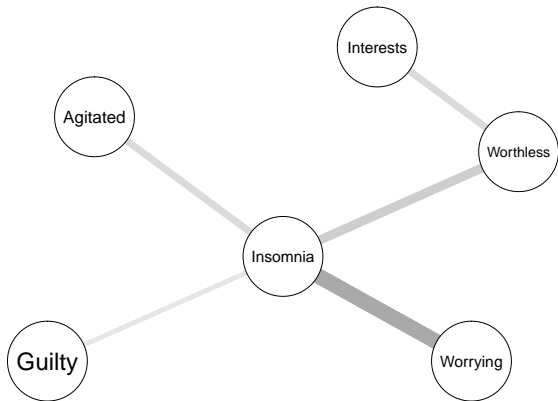
Computing Nodewise Predictability



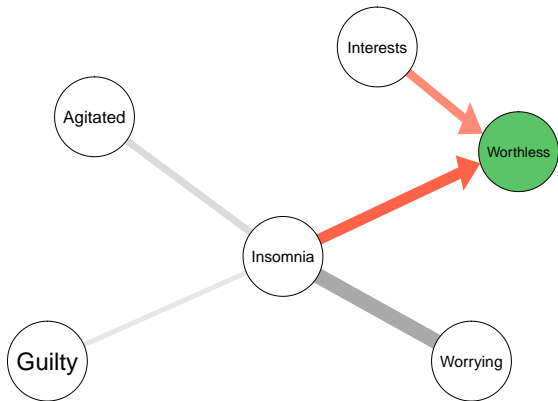
Computing Nodewise Predictability



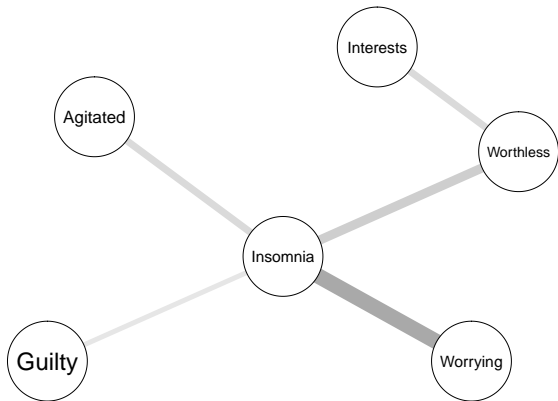
Computing Nodewise Predictability



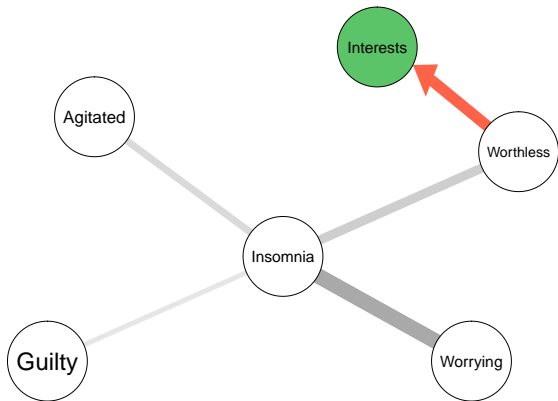
Computing Nodewise Predictability



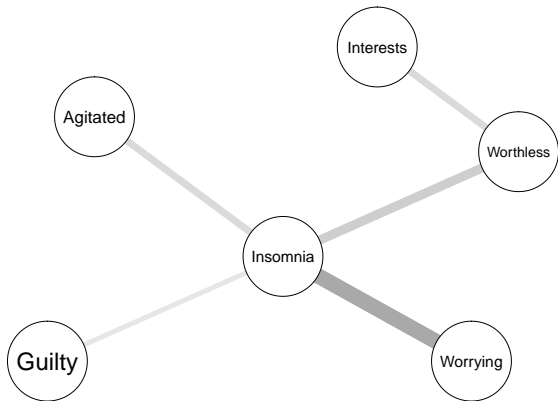
Computing Nodewise Predictability



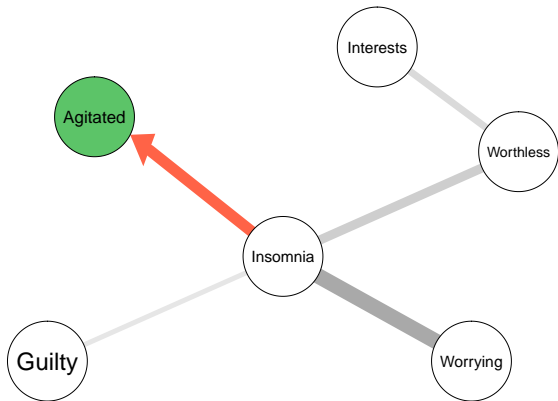
Computing Nodewise Predictability



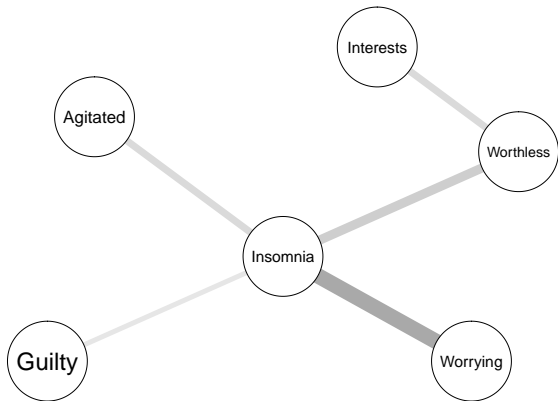
Computing Nodewise Predictability



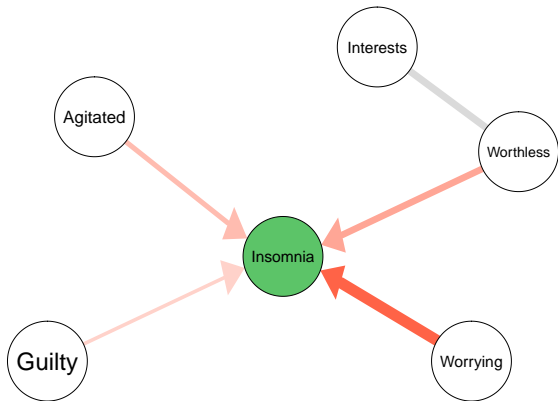
Computing Nodewise Predictability



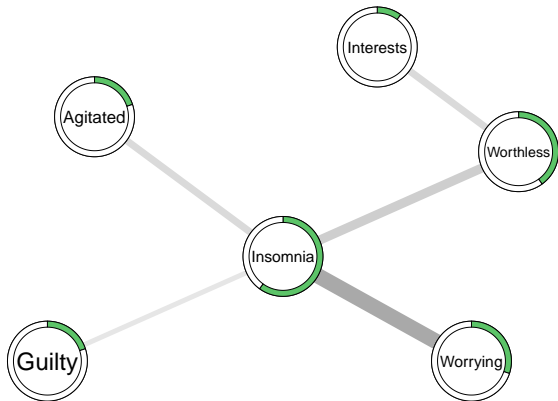
Computing Nodewise Predictability

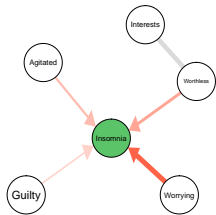
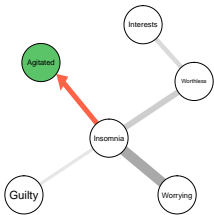
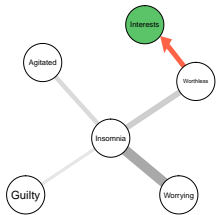
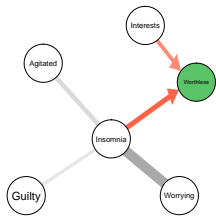
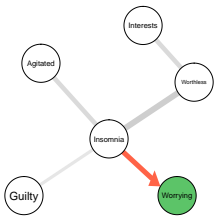
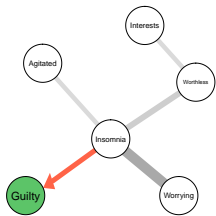


Computing Nodewise Predictability

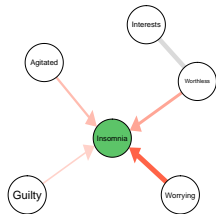
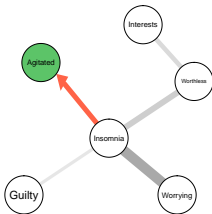
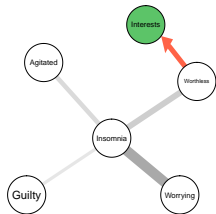
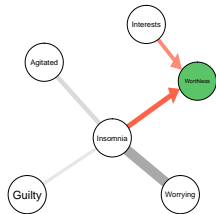
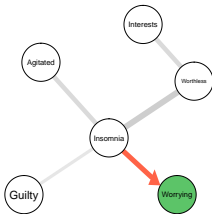
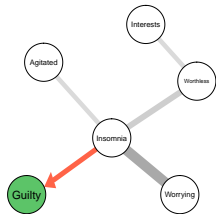


Visualizing Nodewise Predictability

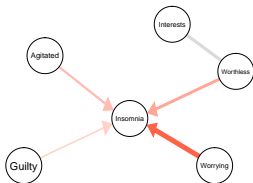




Predictability = Upper Bound

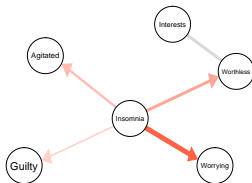


What we can (not) compute



How much is node A determined by all other nodes?

YES



How much does A influence (all) other nodes?

NOPE

Tutorial Paper on Predictability in Network Models

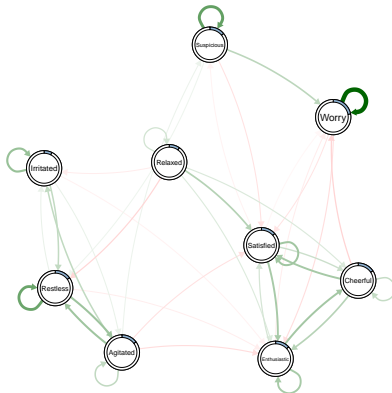
```
pred_obj <- predict(fit_obj, dataList$data,  
  errorCat = c("CC", "nCC", "CCnarg"),  
  errorCen = c("RG"))
```

To display both the accuracy of the intercept model and the normalized accuracy (contribution by other variables), we require a list for the ring-segments and a list for the corresponding colors:

```
error_list <- list() # list for ring-segments  
for(i in 1:11) error_list[[i]] <- pred_obj$errors[i, 2]  
error_list[[12]] <- c(p_obj$errors[12,5], p_obj$errors[12,6])  
  
color_list <- list() # List for Colors  
for(i in 1:11) color_list[[i]] <- "#90B4D4"  
color_list[[12]] <- c("#ffa500", "#ff4300")
```

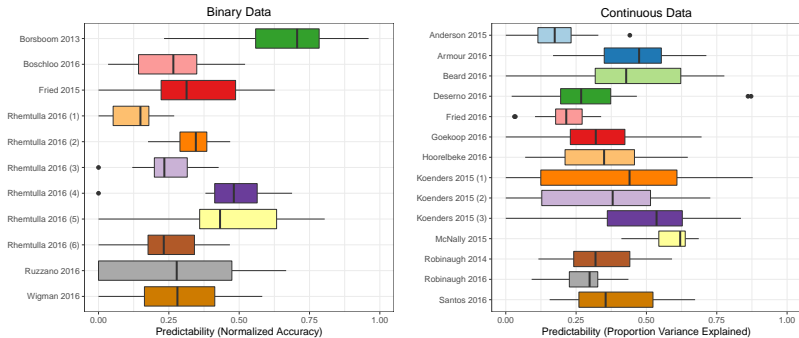
We now provide the weighted adjacency matrix and the list containing the nodewise predictability measures to qgraph, resulting in Figure 2:

```
pieColor <- c(rep("#90B4D4", 11), rep("#E89446", 1)) # pick nice color  
  
library(qgraph)  
qgraph(fit_obj$pairwise$wadj, pie = error_list,  
  layout="spring", labels = dataList$names,  
  pieColor = color_list, sbel.cen = .9,  
  edge.color = fit_obj$pairwise$edgecolor,  
  curveAll = TRUE, curveDefault = .6,  
  cut = 0, labels = dataList$names)
```



Haslbeck & Waldorp (in press) How well do Network Models predict Observations? On the Importance of Predictability in Network Models.
Behavior Research Methods.

First peak into Predictability in Psychopathological Networks



Haslbeck & Fried (in press) How predictable are symptoms in psychopathological networks? A reanalysis of 18 published datasets
Psychological Medicine.

Predictability in Psychopathological Network Models

Summary

- ▶ Predictability = degree to which a node is determined by its neighbors (on absolute scale)
- ▶ Clinical practice: helps to judge relevance of edges and to select treatments
- ▶ Research: gives an idea about degree of self-determination and controllability

Contact:

- ▶ jonashaslbeck@gmail.com
- ▶ jmbh.github.io (papers and tutorials)

backup

Relationship between Centrality and Predictability

