

I'm sorry that HW 6 was not handed in in time, because I have 8 interviews to prepare during this period, and I am doing an internship so that I don't have so much time. I am very grateful for your understanding, and I also accept any punishment for the late submission of this homework.

1 Introduction

This is the solution of HW6 of Network Data. First, we need to consider the model in the slide #168, and add two more effects: an actor is less/more likely to form a tie based on own gender status (RSiena uses term "egoX") and an actor is less/more likely to form a tie based on others' gender status (RSiena uses term "altX"). Then, we need to re-run the model specified in slide #167 and use the first set of simulated data from the running results to construct following models: model #1: the model specified in slide #167 and model #2: the model in the next slide #171. Finally, we need to compare and discuss the estimates and their significance for each of the two models and also check the convergence of each estimate.

2

M1:

	name	effectName	include	fix	test	initialValue	parm
1	fr4wav	constant fr4wav rate (period 1)	TRUE	FALSE	FALSE	2.00405	0
2	fr4wav	constant fr4wav rate (period 2)	TRUE	FALSE	FALSE	2.00405	0
3	fr4wav	constant fr4wav rate (period 3)	TRUE	FALSE	FALSE	2.00405	0
4	fr4wav	outdegree (density)	TRUE	FALSE	FALSE	-0.80750	0
5	fr4wav	reciprocity	TRUE	FALSE	FALSE	0.00000	0
6	fr4wav	transitive triplets	TRUE	FALSE	FALSE	0.00000	0
7	fr4wav	gender alter	TRUE	FALSE	FALSE	0.00000	0
8	fr4wav	gender ego	TRUE	FALSE	FALSE	0.00000	0
9	fr4wav	same gender	TRUE	FALSE	FALSE	0.00000	0
10	fr4wav	smokebeh alter	TRUE	FALSE	FALSE	0.00000	0
11	fr4wav	smokebeh ego	TRUE	FALSE	FALSE	0.00000	0
12	fr4wav	same smokebeh	TRUE	FALSE	FALSE	0.00000	0
13	smokebeh	rate smokebeh (period 1)	TRUE	FALSE	FALSE	0.20811	0
14	smokebeh	rate smokebeh (period 2)	TRUE	FALSE	FALSE	0.20811	0
15	smokebeh	rate smokebeh (period 3)	TRUE	FALSE	FALSE	0.20811	0
16	smokebeh	smokebeh linear shape	TRUE	FALSE	FALSE	0.56173	0
17	smokebeh	smokebeh average similarity	TRUE	FALSE	FALSE	0.00000	0
18	smokebeh	smokebeh total similarity	TRUE	FALSE	FALSE	0.00000	0

		estimates	significance	t-ratio
	rate constant fr4wav_new rate (period 1)	4.0233	8.2419	0.0229
	rate constant fr4wav_new rate (period 2)	3.7031	7.7644	-0.0780

		estimates	significance	t-ratio
Network Dynamics	rate constant fr4wav_new rate (period 3)	2.1478	6.7657	-0.0963
	eval outdegree (density)	-2.6921	-12.7813	-0.0616
	eval reciprocity	0.8408	5.5782	-0.0659
	eval transitive triplets	0.1522	3.2373	-0.0700
	eval gender alter	-0.0436	-0.2385	0.0339
	eval gender ego	0.0710	0.3755	0.0218
	eval same gender	1.2599	6.0393	-0.0712
	eval smokebeh_new alter	0.1628	0.9737	-0.0321
	eval smokebeh_new ego	-0.0960	-0.5886	-0.0346
	eval same smokebeh_new	0.3363	1.7226	-0.0497
Behavior Dynamics	rate rate smokebeh_new (period 1)	0.2601	1.5525	0.0161
	rate rate smokebeh_new (period 2)	0.6774	1.8438	-0.0806
	rate rate smokebeh_new (period 3)	0.4637	1.2414	-0.0806
	eval smokebeh_new linear shape	0.4230	0.3391	-0.0627
	eval smokebeh_new average similarity	26.8604	0.1865	-0.0691
	eval smokebeh_new total similarity	-3.9174	-0.1756	-0.0627

M2:

		etimates	significance	t-ratio
	rate constant fr4wav_new rate (period 1)	3.8356	7.9073	0.0035

		etimates	significance	t-ratio
Network Dynamics	rate constant fr4wav_new rate (period 2)	3.5903	7.5935	-0.0692
	rate constant fr4wav_new rate (period 3)	2.1092	7.1219	-0.0331
	eval outdegree (density)	-2.6461	-12.9551	0.0482
	eval reciprocity	0.9280	6.4470	0.0482
	eval same gender	1.5707	8.3306	0.0503
	eval same smokebeh_new	0.3409	2.0300	0.0095
Behavior Dynamics	rate rate smokebeh_new (period 1)	0.1934	1.7009	0.562
	rate rate smokebeh_new (period 2)	0.4320	2.1716	0.0114
	rate rate smokebeh_new (period 3)	0.2597	1.9393	0.0679
	eval smokebeh_new linear shape	-0.3516	-0.6673	-0.0057

	name	effectName	include	fix	test	initialValue	parm
1	fr4wav	constant fr4wav rate (period 1)	TRUE	FALSE	FALSE	2.00405	0
2	fr4wav	constant fr4wav rate (period 2)	TRUE	FALSE	FALSE	2.00405	0
3	fr4wav	constant fr4wav rate (period 3)	TRUE	FALSE	FALSE	2.00405	0
4	fr4wav	outdegree (density)	TRUE	FALSE	FALSE	-0.80750	0
5	fr4wav	reciprocity	TRUE	FALSE	FALSE	0.00000	0
6	fr4wav	same gender	TRUE	FALSE	FALSE	0.00000	0
7	fr4wav	same smokebeh	TRUE	FALSE	FALSE	0.00000	0
8	smokebeh	rate smokebeh (period 1)	TRUE	FALSE	FALSE	0.20811	0
9	smokebeh	rate smokebeh (period 2)	TRUE	FALSE	FALSE	0.20811	0
10	smokebeh	rate smokebeh (period 3)	TRUE	FALSE	FALSE	0.20811	0
11	smokebeh	smokebeh linear shape	TRUE	FALSE	FALSE	0.56173	0

The result is that the estimates in model 2 are smaller than model 1 and all t-ratios are less than 0.10, which means the convergence of each estimate of 2 models are good.

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3 Appendix
> library(RSiena)
> library(UserNetR)
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> library(igraph)
> library(Matrix)
> data(Coevolve)
> fr_w1 <- Coevolve$fr_w1
> fr_w2 <- Coevolve$fr_w2
> fr_w3 <- Coevolve$fr_w3
> fr_w4 <- Coevolve$fr_w4
> matw1 <- as.matrix(get.adjacency(fr_w1))
> matw2 <- as.matrix(get.adjacency(fr_w2))
> matw3 <- as.matrix(get.adjacency(fr_w3))
> matw4 <- as.matrix(get.adjacency(fr_w4))
> fr4wav<-sienaDependent(
+   array(c(matw1,matw2,matw3,matw4),
+     dim=c(37,37,4)), sparse=FALSE)
> fr4wav
> gender_vect <- V(fr_w1)$gender
> table(gender_vect)
> gender <- coCovar(gender_vect)
> gender
> smoke <- array(
+   c(V(fr_w1)$smoke, V(fr_w2)$smoke,
+     V(fr_w3)$smoke, V(fr_w4)$smoke),
+   dim=c(37,4))
> smokebeh <- sienaDependent(smoke,type = "behavior")
> smokebeh
> friend <- sienaDataCreate(fr4wav,smokebeh,gender)
> friend
> frndeff <- getEffects(friend)
> frndeff
> frndeff <- includeEffects(frndeff,sameX,
+   interaction1="gender",name="fr4wav")
> frndeff <- includeEffects(frndeff,egoX,
+   interaction1="smokebeh",name="fr4wav")
> frndeff <- includeEffects(frndeff,altX,
+   interaction1="smokebeh",name="fr4wav")
> frndeff <- includeEffects(frndeff,sameX,
+   interaction1="smokebeh",name="fr4wav")
> frndeff <- includeEffects(frndeff,avSim,
+   interaction1="fr4wav",name="smokebeh")
> frndeff <- includeEffects(frndeff,totSim,
+   interaction1="fr4wav",name="smokebeh")
> frndeff <- includeEffects(frndeff,recip,transTrip,
+   name="fr4wav")
> frndeff
> frndeff_a <- includeEffects(frndeff,egoX,
+   interaction1="gender",name="fr4wav")
> frndeff_a <- includeEffects(frndeff_a,altX,
+   interaction1="gender",name="fr4wav")
> myalgorithm <- sienaAlgorithmCreate(
+   projname='coevolve_1')
> set.seed(123)
> RSmod <- siena07(myalgorithm, data = friend,
+   effects = frndeff_a,batch=TRUE,
+   verbose=FALSE,useCluster=TRUE,

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+         initC=TRUE,nbrNodes=3, returnDeps =TRUE)
> new_data = RSmod$sims[[1]]
> w1 = new_data$Data1$fr4wav$`1`
> w2 = new_data$Data1$fr4wav$`2`
> w3 = new_data$Data1$fr4wav$`3`
> w4 = new_data$Data1$fr4wav$`4`
> w1s <- spMatrix(37, 37, w1[,1], w1[,2], w1[,3])
> w2s <- spMatrix(37, 37, w2[,1], w2[,2], w2[,3])
> w3s <- spMatrix(37, 37, w3[,1], w3[,2], w3[,3])
> w4s <- spMatrix(37, 37, w4[,1], w3[,2], w4[,3])
> fr4wav_new <- sienaDependent(list(w1s,w2s,w3s))
> fr4wav_new
> smoke_new <- array(
+
c(new_data$Data1$smokebeh$`1`,new_data$Data1$smokebeh$`2`,new_data$Data1$smokebe
h$`3`,V(fr_w4)$smoke),
+   dim=c(37,4))
> smokebeh_new <- sienaDependent(smoke_new,
+                               type = "behavior")
> smokebeh_new
> friend_new = sienaDataCreate(fr4wav_new,smokebeh_new,gender)
> ndeff_1 <- getEffects(friend_new)
> ndeff_1 <- includeEffects(ndeef_1,sameX,
+                           interaction1="gender",name="fr4wav_new")
> ndeff_1 <- includeEffects(ndeef_1,egoX,
+                           interaction1="smokebeh_new",name="fr4wav_new")
> ndeff_1 <- includeEffects(ndeef_1,altX,
+                           interaction1="smokebeh_new",name="fr4wav_new")
> ndeff_1 <- includeEffects(ndeef_1,sameX,
+                           interaction1="smokebeh_new",name="fr4wav_new")
> ndeff_1 <- includeEffects(ndeef_1,avSim,
+                           interaction1="fr4wav_new",name="smokebeh_new")
> ndeff_1 <- includeEffects(ndeef_1,totSim,
+                           interaction1="fr4wav_new",name="smokebeh_new")
> ndeff_1 <- includeEffects(ndeef_1,recip,transTrip,
+                           name="fr4wav_new")
> ndeff_1 <- includeEffects(ndeef_1,egoX,
+                           interaction1="gender",name="fr4wav_new")
object 'ndeef_1' not found
> ndeff_1 <- includeEffects(ndeef_1,altX,
+                           interaction1="gender",name="fr4wav_new")
> ndeff_1
> myalgorithm <- sienaAlgorithmCreate(projname='coevolve_2')
> set.seed(123)
> RSmod_1 <- siena07(myalgorithm, data = friend_new,
+                   effects = ndeff_1,batch=TRUE,
+                   verbose=FALSE,useCluster=TRUE,
+                   initC=TRUE,nbrNodes=3, returnDeps =TRUE)
> summary(RSmod_1)
> t = RSmod_1$theta/RSmod_1$se
> t < qnorm(0.975) & t > qnorm(0.025)
> ndeff_2 <- getEffects(friend_new)
> ndeff_2 <- includeEffects(ndeef_2,sameX,
+                           interaction1="gender",name="fr4wav_new")

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> ndeff_2 <- includeEffects(ndeff_2,sameX,  
+                           interaction1="smokebeh_new",name="fr4wav_new")  
> ndeff_2  
> myalgorithm <- sienaAlgorithmCreate(  
+   projname='coevolve_3')  
> RSmod_2 <- siena07(myalgorithm, data = friend_new,  
+                   effects = ndeff_2,batch=TRUE,  
+                   verbose=FALSE,useCluster=TRUE,  
+                   initC=TRUE,nbrNodes=3, returnDeps =TRUE)  
> t = RSmod_2$theta/RSmod_2$se  
> t < qnorm(0.975) & t > qnorm(0.025)
```