Lab Activity: Making a Classification Diagnostics Table for a Latent Class Model

Learning goal:

The goal of this lab activity is to practice making a classification diagnostics table. This table includes the following columns: *K*-class solution, *k*-class, model estimated *k*-class proportion, 90% bias-corrected bootstrapped confidence intervals, modal class assignment proportions ($mcaP_k$), average posterior probabilities ($AvePP_k$), odds of correct classification (OCC_k), and Entropy.

Examples of an applied diagnostic table can be seen in Thibodeau, Masyn, Rogosch & Ciccetti (2019). Descriptions of classification statistics can be found on page 569 – 570 of Masyn (2013). A summary of classification diagnostics and benchmark recommendations can be found in Nylund-Gibson, Choi, 2018.

Table 2. *Model classification diagnostics for the four-class solutions*

K-class solution	*k*-class	Estimated *k*-class proportion	90% CI[a]	$mcaP_k$	$AvePP_k$	OCC_k	Entropy
4-Class	Class 1	.33	[.26, .39]	.318	.913	21.82	.785
	Class 2	.15	[.09, .22]	.119	.853	32.62	
	Class 3	.24	[.19, .28]	.239	.917	35.65	
	Class 4	.29	[.24, .34]	.324	.814	10.84	

Note: [a]Bias-corrected bootstrapped 95% confidence intervals.

*Table from: Thibodeau, Masyn, Rogosch & Ciccetti (2019)

The *K*-class solution that we will use in this lab is the 4-class model from the PYDI dataset.

Making the table (summary of steps):

1. In the Mplus output file for the *K*-class model find the statistics provided in the output that do not require calculations.

Task: Add these statistics to the table using the Excel template file provided

2. Compute the OCC_k & $mcaP_k$ statistics

Model estimated modal class assignment

$$OCC_k = \frac{AvePP_k/(1 - AvePP_k)}{\hat{\pi}_k/(1 - \hat{\pi}_k)},$$

$$mcaP_k = \frac{\sum_{i=1}^{n} I\{\hat{c}_{\text{modal},i} = k\}}{n},$$

3. Estimate bias corrected bootstrapped confidence intervals

Add the following syntax to the 4-class input file and re-run to estimate bootstrap intervals:

```
Analysis:
BOOTSTRAP = 1000;

Model:
%OVERALL%
[C#1](c1);
[C#2](c2);

Model constraint:
New (p1 p2 p3);

p1 = exp(c1)/(1+exp(c1)+exp(c2));
p2 = exp(c2)/(1+exp(c1)+exp(c2));
p3 = 1/(1+exp(c1)+exp(c2));

output: cinterval(bcbootstrap);
```

Fit index endorsement criteria lab exercise:

Task: Highlight the model that the statistic or fit index endorses for each table:

Model (*K*-class)	*LL*	npar	CAIC	BIC	aBIC	AWE	*Adj. LMR*	*BLRT p-value*	*BF*	cmP_k
1-class	-1294.0	5	2623.55	2618.55	2602.68	2664.05				0.0
2-class	-1259.2	11	2596.58	2585.58	2550.67	2685.69	<.001	<.001	>10	1.0
3-class	-1249.2	17	2619.01	2602.01	2548.06	2756.72	0.125	0.004	>10	0.0
4-class	-1244.3	23	2651.84	2628.84	2555.85	2838.14	0.012	0.263	>10	0.0
5-class	-1242.4	29	2690.63	2661.63	2569.60	2925.54	0.352	1.000	>10	0.0

Model *K*-class	LL	*npar*	CAIC	BIC	aBIC	AWE	*Adj. LMR*	*BLRT*	BF	*cmP*
1-class	-9016.16	6	18087.27	18081.27	18062.20	18148.21	-----	-----	0.0	0.0
2-class	-8188.16	13	16495.36	16482.36	16441.05	16627.40	.001	.001	0.0	0.0
3-class	-7895.28	20	15973.70	15953.70	15890.15	16176.84	.001	.001	0.0	0.0
4-class	-7857.55	27	15962.33	15935.33	15849.54	16236.57	.001	.001	>10	1.0
5-class	-7854.17	34	16019.68	15985.68	15877.64	16365.02	.640	1.00	>10	0.0
6-class	-7850.44	41	16076.32	16035.32	15905.05	16492.76	.190	0.43	>10	0.0
7-class	-7847.56	48	16134.66	16086.66	15934.14	16622.20	.610	1.00	>10	0.0
8-class	-7845.69	55	16195.01	16140.01	15965.25	16753.65	.520	1.00	-----	-----