

An improved model of latent class analysis in a multiple group set-up with a parameter of social influence

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Motivation and objective

Objectives

Presence of social network among the respondents in a survey may have an influence on the patterns of response. Latent class analysis identifies hidden subgroups in the respondents in a survey and simplifies the structure of heterogeneity amongst them. The overall objective of the study are given below,

- To segregate the population of respondents into two or more latent classes based on the influence of social network they belong to.
- To estimate the effect of such influence on unobserved or latent classes of respondents.
- To modify the classical model of latent class analysis by introducing a new parameter of social influence.

Thematic Diagram

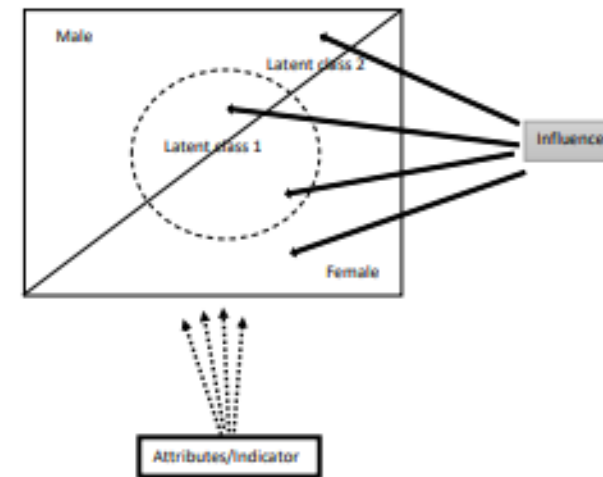


Figure 1: Multiple group LCA under the influence of social network

Data set and model specifications

Data set

Data from a survey of social networks (*available at <http://economics.mit.edu/>*) in 75 villages in rural southern Karnataka, a state in India, have been considered here to support the model. Individuals were asked detailed questions about the relationships they had with others in the village, for example,

- borrow money from
- give advice to
- help with a decision
- obtain medical advice from etc.

Present study includes three randomly sampled villages (i.e village serial number 60, 52, 28) with the sample sizes 413, 396 and 296 respectively.

Model

The likelihood function for the vector of parameters θ , α and ρ is given by,

$$L(\theta, \alpha, \rho) \propto \prod_{s=1}^S \prod_{j=1}^J \{P_{j1s}^{n_{j1s}} (1 - P_{j1s})^{n_{j\cdot s} - n_{j1s}}\}$$

Five variables or indicators are chosen as 1) language other than mother tongue (known or not), 2) Work frequency in the last week (less than 5 days or not), 3) Education (passed 10th standard or not), 4) native residence (yes or no), 5) Gender. In a particular estimation cycle, a village is considered with four indicators of latent class and a stratifier.

Parameters

- 1 θ_{sl} , $s = 1, \dots, S$; $l = 1, \dots, L$, defined as the latent class size (prevalence) specific to the observed groups.
- 2 α_{ljr} , $l = 1, \dots, L$; $j = 1, \dots, J$; $r = 1, \dots, R$, defined as the conditional item-response probabilities i.e. the probability of responding with r^{th} response option to j^{th} item given that the respondent belongs to the l^{th} latent class.
- 3 ρ_{sl} , $s = 1, \dots, S$, $l = 1, \dots, L$, the probability of obedience of an individual in the (s,l) group to the common response of the influencer.

Results and conclusion

Important Result

Latent class 1: The class of respondents who are more networked socially and are more consistent or in agreement with a common influencer

Latent class 2: The class of respondents who are less networked socially and are less consistent or in disagreement with a common influencer.

Conclusion

Irrespective of the membership in observed group, the obedience probabilities are higher in the first latent class than the second ($\rho_{1l} > \rho_{2l}$, for all 'l'). Latent group 1 shows uniformly higher obedience in all villages and in all cases of chosen indicator for observed classification. It may be thus concluded that the first latent class is 'more obedient' to the influencer i.e. more networked individuals have more impact of the social influence and they are more obedient to the influencer.

References

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