Announcement: doctoral course in Statistics, PhD in Pure and Applied Mathematics, Politecnico di Torino and Università di Torino: "Graphical models for the analysis of the independence structure in contingency tables."

Dates and times: May 14 2015, 14:00-18:00
May 15 2015, 14:00-18:00
May 19 2015, 15:00-18:00
May 20 2015, 15:00-18:00
May 21 2015, 15:00-18:00
May 22 2015, 15:00-18:00

Location: aula Buzano del Dipartimento di Scienze Matematiche (DISMA), Corso Duca degli Abruzzi 24, Torino, terzo piano

Teacher: Dr. Monia Lupparelli, Università di Bologna

Graphical models for the analysis of the independence structure in contingency tables.

Contingency tables are very common tools used to summarize data collected on several categorical variables and distributed according to complex discrete distributions.
An overview of some mixed and mean parameterizations for multinomial distributions is given in order to specify graphical models for investigating the independence structure of a vector of categorical random variables represented by means of a multi-way contingency table. A graphical model is defined by a set of nodes associated to the random variables and a set of edges joining pairs of nodes. Missing edges between nodes correspond to conditional independence properties for the joint distribution of the random vector under certain Markov properties.
The class of marginal log-linear parameterizations of Bergsma & Rudas (2002), which include the well-known log-linear parameterization and the multivariate logistic one as special cases, is illustrated. It is shown that graphical independence models for contingency tables can be specified by imposing suitable zero constraints in these parameterizations.
The log-mean linear parameterization recently developed by Roverato, Lupparelli & La Rocca (2013) provides a useful tool for specifying graphical models of marginal independence and context-specific independences by imposing suitable linear constraints. The latter are independencies specified in certain slices of a multi-way contingency table. This feature might be especially appealing for testing independence hypothesis in sub-populations of interest rather than in the full population.
Maximum likelihood estimation for these models is a constrained optimization problem which can be carried out using an iterative procedure based on the method of Lagrange multiplier; see Lang (1996) for technical details about the algorithm and the asymptotic properties of the maximum likelihood estimates.

References

Bergsma, W. P. & Rudas, T. (2002). Marginal log-linear models for categorical data. *Annals of Statistics* 30, 140 – 159
Lang, J. B. (1996). Maximum likelihood methods for a generalized class of log-linear models. *Annals of Statistics* 24, 726–752.
Roverato, A., Lupparelli, M., and La Rocca, L. (2013). Log-mean linear models for binary data. *Biometrika* 100**,** 485–494.

Contacts and further information: Mauro Gasparini, gasparini@calvino.polito.it