Author: Louis-Paul Rivest (Université Laval)

Title: Sampling in two dimensions.

Co-authors:

Abstract:

This presentation considers populations where the units can be arranged on a two-dimensional R×C rectangular grid. For instance, in an anglers' survey, the rows of the grid would be sites of interest and the columns would be fishing days. A sample is an R×C matrix S of 0's and 1's where a 1 in position (i,j) means that the corresponding unit is selected. We are interested in samples with constant column totals, $S_{\bullet j}=r$, $j=1,\ldots,C$, and row totals $S_{i\bullet}=r_i$ that varies with the rows' importance where $\Sigma\, r_i=C\times r$. We propose selecting S using a uniform distribution of the sets of R×C 0-1 matrices satisfying the row and the column constraints. This is done using MCMC: a Markov chain is defined on the set of possible samples and its stationary distribution is shown to be uniform on that set. The marginal sampling plans for the rows and the columns of the population matrix are investigated and the marginal and joint selection probabilities are derived. A numerical illustrating using data from a creel survey is presented.