

Department of Decision Sciences

Statistics Seminar

Bayesian sample size determination: an overview

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Thursday, 8th November 2012

12:30pm Room 3-E4-SR03 Via Röntgen 1 Milano

Abstract

Determination of the number of units to include in a study is a crucial aspect of experimental design and “how large the sample size must be” is, probably, one of the most frequent questions any statistician is asked about. Nevertheless, quoting Lindley, “it is a question that is embarrassingly difficult to answer”. The literature on sample size determination (SSD) from a frequentist perspective is extremely large. The last 15-17 years have witnessed strong advances in addressing the SSD problem also from a Bayesian perspective. Efforts have focused on two primary issues. The first is the distinction between a formal decisional approach, which provides the sample size through the maximization of an expected utility, and a performance based approach, which chooses the sample size to control inference for a parameter of interest to a specified degree of error. The other issue is the elaboration of a variety of performance measures and their respective advantages and disadvantages. Regardless of the approach (decisional or non-decisional), a crucial point for implementation of SSD methods is the choice of the priors. The recent literature makes a sharp distinction between the “analysis prior” used to determine the posterior distribution of the parameter of interest, and the “design prior”, used in pre-posterior computations. In this seminar, we present several performance-based criteria and discuss several robustness issues. The presentation focuses primarily on the use of SSD criteria for the design of clinical trials.