

SPATIAL STATISTICS AND IMAGE MODELING
SPECIAL ISSUE: “III SEEMI”
RESEARCH PAPER

A message from the guest editor

Spatial techniques and image processing are very relevant topics with applications in a wide variety of disciplines and fields. There have been substantial advances in analysis of spatial data in the last decade or two, and many of these are linked to image modeling and in general to computational statistics. Having this in mind, in 2008 a group of researchers mainly from Chile, Argentina and Brazil organized the first symposium on spatial statistics and image modeling, in Spanish SEEMI, to gather people working in areas related to spatial statistics and image processing. That meeting was held in Valparaiso, Chile in December of 2008; see Figure 1.



Figure 1. First SEEMI held in Valparaiso, Chile in December of 2008.

This was the beginning of a group of 30 people with similar interests and motivation in fields that are not well developed in South America. However, the enthusiasm to see many potential applications and further interactions between them moved Drs. Silvia Ojeda and Oscar Bustos from the Universidad Nacional de Córdoba, Argentina to organize the second version of SEEMI in Córdoba in December of 2009. That meeting was a success because several professors from other disciplines joined us and participated. The third SEEMI was held in Foz do Iguaçu, Brazil, in December of 2010. Dr. Miguel Uribe Opazo, from the Universidade Estadual do Oeste do Paraná, Brazil, was in charge of the organizing committee. A wide range of topics and applications were given including a course on image processing using R. Once again we appreciated the hospitality and efforts of the local committee to have a successful congress.

The papers in this special issue are divided into two groups. The first group of six articles are selected contributions presented at the third SEEMI in Brazil. The second group consist in one invited paper written by Alejandro C. Frery, Abraão D. Nascimento, and R.J. Cintra. In the first article, Daniel Griffith provides a discussion about how positive spatial autocorrelation –the most frequently encountered in practice– can distort histograms when they are constructed with georeferenced data. Joelmir A. Borssoi, Fernanda De Bastiani, Miguel A. Uribe-Opazo, and Manuel Galea present diagnostic techniques of local influence, based on the likelihood displacement, in the covariance function and in the effect of generalized leverage when there is perturbation in the matrix of covariates or explanatory variables of a Gaussian spatial linear model, used in geostatistic analysis. Luciana P.C. Guedes, Paulo J. Ribeiro Jr, Sônia M. De Stefano, and Miguel A. Uribe-Opazo define optimal sample configurations for simulated data sets, using optimization algorithms called simulated annealing and hybrid genetic algorithm. An interesting experiment of precision agriculture in the cultivation of soy-beans in Paraná is developed and the reduction in sample size is accounted. Ricardo D. da Silva, William R. Schwartz and Helio Pedrini propose a two-stage image segmentation method that maintains an adequate discrimination of details while allowing a reduction in the computational cost. Ricardo D. da Silva, William R. Schwartz, Rosane Minghim and Helio Pedrini describe a method for constructing triangle meshes from images at multiple scales smoothed with Gaussian filters. A new metric for incrementally inserting data points into the mesh is proposed, which is robust in the presence of noise or outliers. Clara Quintana, Silvia Ojeda, Germán Tirao and Mauro Valente present an investigation about mammography image formation by means of validated Monte Carlo simulations along with corresponding dedicated image analysis and processing. Four different image processing methods are considered, suitably introduced and investigated according to their capability for micro-calcification detection. Finally, Alejandro C. Frery, Abraão D.C. Nascimento and Renato J. Cintra provide a comprehensive review and examination of the use of information theory for understanding polarimetric synthetic aperture radar images by means of contrast measures that can be used as test statistics.

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