

Bayes Spatio-temporal Models for East Java Poverty Analysis with R-INLA

Ro'fah Nur Rachmawati

Statistics Department

Bina Nusantara University

Kebun Jeruk Raya No. 27, Jakarta Barat 11530, Indonesia

rofah.nr@binus.ac.id

Anik Djuraidah

Statistics Department

Bogor Agricultural University

Jl. Raya Darmaga, Bogor 16680, Indonesia

anikdjuraidah@gmail.com

Abstract

The availability of spatial and spatio-temporal data has widely increased and allow researcher to describe potential geographical pattern, including information about space and time (and its interaction) in many scientific fields. Bayesian method to deal with spatial and spatio-temporal data extensively approach with Markov Chain Monte Carlo (MCMC), however, when models are complex and designed with hierarchical fashion, MCMC algorithms may be extremely slow and even become computationally unfeasible. The Integrated Nested Laplace Approximation (INLA) algorithm is current development in R-INLA package in R, designed to deal with fundamental limitation of MCMC computation. This paper purpose to investigate how the socioeconomic information (i.e. population density, expectation years of schooling and construction overpriced index) effect the number of poor people in East Java province, Indonesia, using Bayes spatial model. Investigation result that expectation years of schooling has greatest effect in reducing number of poor people. Not only on its spatial pattern, we also investigate time dependency of poor people data from years 2012 to 2016 using classical, dynamic and space-time interaction of Bayes spatio-temporal models. In this paper, the computational aspect is efficiently solved with R-INLA, resulting dynamic Bayes Spatio-temporal is the best model based on the smallest Deviance Information Criteria.

Keywords: Generalized Extreme Value, Integrated Nested Laplace Approximation, Markov Chain Monte Carlo, Areal Data, Gaussian Markov Random Field, Conditional Autoregressive, Random Walk

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Biographies

Ro'fah Nur Rachmawati is a lecturer in Statistics Department, School of Computer Science, Bina Nusantara University and PhD student in Statistics Department, Bogor Agricultural University. She earned Bachelor of Science and Master of Science in Mathematics from Department of Mathematics, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University. She is an active researcher, that has published journals indexed in SCOPUS and conference papers published in SCOPUS Procedia Engineering and IEEE Explorer. Her research

interests include theory and simulation of stochastic process and generalized linear mixed model. She receives BUDI Scholarship from LPDP and Ristekdikti Ministry of Indonesia for PhD opportunity in year 2016. She has several awards for Best Lecturer and Best Teaching in Statistics Department for year 2016 and receive grant from Ristekdikti Ministry for International Publication Incentive in 2013. He is a member of IndoMS Society.

Anik Djuraidah is currently a fulltime senior lecturer in Bogor Agricultural University. She earned PhD in Statistics from Bogor Agricultural University. She is an active researcher that has published journals indexed in SCOPUS and conference papers. Her research interests include in Spatial, Spatio-temporal Analysis and Statistical Downscaling methods that specified using extreme value distributions. She is one of supervisors of Master and PhD student in Spatial and Spatio-temporal area data modeling and simulations.