

Mathematics for Urban and Forest Fires

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Joint spatio-temporal analysis of forest fire multiple outcomes

Giovani L. Silva

CEAUL & Dep. Mathematics
Instituto Superior Técnico
Universidade de Lisboa, Portugal
gloiolas@gmail.com

In this work, we present Bayesian hierarchical models to jointly analyze distinct data formats involving discrete, categorical and continuous outcomes. In the proposed modeling, latent processes are adopted to characterize the dependency among different type outcomes. Our modeling motivation involves forest fire data in Portugal, where the outcomes are usually occurrence of fire (binary), number of fires (count), and burned area (proportion). Since these responses are observed by region over time, this work aims to analyze spatio-temporal forest fire data when the fire ignition, number of fires, and proportion of burned area are jointly modeled. We look for space and time effects on these three outcomes among municipalities over last years. For getting estimates of the model parameters, we have used Integrated Nested Laplace Approximation (INLA) methods[1], as well as for some short term prediction. This is joint work with Elias Krainski, Denis Rustand, and Haavard Rue.

References

- [1] RUE, H., MARTINO, S. AND CHOPIN, N., *Approximate Bayesian inference for latent Gaussian models using integrated nested Laplace approximations (with discussion)*, Journal of the Royal Statistical Society, Series B, 71(2), 319–392 (2009).