

Bayesian Notes for building the geostatistical MANOVA-KNN pipeline

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From Gelman et al. 2014

BAYESIAN INFERENCE is the process of fitting a probability model to a set of data and SUMMARIZING THE RESULT BY A PROBABILITY DISTRIBUTION ON:

1. THE PARAMETERS OF THE MODEL and on
2. THE UNOBSERVED QUANTITIES SUCH AS PREDICTIONS FOR NEW OBSERVATIONS.

=> make inferences from data using probability models for quantities we observe and for quantities we wish to learn. **THE ESSENTIAL CHARACTERISTIC OF BAYESIAN MODELS IS THEIR EXPLICIT USE OF PROBABILITY FOR QUATIFYING UNCERTAINTY IN INFERENCES BASED ON STATISTICAL DATA ANALYSIS.** This is the main idea of the MANOVA-KNN pipeline, to analyse errors and reduce them. I've already sketched a geometric approach. It needs to be better backed up by probability theory. Which is what I expect to find in these Bayesian texts.

Steps of Bayesian Data Analysis:

1. setting up A FULL PROBABILITY MODEL - a JOINT PROBABILITY DISTRIBUTION FOR ALL OBSERVABLE AND UNOBSERVABLE QUANTITIES IN A PROBLEM.
2. CONDITIONING ON OBSERVED DATA - calculating and
- 3.

Note

This document is "under construction". It contains older notes of mine on Bayesian data analysis. Some were used in technical reports of mine (see [https://w](https://www.researchgate.net/publication/317549069_poisson_model)

[ww.researchgate.net/publication/317549069_poisson_model](https://www.researchgate.net/publication/317549069_poisson_model)) and also new sections aiming at creating the background necessary for the implementation of the MANOVA-KNN pipeline in geostatistics using the idea of **posterior predictive checks** (Introduction and Deduction in Bayesian Data Analysis, Andrew Gelman, 2011) [1]. For this purpose, I will have to work through books building up my skills, fortunately I was given a hint (and a copy) by a friend on "Bayesian Data Analysis for Social Sciences" by Simon Jackman (Wiley, 2009) [2] and "Bayesian Data Analysis" by Andrew Gelman, John B. Carlin, Hal S. Stern, David B. Dunson, Aki Vehtari and Donald B. Rubin (CRC, 2014) [3]. Please download the current version from my GitHub profile under

the multivariate_analyses project repository: https://github.com/RoxanaTesileanu/multivariate_analyses/blob/master/literature_analysis/geospatial_scala/bayesian_notes_geosp.pdf.

The statistical plots in this document were generated in Scala using the JavaPlot package developed by Panayotis Katsaloulis [4]. You can find the scala source files used for generating them under the link: https://github.com/RoxanaTesileanu/multivariate_analyses/tree/master/DeepLearning/src/main/scala/com/mai/scalaPlot.

The present document was edited using Latex [5] (<https://www.latex-project.org/>). The source .tex file of the present document is also available in the multivariate_analyses repository on my GitHub profile. Special thanks to Gustavo Mezzetti for the LaTeX halloweenmath package: <http://mirrors.concertpass.com/tex-archive/macros/latex/contrib/halloweenmath/halloweenmath-man.pdf>!

References

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