Computational Statistics II

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Computational Statistics II is a short course (10-12h) on **Bayesian computations**. The course covers both theoretical and programming aspects. The final examinations is based on 2-3 homeworks, that must be submitted in the form of a Markdown file.

The teaching material will be available at the website: https://tommasorigon.github.io/CompStat/

Syllabus

1. Efficient R programming
   - R programming and MCMC
   - Rcpp & RcppArmadillo
2. Advanced MCMC algorithms
   - Optimal scaling & adaptive Metropolis
   - MALA algorithm & Hamiltonian Monte Carlo
3. Data augmentation
4. Variational Bayes

Essential references

1. Albert, J. H. and Chib, S. (1993). Bayesian analysis of binary and polychotomous response data. *Journal of the American Statistical Association*, **88**(422), 669–679.

2. Blei, D. M., Kucukelbirb A., and McAuliffe, J. D. (2017). Variational inference: a review for statisticians. *Journal of the American Statistical Association*, **112**(518), 859–877.

3. Chopin, N. and Ridgway, J. (2017). Leave Pima indians alone: binary regression as a benchmark for Bayesian computation. *Statistical Science*, **32**(1), 64–87.

4. Durante, D. and Rigon, T. (2019). Conditionally conjugate mean-field variational Bayes for logistic models. *Statistical Science*, **34**(3), 472–485.

5. Dunson, D. B. and Johndrow, J. E. (2020). The Hastings algorithm at fifthy. *Biometrika*, **107**(1), 1–23.

6. Eddelbuettel, D. and Balamuta, J. J. (2018). Extending R with C++: a brief introduction to Rcpp. *The American Statistician*, **72**(1), 28–36.

7. Neal, R. M. (2011). MCMC using Hamiltonian dynamics. CRC press.

8. Polson, N. G., Scott, J. G. and Windle J. (2013). Bayesian inference for logistic models using Pólya–Gamma latent variables. *Journal of the American Statistical Association*, **108**(504), 1339–1349.

9. Roberts, G. O. and Rosenthal, J. S. (2001). Optimal scaling for various Metropolis-Hastings algorithms. *Statistical Science*, **16**(4), 351–367.

10. Roberts, G. O. and Rosenthal, J. S. (2009). Examples of adaptive MCMC. *Journal of Computational and Graphical Statistics*, **18**(2), 349–367.