COSMOSTATS 2023 - Bridging the Gap: Statistical Modeling of Cosmology Extremes



Contribution ID: 35

Type: not specified

Efficient Estimation of Mixed Effect Models via Variational Message Passing

Wednesday, 13 September 2023 16:00 (1h 30m)

Abstract: Nowadays, approximate Bayesian methods, such as integrated nested Laplace approximation, variational Bayes, expectation propagation and stochastic variational inference, are routinely used in statistics for the estimation of complex hierarchical models. They are particularly convenient, if not necessary, when Markov chain Monte Carlo algorithms can not be employed due to memory or time constraints. In these cases, minimal assumptions on the regularity of the likelihood and the conditional conjugacy of the prior, eventually after some model transformation via data augmentation, must be imposed in order to obtain tractable computations. As an alternative, we propose a simple and efficient variational message passing procedure to approximate the posterior density function of additive and mixed regression models without requiring either differentiability or conjugacy. Generalized linear models, support vector machines, quantile, robust and sparse regression can be naturally accommodated using the proposed approach, which also allows for many generalizations to more structured model specifications and stochastic optimization schemes. Simulation studies and real data applications confirm that the proposed method enjoys increasing computational and statistical advantages over alternative gold standard methods as the dimension and complexity of the model grow.

Primary author: CASTIGLIONE, Cristian (University of Padova - DSS)Presenter: CASTIGLIONE, Cristian (University of Padova - DSS)Session Classification: Poster session