

Use equations to clarify your answers if necessary.

1. Describe briefly the following terms and what they are used for:
 - a) Inverse-cdf -method (2p)
 - b) Convergence (2p)
 - c) Observed information (2p)
2. Markov chain Monte Carlo (MCMC)
 - a) How one can estimate how many MCMC samples are needed? (3p)
 - b) Describe briefly Metropolis-Hasting algorithm. What issues have an effect to its performance and how the performance can be improved? (3p)
3. Describe shortly alternative ways to choose priors that try to encode ignorance. (6p)
4. Discuss Bayesian model checking and evaluation. (6p)
5. Decision analysis
 - a) Describe shortly the Bayesian decision analysis process (principle, terms, and steps) (2 p)
 - b) Compute the expected cost in the following example (maximum 2 digits accuracy) (4 p)

Patient has some symptoms X and goes to see a doctor. Symptoms might be caused by disease Y or Z. Only disease Y can be cured with antibiotics. Time in bed for disease Z is 5 days. Time in bed for disease Y without antibiotics is 7 days. With antibiotics symptoms are relieved in 3 days. With present symptoms prior for disease Y is 5%. Disease Y can be tested with laboratory test, which accuracy is 98%. Receiving the test result takes one day. If the cost is time (time in bed + optional waiting of the test result), compare costs if 1) no antibiotics, 2) antibiotics right away without test. 3) antibiotics only if the test result is positive? If antibiotics had a cost how many days it would have to correspond so that it would be better not to eat antibiotics.

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