Applications of Chatterjee's Correlation in MCMC

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Markov Chain Monte Carlo

- A Markov chain is a discrete time stochastic process $X_1, X_2, \dots$ such that the next state of the process depends solely on the present state, i.e.
$$\Pr(X_n | X_1, \dots, X_{n-1}) = \Pr(X_n | X_{n-1}).$$

- A Markov chain can be specified by two things
  1. The initial distribution, i.e. the marginal of X_1.
  2. The transition probabilites, i.e. the conditional of $X_{n+1} | X_n$

Markov chain Monte Carlo

- A Markov chain is said to be **stationary** if the marginal of X_n is independent of n. This invariant distribution is called the stationary distribution.
- A Markov chain is **ergodic** if the distribution of X_n converges to the invariant distribution.
- A stationary Markov chain is **time-reversible** w.r.t. the stationary distribution if X_n and X_{n+1} are exchangable.

Pearson's Correlation Coefficient

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