

Bayesian models and Markov chains

Mohar Sen

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Research topic: Sleep deprivation

Research Question

How does sleep deprivation impact reaction time?

The Study

- measure reaction time on Day 0
- restrict sleep to 3 hours per night
- measure reaction time on Day 3
- measure the change in reaction time

Y_i = change in reaction time(ms) for subject i

Assume

Y_i are Normally distributed around some average change in reaction time m with standard deviation s .

$$Y_i \sim N(m, s^2)$$

Prior model for parameter m

Y_i = change in reaction time (ms)

$$Y_i \sim N(m, s^2)$$

$$m = \text{average} Y_i$$

Prior information:

- with normal sleep, average reaction time is ~250 ms
- expect average to increase by ~50 m
- average is unlikely to decrease & unlikely to increase by more than ~150 ms