

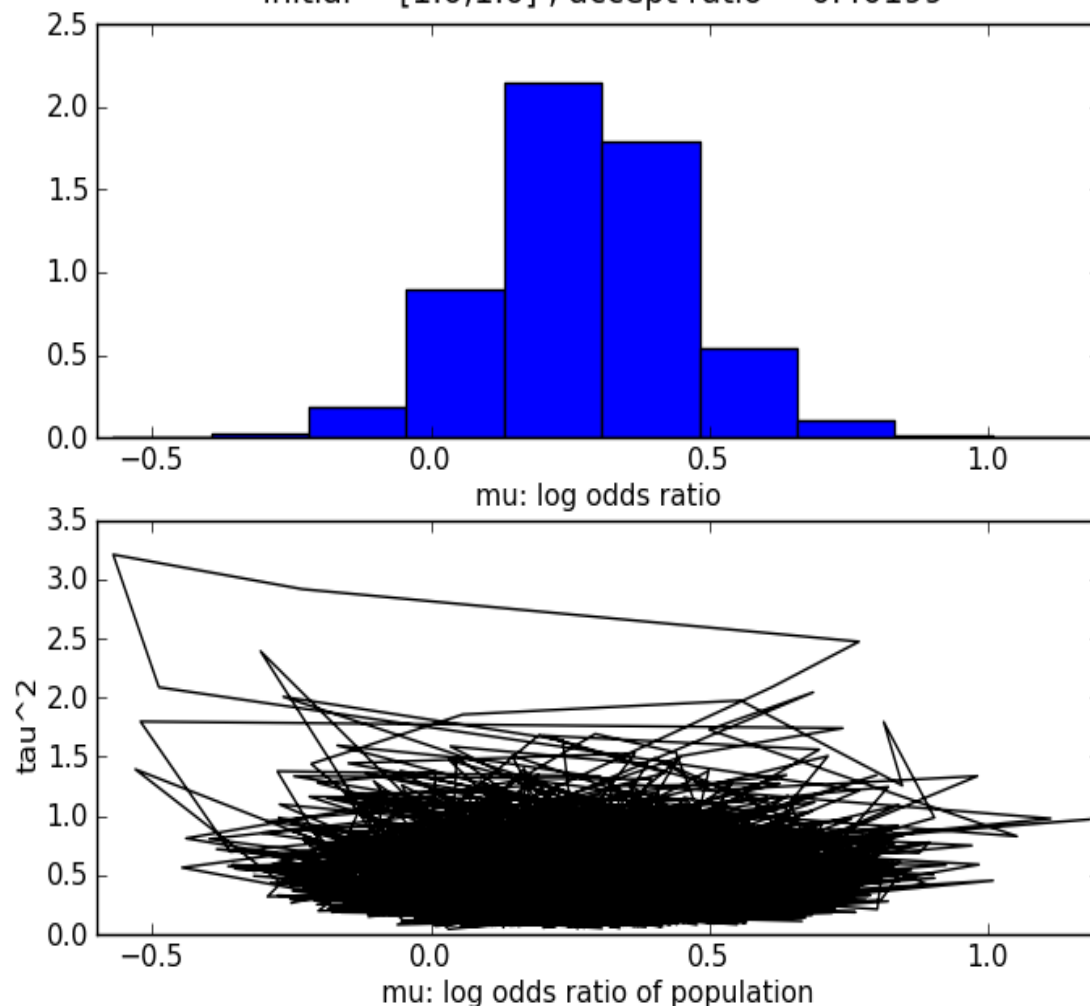
MCMC Lab #3: Hierarchical Models in Meta-Study Analysis

In this lab, we considered a population of both healthy and individuals with a particular disease and examined whether the presence of a specific genetic trait increased, decreased, or had no effect at all on the risk of contracting that disease. The odds ratio is a quantitative measure of how the genetic trait is related to the disease. If the odds ratio is 1 the trait protects against the disease, if the odds ratio is 0 the trait has no effect, and as the odds ratio increases the trait's implication of the disease becomes stronger. We will use the log of the odds ratio for a symmetric domain.

Twelve different studies provided the measured log odds ratio and standard error for different sample populations. By using Bayesian analysis and models of the sampling error and the measured error we can sample the distribution of the true log odds ratio for the entire population using Metropolis MCMC. From those samples we can estimate the expected value of the true log odds ratio and determine whether the train has any implication of the disease.

Below are the results from the Metropolis MCMC sampling.

9900 samples, $\delta\mu = 0.25$, $\delta\tau_{sq} = 0.25$,
initial = [1.0,1.0] , accept ratio = 0.40199



From the normalized histogram of the samples of the true log odd ratio, μ , the expected value seems to lie at approximately 0.2. Since this value is pretty close to zero, I would conclude that the trait has a negligible implication that an individual would contract the disease.