PHYS 512 Assignment 4
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1. The parameters in the test script give a chi square of 15267.9 which is nowhere near the mean chi square of 2501 and given the standard deviation of the chi square value is sqrt(2*2501) ~= 71, it's clear that this is a pretty unacceptable fit. The other parameters give a chi square of 3272.2 which is about 11 standard deviations from 2501 so while it's a much better fit than the other parameters it's still not quite acceptable and we can definitely do better.
2. Newton's method returned the parameters [68.50863805105054, 0.022393973934427748, 0.11708121635132995, 0.12257835808466587, 2.38556703753409e-09, 0.97519126662635] which gave a chi square of 2578.1 which is within about 1 standard deviation of 2501.
3. MCMC initialized with the parameters I got from using Newton's method and using the final curvature from Newton's method as the step size returned the parameters [68.7116111 0.0223307445 0.116448070 0.1.06823698 2.31078472e-09 0.975996741e-01] which gave a chi square of 2577.5 after 10000 steps. I think this chain converged because it was slightly more accurate than Newton's method and I ran another chain earlier with only 2000 steps which gave similar parameters and chi square, suggesting the accuracy plateaued and we've reached a minimum. The mean value I obtained for dark energy is 0.7061±0.004
4. Doing another chain and fixing tau = 0.0540±0.0074 I got [67.5427018 0.0222033886 0.119102159 0.08.53807667 2.22811557e-09 0.970318634e-01] with chi square 2577.2 and by importance sampling the first chain I got [68.3906337 0.0223424291 0.117497292 0.0634203740 2.12307838e-09 0.974808214] with chi square 2577.6. The new chain gave a slightly better chi square value however the importance sampling gave a tau value much closer to the more accurate value of 0.0540 so I believe those parameters are likely closer to the true values.