Demystifying Radio Astronomy: Fundamentals And Data Exploration
Krittika Summer Projects
Week 7

Monte Carlo Markov Chain Methods

Recall the activity in Week 1, where we plotted the non-thermal jet emission in the radio (and another band). In the activity this week, we will be fitting the lightcurve with a model called the smooth broken power-law model, which is parameterized as follows:

$$F(t,\nu) = 2^{1/s}\left(\frac{\nu}{3\ \mathrm{GHz}}\right)^{\beta} F_p \left[\left(\frac{t}{t_p}\right)^{-s\alpha_1} + \left(\frac{t}{t_p}\right)^{-s\alpha_2}\right]^{-1/s} \tag{1}$$

Where ν is the observing frequency, β is the spectral index, F_p is the flux density at 3 GHz at the light curve peak, t is the time post-merger, t_p is the lightcurve peak time, s is the smoothness parameter, and α_1 and α_2 are the power-law rise and decay slopes, respectively.

- Start with the same dataset as the one we used in week 1 from `http://www.tauceti.caltech.edu/kunal/gw170817/gw170817_afterglow_data_full.txt`
- Choose observations in two frequencies (VLA 3 GHz and Chandra).
- Use MCMC to fit the smooth broken power-law parameters and compare them to the ones obtained in Makhatini et al. 2021.