Krittika Summer Projects 2025:
Assignment – 2

Fitting the Light Curve of GRB170817

In this assignment, we will fit the light curve with a model called the *smooth broken power-law model*, which is parametrized as follows:

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

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 light-curve peak time,
- s is the smoothness parameter, and
- α_1 and α_2 are the power-law rise and decay slopes, respectively.

Steps:

1. Start with the dataset available from:
   http://www.tauceti.caltech.edu/kunal/gw170817/gw170817_afterglow_data_full.txt
2. Choose observations in two different frequencies (for example, VLA 3 GHz and Chandra X-ray).
3. Use MCMC to fit the smooth broken power-law parameters (Equation (1)) and compare them to the ones obtained in Makhatini et al. (2021).