Part 2

The North American Breeding Survey provides information about the abundance of the different species of birds in North America (`https://www.pwrc.usgs.gov/BBS/index.cfm`). Download the data for Red Hawks in California for the years 1966 to 2017, together with the route count for each year. Let y_i be the count of red hawks for year i and let c_i the route count for year i. Assume that $y_i \sim Pois(\lambda_i/c_i)$.

(1) Perform an exploratory analysis of the data.

(2) Propose a hierarchical model based on distributional assumptions that allow to obtain estimates of λ_i that borrow strength from all the data, and learn about the common structure of all years.

(3) Fit the proposed model using a sample based approach.

(4) Validate your model by exploring if the results are compatible with the observed data, and discuss possible elaborations of the model that may be needed.

(5) Estimate the probability of observing more than 450 red Hawks in California in a year with a route count of 120.

Remember to use the template provided on the course web page. Start your paper with an abstract that contains a short description of the problem and the main findings. Then, the first part of the body of the paper will correspond to an introduction with a description of the problem and an exploratory data analysis. The methods and the analysis will follow. The paper will finish with concluding remarks and references. Tables and figures, if any, need to be part of the text. Do not append them to the end of the paper. You have a maximum of ten pages, including figures and tables.

(10 pts)