Mini Project: Football Match

Your task is to infer the result of the championship games between two top teams by analyzing the regular season games and then simulating 500 two-leg finals.

- Write a code to perform these simulations.
- Plot the posterior distribution of the cumulative scores as a 2D "heat map" (teamA total score as the *x* axis and teamB total score as the *y* axis). You may consider using `histogram2d`.
- Calculate the inferred winning probability for each of the two teams.

Submit a short report "describing/explaining" your model and a few well-formatted plots/tables (professional quality and with clear figure captions) of your choice. Include discussions of your observations and conclusions.

Your target audience is your peers at another university who have some basic understanding of Bayesian statistics (but not multi-level models). Your report should be 2~4 pages long (12 pt Times New Roman, single spaced, 1" margin all around) and should be submitted as a single pdf file.

Also submit your final code (with ample comments).

Caution: The starter code is already providing significant amounts of hints and tips. You should NOT look for or otherwise consult code examples on the internet or other books for this or related problem!!! Doing so would be considered cheating. You not only would get zero point for your project, but you also would lose a valuable opportunity to learn how to do "real" Bayesian statistical analysis.

`CODE: Football_simulation`

Struggling, getting frustrated, and then having a moment of epiphany is all part of the real learning process. Consulting official online documentations for Julia and relevant libraries or getting limited debugging help from StackOverflow or similar coding websites (but not for this specific football match example) is acceptable.

Some background info: We model the goals scored by each team with the Poisson distribution, which is often used for discrete events ("arrivals") in a continuum. For example, it is used to model customer arrivals at a location as time passes or failures in continuous industrial processes. The "goal" rate of our Poisson distribution can be thought of as the number of goals a team scores per unit time. It depends on the attacking power of the team, the defensive power of the opposing team, and also whether the game is played at home or away for the team.

Note: In the example code, we calculate the sum of the mean of the attacking powers and the mean of the defensive powers and then subtract it (to zero the offset) when calculating the goal rate for each game.