Bruins vs Blackhawks - A Bayesian Approach to Determining Who's the Better Team
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Background:
In the 2013 NHL Stanley Cup final series, the Chicago Blackhawks defeated Allen's beloved team - the Boston Bruins - in six games. Ignoring the overtime play, the scores at the end of regulation play were:

Game 1: 3-3 tie (Blackhawks win in OT)
Game 2: 1-1 tie (Bruins win in OT)
Game 3: 2-0 Bruins win
Game 4: 5-5 tie (Blackhawks win in OT)
Game 5: 1-3 Bruins lose (Blackhawks win)
Game 6: 2-3 Bruins lose (Blackhawks win)

This leads to the question of: how much evidence does this series provide that the Blackhawks were the better team?

Process:
The approach for answering this question is rather similar to the Soccer problem in Lecture 11 (do not get this one confused with the Boston Bruins problem in Chapter 7 of Think Bayes - these two are **not** the same).

STEP ONE: I use statistics from previous games to choose the prior distribution for λ, the long-term average goals per game, for each team. Based off the ESPN 2012-2013 season stats, the average goals per game for the Blackhawks is 3.1, while the average goals per game for the Bruins is 2.65. Based off these stats alone, one might assume that the Blackhawks must be better . . . but let's investigate!

(NOTE: Yes - the stats are the average goals per game against a variety of opponents. However, getting the average of goals per game against each other would also have its flaws since players can change throughout the seasons.)

STEP TWO: I use Poisson to evaluate the distribution of goals per game in the Likelihood function. A Poisson process implies that an event can occur at any point in time with equal probability, which in the real world is not necessarily true, but simplifying this model by using Poisson is not unreasonable.

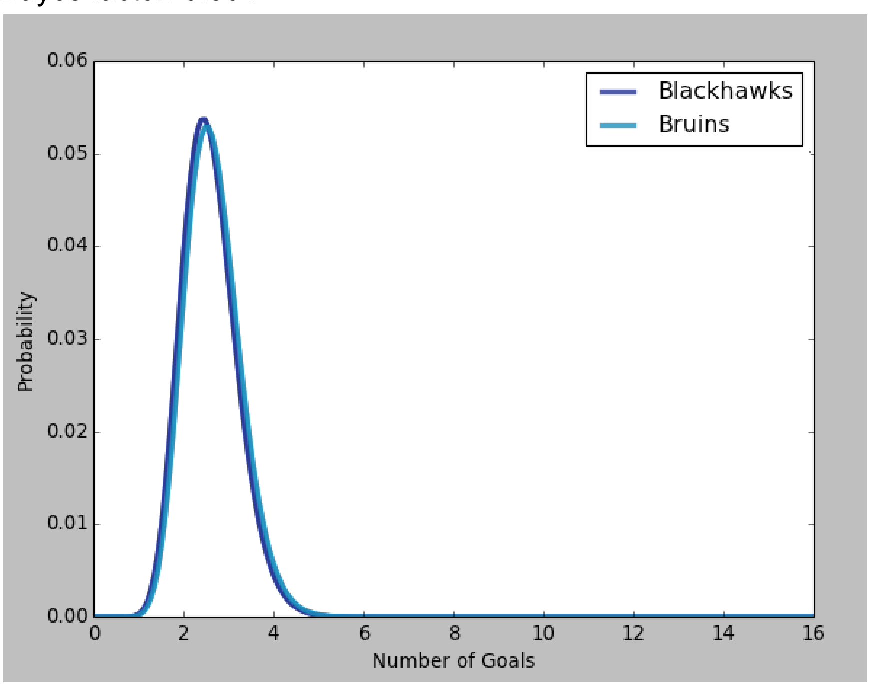
STEP THREE: Taking the scores for each game of the finals, I update the priors. For each hypothetical value of λ, I create a Poisson distribution and then create a mixture of the Poisson distributions.

STEP FOUR: I take the means of each suite to compute the mean posterior probability of each team and plot it.

STEP FIVE: Using the prior and posterior probabilities, I then compute the Bayes factor and use that and the posterior probability that the Blackhawks are better than the Bruins to determine if the Blackhawks are STATISTICALLY better than the Bruins given our priors.

RESULTS:

Posterior mean of Blackhawks: 2.586
Posterior mean of Bruins: 2.664
Posterior probability that the Blackhawks are better than the Bruins: 0.445
Bayes factor: 0.801



INTERPRETATION:

As shown by the results, based on the scores of the final games, the posterior mean of the Blackhawks is approximately 2.59 goals/game, and the posterior mean of the Bruins is approximately 2.66 goals/game. Not taking into account overtime and looking at scores rather than outcomes, we find that in this situation, the Bruins are the better team and not the Blackhawks (though the difference in posterior means is not as drastic as the difference in the priors). This is supported by the Bayes factor. Since it is less than 1, it means that there is more evidence against the Blackhawks being the better team than for it.

LOCATION OF REPO:

https://github.com/jenwei/ThinkBayes2