

STAT 456 - Intro Activity

Bayesian Thought Experiment

There are two foundational elements in a Bayesian Analysis:

1. Bayesian inference is a re-allocation of credibility across possibilities
2. These possibilities are parameter values in meaningful mathematical models

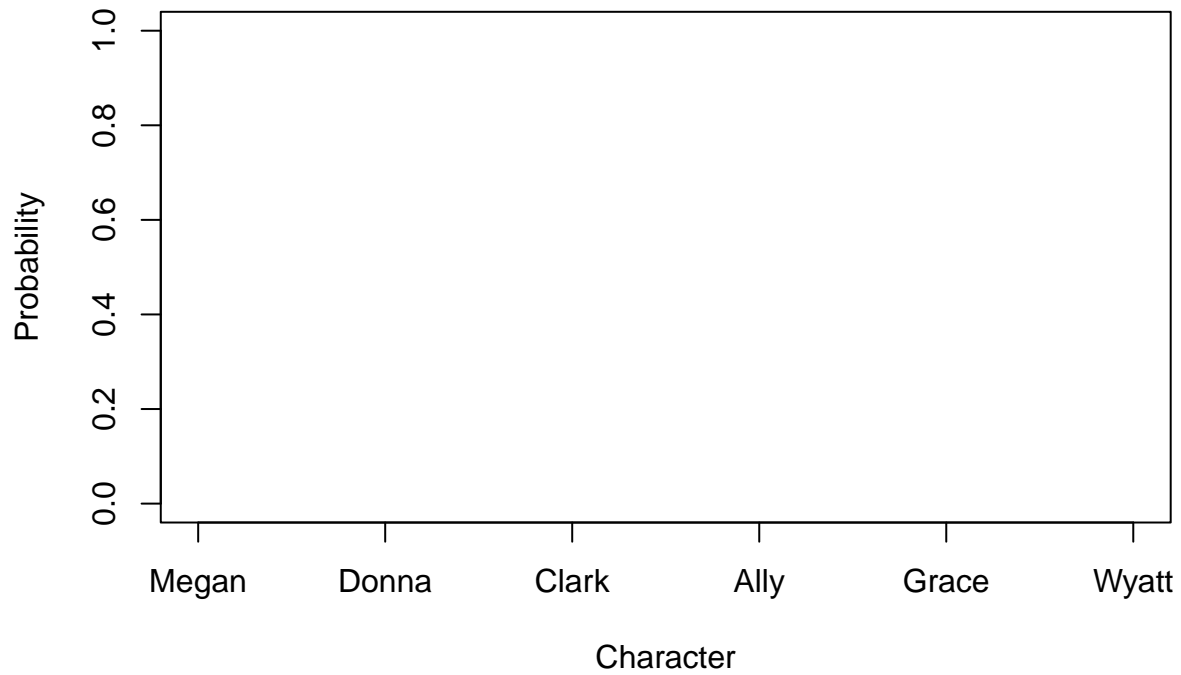
Guess Who Exercise

Consider the game Guess Who, where the goal is to ask questions to identify an opposing player's character.



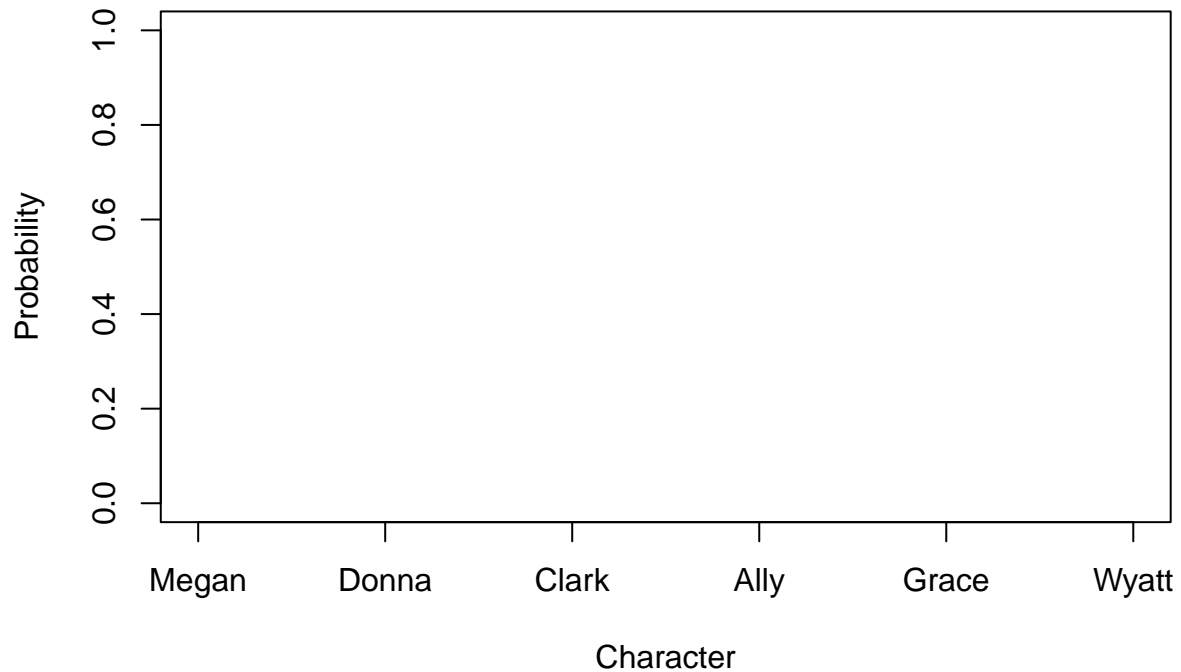
Figure 1: Guess Who Faces

- Given the line up of suspects above, draw your belief (as a probability) for each character. Note these should sum to one and constitute the first foundation element in Bayesian Analysis.
- The first set of probabilities are known as *prior* probabilities.



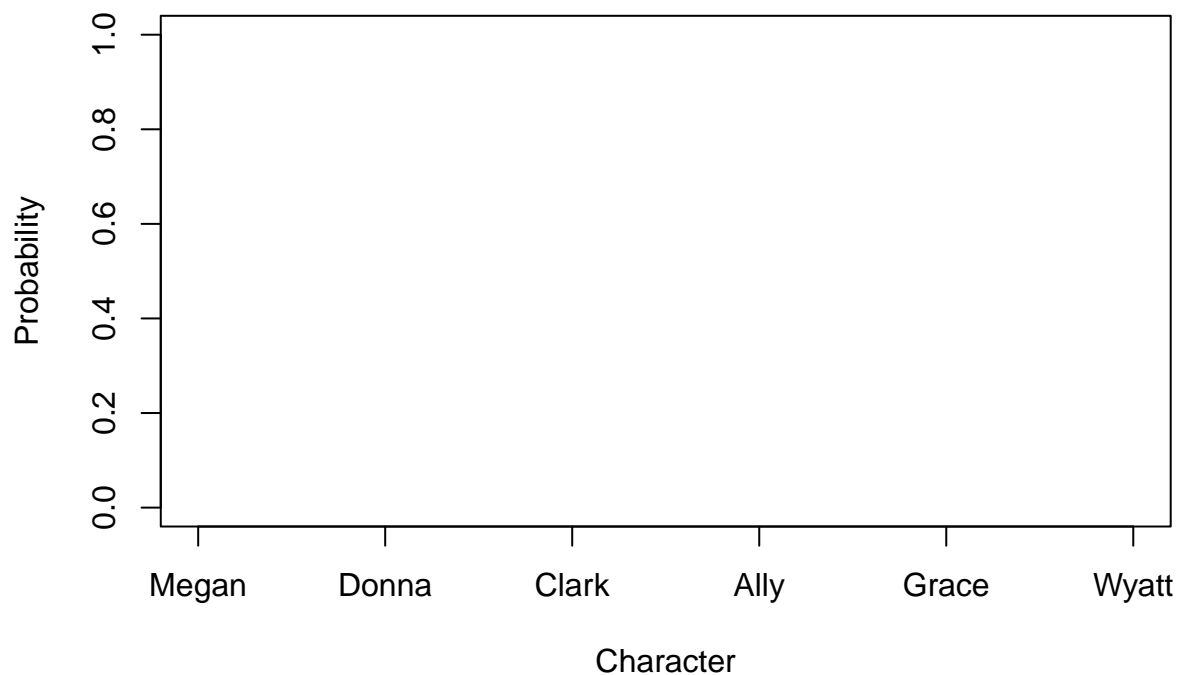
Follow the conversation and update your probabilities accordingly

- **You:** Does your character have a hat
- **Your adversary:** Yes



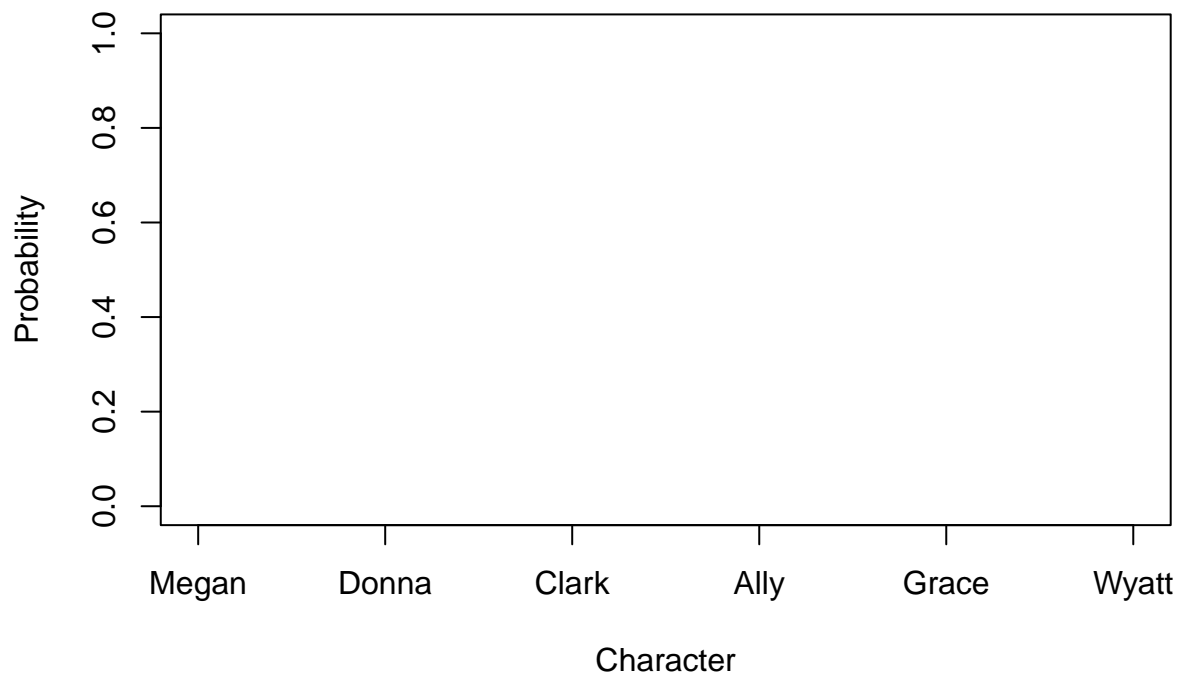
Follow the conversation and update your probabilities accordingly, again

- **You:** Is your character wearing glasses
- **Your adversary:** Yes



Follow the conversation and update your probabilities accordingly, again

- **You:** Is your character wearing purple glasses
- **Your adversary:** No

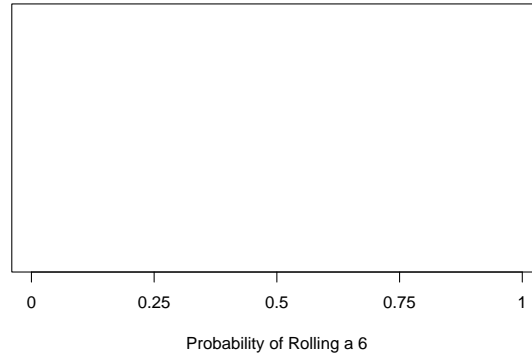


Ex. Rolling a Die

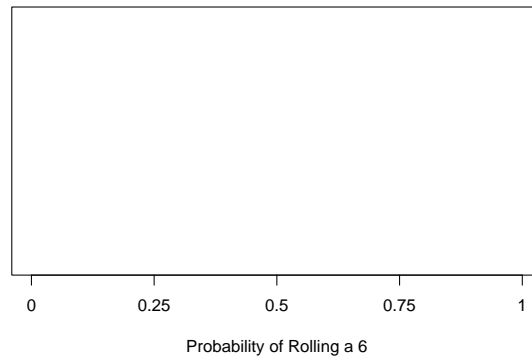
Now consider a similar example using a die. Suppose our goal is to determine the probability of the die landing on 6. Now construct your prior belief for this die.

Note this is different from the previous example.

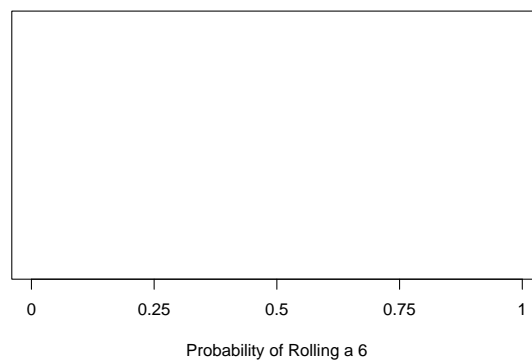
- We are now interested in estimating the probability of rolling a 6, rather than if the character is one of 6 possibilities.
- We are still thinking in a distribution, so the total probability (or credibility) should be allocated across the set of possible values.



Suppose we observe three rolls, now update your beliefs.



Finally suppose we observe 100 more rolls, now update your beliefs.



Key Points From This Activity

- *Thinking with distributions:*
- *Specifying a prior distribution:*
- *Update distribution with additional data or evidence:*