1 Lecture 17, 2-14-20: Beta
1. Suppose you have a coin where you have no prior belief on its true probability of heads $p$. How can you model this belief as a beta distribution?

2. Suppose you have a coin which you believe is fair, with “strength” $\alpha$. That is, pretend you’ve seen $\alpha$ heads and $\alpha$ tails. How can you model this belief as a Beta distribution?

3. Now suppose you take the coin from the previous part and flip it 10 times. You see 8 heads and 2 tails. How can you model your posterior belief of the coin’s probability of heads?

   1. $Beta(1, 1)$ is a uniform prior.
   2. $Beta(\alpha + 1, \alpha + 1)$. This is our prior belief about the distribution.
   3. $Beta(\alpha + 9, \alpha + 3)$

2 Lecture 18, 2-18-20: Central Limit Theorem
1. What is the distribution (with name and parameter(s)) of the average of $n$ i.i.d. random variables, $X_1, \ldots, X_n$, each with mean $\mu$ and variance $\sigma^2$?

   1. According to the central limit theorem, this can be modeled as $N(\mu, \sigma^2/n)$. 