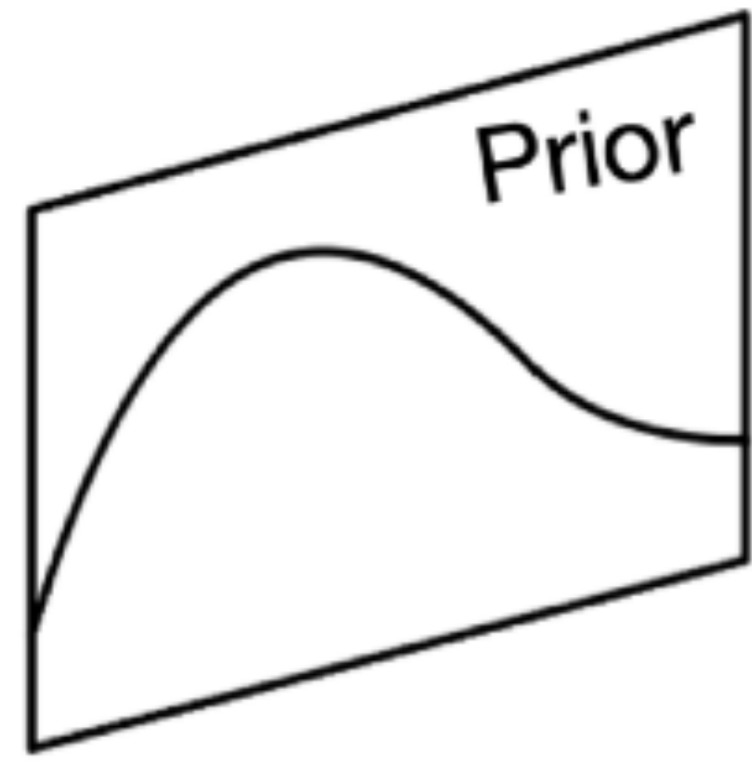
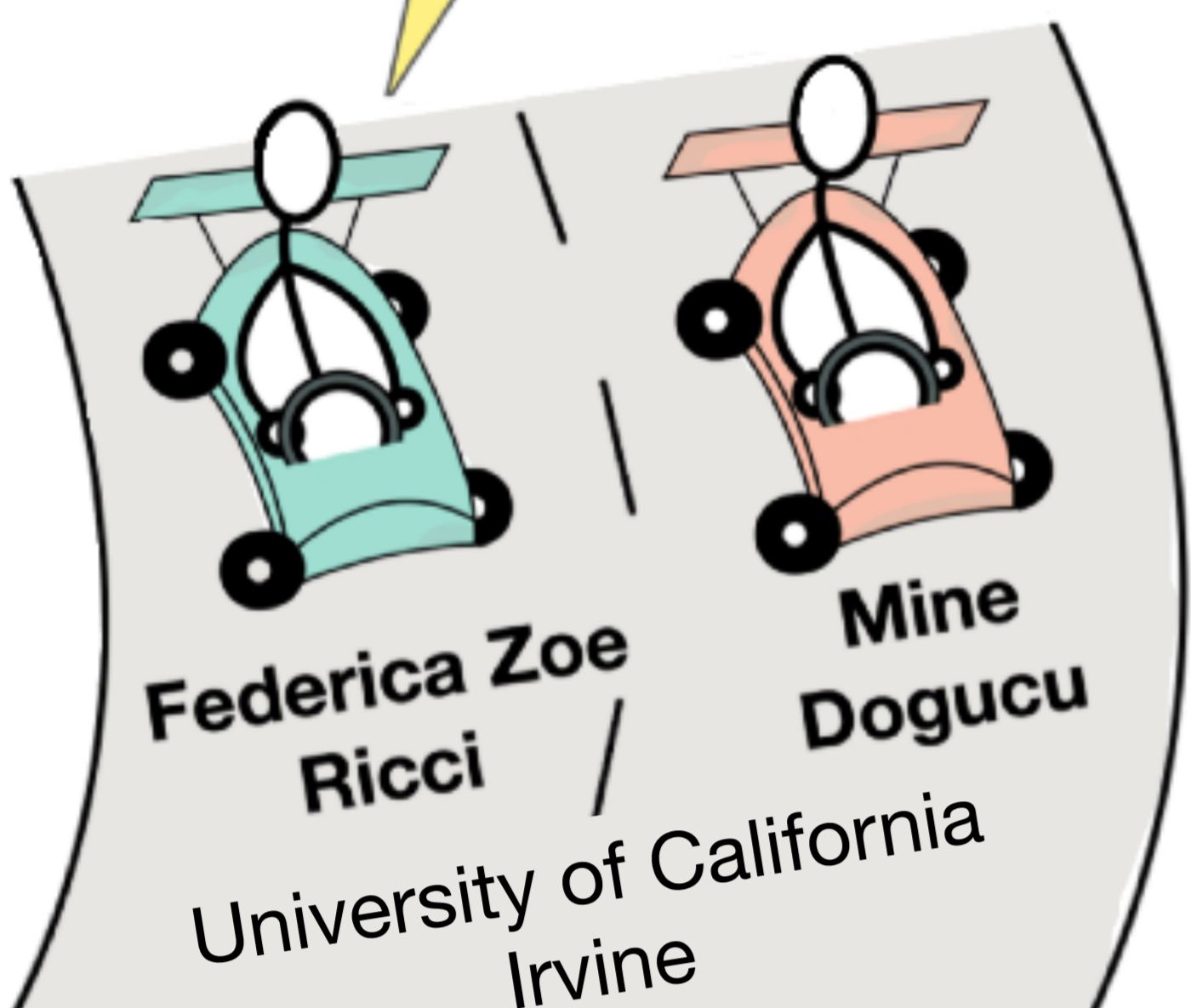


Learning Bayesian modeling with an online racing game



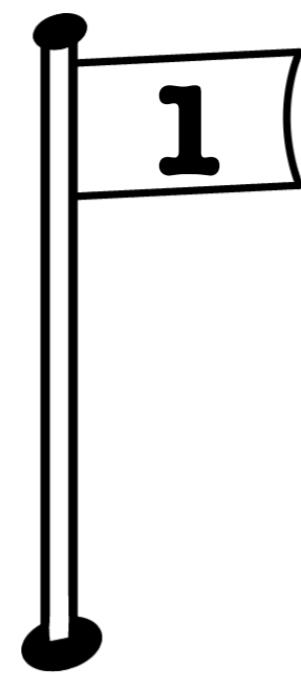
SEE YOU AT...



THE POSTERIOR LINE

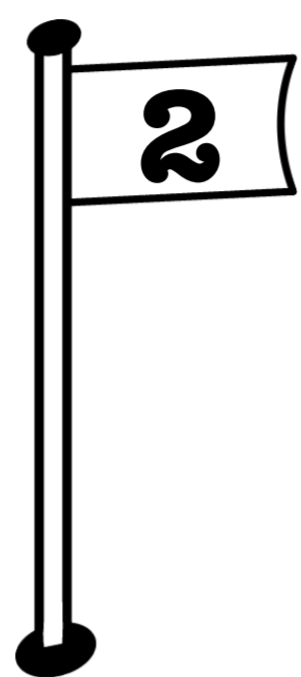
Posterior

GOALS



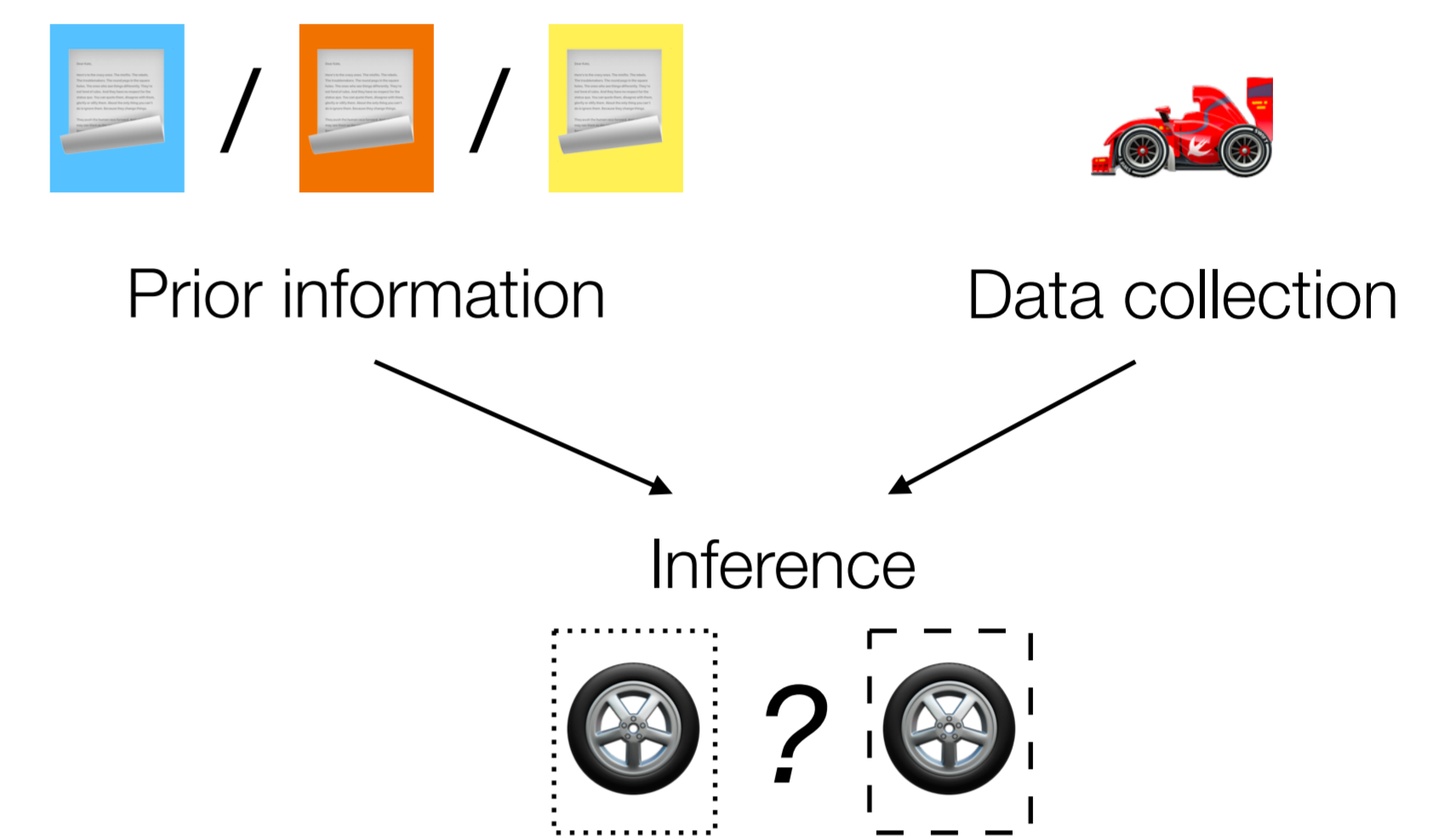
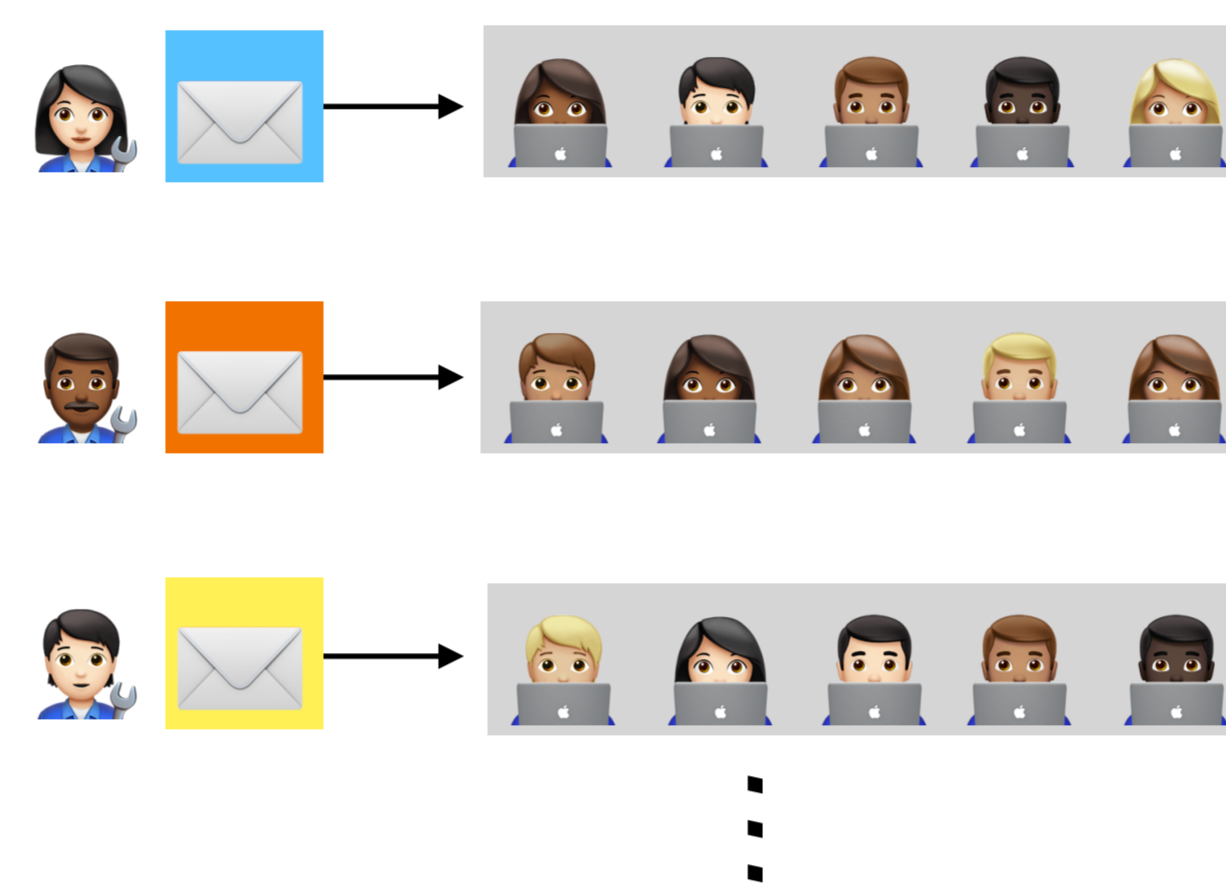
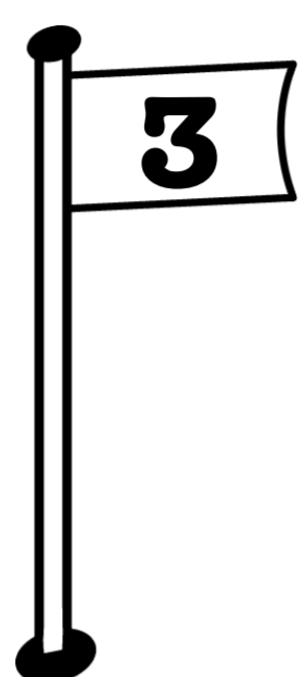
- Learn how to use available information to set a prior
- Learn that there isn't only one correct prior
- Experience applying Bayesian modeling to a realistic and fun setting

SETUP



- Intro to Bayesian Data Analysis class (UC Irvine)
- 50 upper level undergraduate students
- 50-min lab session after lecture on Beta-Binomial model

ACTIVITY



Students are divided into teams. Each team is given a letter by one of 3 racing managers

Teams need to help their managers decide which tires to use, combining information in their letter with data they collect by racing

0 min

```
2. **Where would you center your prior for the probability that the hot rod tires would be faster than the tiny tires? Explain your reasoning.**

Your answer here.

4. **Play around with values for**  $\alpha$  and  $\beta$  below that give you a prior that looks reasonable enough to you. Briefly explain why it is reasonable (just the intuition)**.

{r}
alpha <- 1
beta <- 1
plot_beta(alpha, beta)
{r}
```

Team Danica Hi team!

Last year, we had four players racing on the Eight track with the Classic car, once with the HotRod and once with the Tiny tires. Three of them finished faster with the HotRod tires, one of them with the Tiny tires.

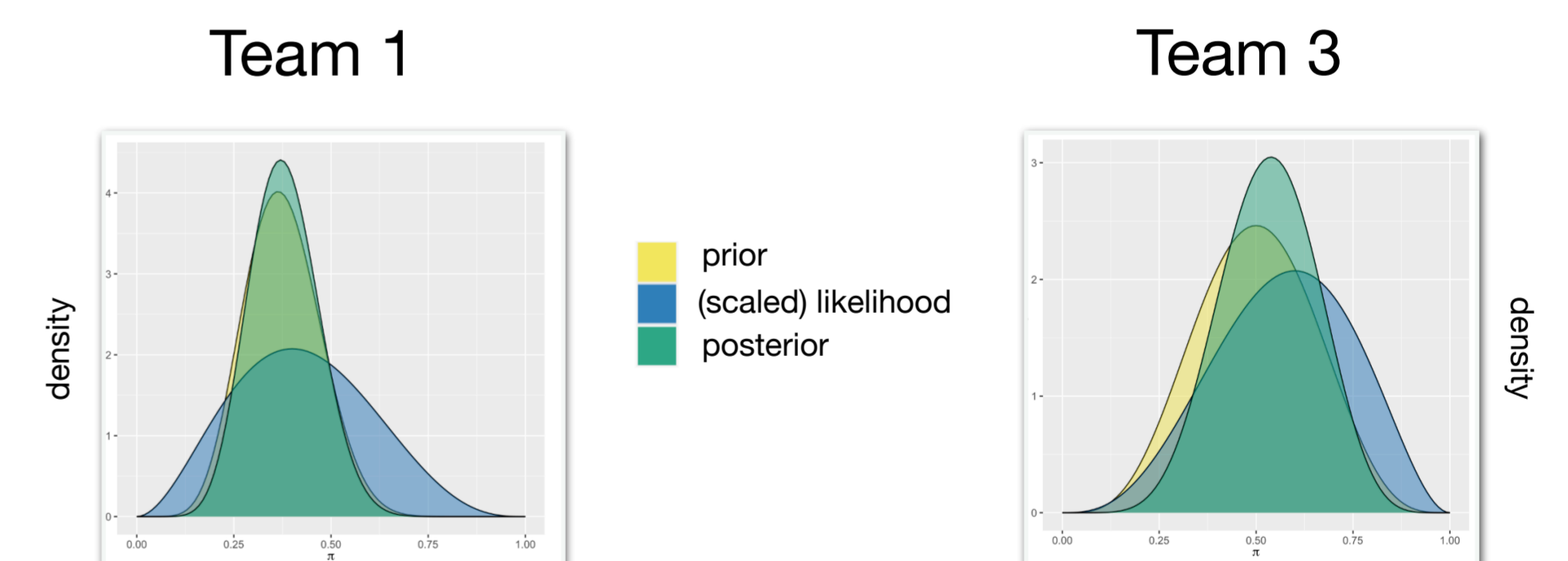
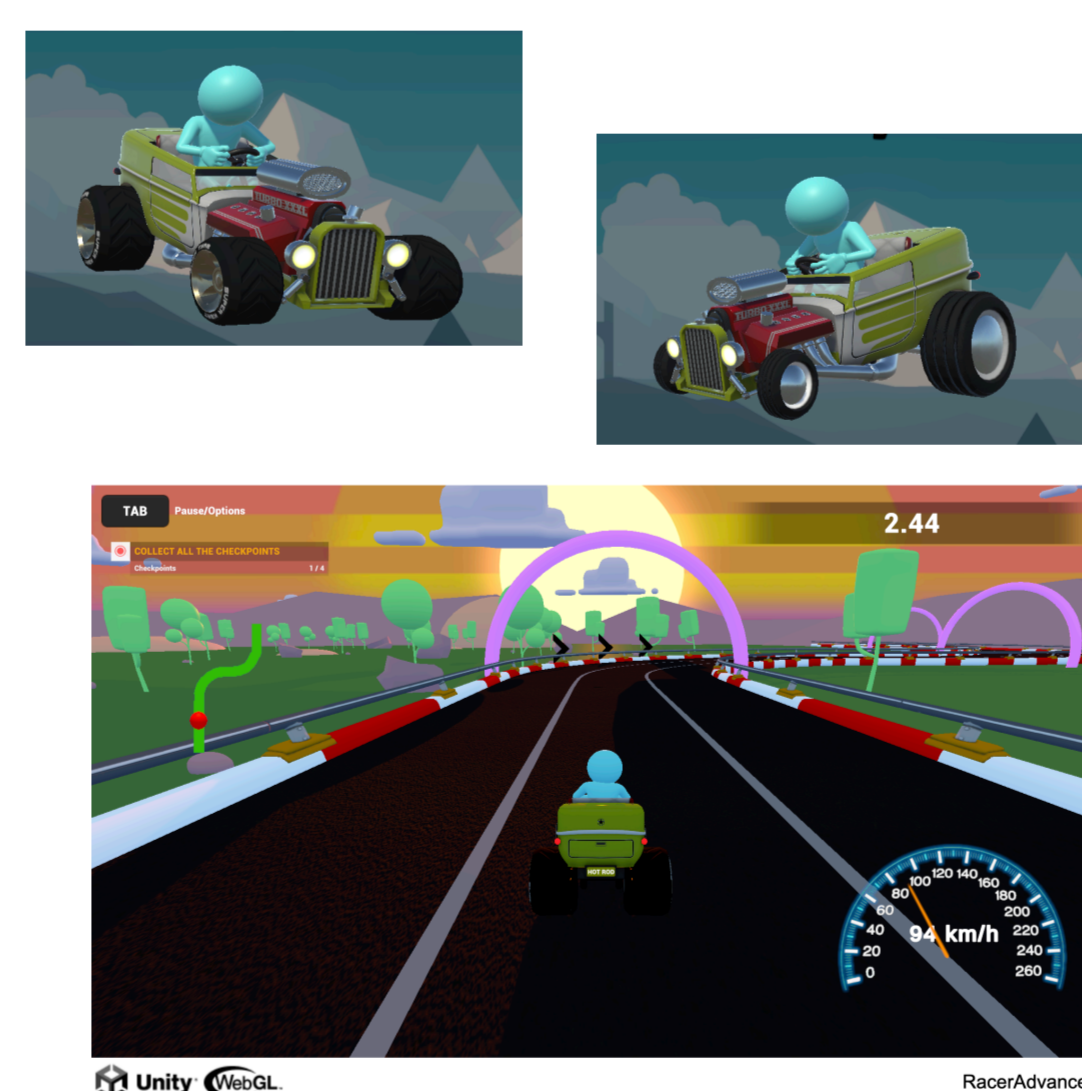
[...]

By the way, our engineers think it's likely that 6 out of 10 races the HotRod tires would be faster than the Tiny ones..but they think that it could also be as low as 4 out of 10 races, or as high as 9 out of 10 races.

Team members reflect on their prior information and choose their prior distribution

Letters talk about past experience of the racing team with two types of tires, and about the engineers beliefs on tires' relative performance

10 min



What does your posterior suggests in terms of the probability of finishing the Eight track race faster with the HotRod tires than with the Tiny ones, on a HotRod car?

Our posterior is more confident than our prior, and they both center around the same point roughly. This suggests the probability of finishing faster with HotRod tires is 0.38.

Our posterior suggests that it's more likely that the Hotrod tires will finish faster compared to what we believed based on the prior.

Each team member plays once with each type of tire and records which tire was fastest

Teams derive their posterior distributions and write a recommendation for their managers. Some teams discuss their analysis with the class

20 min

50 min

RESOURCES

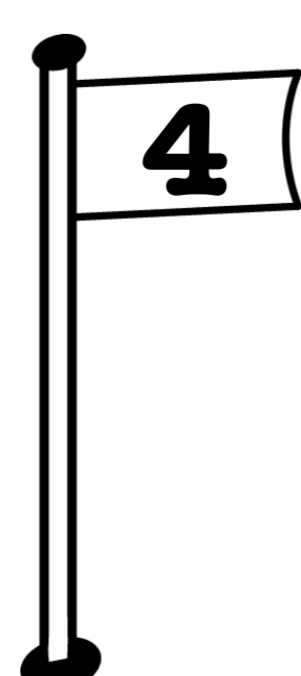
"I really liked it, if every discussion was like this I would have no problem going at 9:00am."



<https://federicazoe.github.io/bayes-games/>

STUDENTS' PERCEPTIONS

32 participants (open-ended questions)



Fun (22)

"The racing game was very fun which make learning the concepts much more engaging than simply reading about a simulation in a book."

Understanding Bayesian modeling (17)

"This activity was a lot of fun, and I enjoyed completing it. I felt like it was a great example in order to understand the beta binomial model."

Interactive (15)

"I really liked how interactive the discussion was with the cart-racing game. I got to have fun while learning."

Teamwork (14)

"I believe that applying the concepts in a group setting made the learning more interesting and memorable."

Data collection (9)

"I think the literal sampling helped give me an idea of how it directly affects the prior."

Time (18)

"The activity felt a bit long (and thus a little rushed) for the allotted discussion time."