Difference in Means - Analysis

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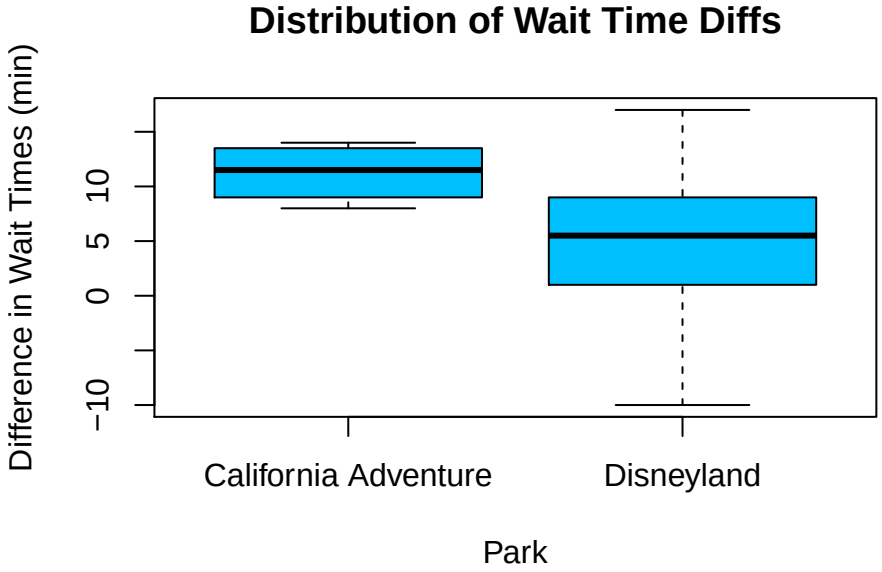
Introduction

Disneyland opened in 1955 and in 2001 California Adventure opened as an expansion across the main entrance plaza. Disneyland has the classic attractions like Pirates and Matterhorn and California Adventure has more modern attractions like Soarin' and Toy Story Mania. As popularity of the two Parks increases, more demand means an increase in wait times for the top attractions. We want to see whether there is a signficant difference in the change in mean wait times for the two Parks.

Exploratory Data Analysis

This data consisted of measured wait times for 10 popular rides at the Disneyland Amusement Park. Six of the rides are located in Disneyland (Space Mountain, Matterhorn, Indiana Jones Adventure, Peter Pan's Flight, Star Tours, and Splash Mountain), and the other four are located in California adventure (Radiator Springs Racers, Soarin' Around the World, Toy Story Mania!, and Grizzly River Run). For each ride, we have two measured wait times–one from 2015 and one from 2017. The difference between these two measurements (2017 wait time minus 2015 wait time) is calculated for each ride. This means we have 10 total differences observed–four from California Adventure and six from Disneyland.

Based on the boxplots below, we can see that California Adventure's differences in wait times are less spread out than Disneyland's. Disneyland has one outlier: a measured difference in wait time of -10 minutes. This was the only observation where there was a shorter wait time for the ride in 2017 than there was in 2015. There does appear to be a skewness to Disneyland's measured differences in wait times, perhaps due to the small sample size, but also due to the outlier. The distribution of differences for California Adventure appears approximately normal.



The table below provides the sample mean difference in wait time and standard deviation of differences in wait times for each of the two Parks. We can see that California Adventure has a higher average difference in wait time (2017-2015) of 11.25 minutes, but a standard deviation of only 2.75 minutes, whereas Disneyland has a lower average difference in wait time of 4.67 and a higher standard deviation of 9.09 (most likely due to the outlier discussed previously).

Park	Mean	SD
California Adventure	11.25	2.75
Disneyland	4.67	9.09

Analysis

We will test the following hypotheses using Welch's two-sample t test for the difference in mean change of wait times for the two Parks.

$$H_o: \ \mu_{C.A.} = \mu_{Disney}$$
$$H_a: \ \mu_{C.A.} \neq \mu_{Disney}$$

where $\mu_{C.A.}$ is the mean difference in wait times for California Adventure rides (2017-2015), and μ_{Disney} is the mean difference in wait times for Disneyland rides (2017-2015). The results, including a 99% confidence interval for the difference in means, are summarized in the table below.

99% CI	T-Test Stat	P-value
(-7.84,21)	1.66	0.15

Formal Conclusion:

Because the p-value of 0.15 is greater than our significance level of $\alpha = 0.05$, we fail to reject the null hypothesis California Adventure and Disneyland experienced the same change in mean wait time for their rides. There is insignificant evidence to say that that the average change in wait times for the two Parks are significantly different from one another.

Reported Conclusion:

Our observed difference of 6.58333 between the sample mean difference of wait time for California Adventure and the sample mean difference of wait time for Disneyland was close enough to zero to say that the observed difference was due only to chance rather than a true difference in the wait times for the two Parks.