Analyzing A/B test

In this case study, I will analyze A/B test results for the company Audacity. Here's the customer funnel for typical new users on their site:

View home page > Explore courses > View course overview page > Enroll in course > Complete course

Audacity loses users as they go down the stages of this funnel, with only a few making it to the end. To increase student engagement, Audacity is performing A/B tests to try out changes that will hopefully increase conversion rates from one stage to the next.

I'll analyze test results for two changes they have in mind, and then make a recommendation on whether they should launch each change.

Experiment I :

The first change Audacity wants to try is on their homepage. They hope that this new, more engaging design will increase the number of users that explore their courses, that is, move on to the second stage of the funnel.

The metric we will use is the click through rate for the Explore Courses button on the home page. Click through rate (CTR) is often defined as the the number of clicks divided by the number of views. Since Audacity uses cookies, we can identify unique users and make sure we don't count the same one multiple times. For this experiment, we'll define our click through rate as:
CTR: # clicks by unique users / # views by unique users
Now that we have our metric, let's set up our null and alternative hypotheses:

$H0: CTR_{new} \leq CTR_{old}$
$H1: CTR_{new} > CTR_{old}$

Our alternative hypothesis is what we want to prove to be true, in this case, that the new homepage design has a higher click through rate than the old homepage design. And the null hypothesis is what we assume to be true before analyzing data, which is that the new homepage design has a click through rate that is less than or equal to that of the old homepage design. As you've seen before, we can rearrange our hypotheses to look like this:

$H0 :: CTR_{new} - CTR_{old} \leq 0$
$H1: CTR_{new} - CTR_{old} > 0$

IPYNB file name :homepage_action

Experiment II :

The second change Audacity is A/B testing is a more career focused description on a course overview page. They hope that this change may encourage more users to enroll and complete this course. In this experiment, we're going to analyze the following metrics:

1. Enrollment Rate: Click through rate for the *Enroll* button the course overview page
2. Average Reading Duration: Average number of seconds spent on the course overview page
3. Average Classroom Time: Average number of days spent in the classroom for students enrolled in the course
4. Completion Rate: Course completion rate for students enrolled in the course
First, let's determine if the difference observed for each metric is statistically significant individually.