

## Project Overview

In this experiment udacity tested a change where if the student clicked 'start free trial', they were asked how much time they had available to devote to the course. If the student indicated 5 or more hours per week they would be taken through the checkout process as usual. If they indicated fewer than 5 hours per week a message would pop up indicating that Udacity courses usually requires a greater time commitment for successful completion and suggesting that the student might like to access the course material for free. The unit of diversion is a cookie, although if a student enroll in free trial they are tracked by user id from that point.

## Experiment Design

### Metric Choice

- Invariant metrics: number of cookie, number of clicks, click-through -probability
- Evaluation metrics: Gross-conversion, Retention, Net conversion

**1. Number of cookie:** Since the unit of diversion is cookie that is not going to be affected by the change that udacity is launching at the time of enrollment. Hence it can be used as a invariant metric. It is expected to remain same across control and experiment group.

**2. Number of clicks:** It is defined as the number of unique cookie to click the start free trial button. It can be used as a invariant metric because whatever changes are being launched by the udacity appears after clicking 'Start free trial' button. Hence it is expected to remain same across both control and experiment group.

**3. Click-through -probability:** It should not change across control and experiment group as it is the ratio of two unchanging metrics namely number of unique cookie who click and total number of cookie. Hence it can be used as invariant metric.

**4. Gross-conversion:** it is the ratio of number of users who enrolled in free trial and number of unique cookie to click 'start free trial'. This metric can vary depending upon how users respond to the pop-up message displayed in the experiment group. If they are willing to make time commitment only then they will enrol. Hence, in our experiment group this number should be less as compared to control group.

**5. Retention:** It is the ratio of number of users who made their first payment and the number of users who enrolled for the free trial. It is expected to be higher in experiment group as compared to control group.

**6.Net-conversion:** It is the ratio of number of users to remain enrolled for the 14 day trial period and make their first payment and number of users who clicked 'start free trial' button. This metric is expected to vary as the number of user-id to remain enrolled and make their first payment is not expected to remain same in both group.Hence it can be our evaluation metric.

## Measuring Standard Deviation

Evaluation metric	Standard Deviation
1.Gross conversion	0.0202
2.Retention	0.0549
3.Net conversion	0.0156

Unit of analysis is equal to unit of diversion in case of gross -conversion and net-conversion but not retention.Empirical variability may vary from analytical variability when our evaluation metric is retention.

## Sizing

### Number of Samples vs. Power

#### **1.Gross conversion:**

Baseline conversion rate = 20.635%

Minimum detectable effect=1%

alpha=5%

beta=20%

Sample size=25835

#### **2.Retention:**

Baseline conversion rate = 53%

Minimum detectable effect=1%

alpha=5%

beta=20%

Sample size=39115

#### **3.Net conversion:**

Baseline conversion rate = 10.93%

Minimum detectable effect=0.75%

alpha=5%

beta=20%

Sample size=27114

## Duration vs. Exposure

Indicate what fraction of traffic you would divert to this experiment and, given this, how many days you would need to run the experiment. (These should be the answers from the "Choosing Duration and Exposure" quiz.)

Give your reasoning for the fraction you chose to divert. How risky do you think this experiment would be for Udacity?

## Experiment Analysis

### Sanity Checks

For each of your invariant metrics, give the 95% confidence interval for the value you expect to observe, the actual observed value, and whether the metric passes your sanity check. (These should be the answers from the "Sanity Checks" quiz.)

For any sanity check that did not pass, explain your best guess as to what went wrong based on the day-by-day data. **Do not proceed to the rest of the analysis unless all sanity checks pass.**

### Result Analysis

#### Effect Size Tests

For each of your evaluation metrics, give a 95% confidence interval around the difference between the experiment and control groups. Indicate whether each metric is statistically and practically significant. (These should be the answers from the "Effect Size Tests" quiz.)

#### Sign Tests

For each of your evaluation metrics, do a sign test using the day-by-day data, and report the p-value of the sign test and whether the result is statistically significant. (These should be the answers from the "Sign Tests" quiz.)

### Summary

State whether you used the Bonferroni correction, and explain why or why not. If there are any discrepancies between the effect size hypothesis tests and the sign tests, describe the discrepancy and why you think it arose.

### Recommendation

Make a recommendation and briefly describe your reasoning.

## Follow-Up Experiment

Give a high-level description of the follow up experiment you would run, what your hypothesis would be, what metrics you would want to measure, what your unit of diversion would be, and your reasoning for these choices.