A/B Testing, Design and Implementation:

Learning objectives:

Students will learn the fundamentals of randomized control trials (aka A/B tests), namely what they achieve, how to design, implement and analyze their outcomes as well as their shortcomings and work arounds. Students will also learn tools that can be used to analyze data from observational studies where randomization was not implemented.

Course statement and motivation:

How does the demand for a product change when the price does, or the ratings do? How can we anticipate how sales and profits change if the firm changes its business strategy? How can we measure if introducing technology in schools, universities and/or classrooms affects the performance of students? Many companies and Governmental agencies ask and try to answer questions of this type every day. This course introduces the fundamentals of causality and the appropriate language to ask and answer causal questions. The course materials focus on the ideas and on the intuition behind the fundamental tools used to measure causal effects. The students will learn from the theory of A/B testing as well as from examples with real-world datasets drawn from research performed at the Heinz College in entertainment and education.

Prior knowledge:

Knowledge of R or STATA. A class in statistics and regression analysis or permission of the instructor is required to enroll.

Key learning resources:

This course pulls materials from different sources to provide the best introductory mix to studying A/B testing. Appropriate readings selected by the instructor are available on the course website. Related textbooks (non-mandatory reading) include:

1) Mostly Harmless Econometrics: An Empiricist's Companion
by Joshua D. Angrist and Jörn-Steffen Pischke

2) Counterfactuals and Causal Inference: Methods and Principles for Social Research
by Stephen L. Morgan, and Christopher Winship

Course activities:

7 3-hour weekly lectures, 5 weekly homeworks, term project report + slides.

Course schedule:
Tuesday nights.

Assessment structure:

5 weekly homeworks delivered on lectures 2,3,4,5,6 due before the next lecture. Homeworks ask students to explain concepts in their own words and to explain how to analyze certain situations. Answers are at most 4 pages long. Each homework counts 10% for the final grade. Late homeworks are received up to 48 hours after the deadline. A 20% penalty on the obtained grade is applied. No homeworks are received after 48 hours unless the delay is due to illness (contact the instructor in such cases ahead of the deadline). Homeworks will be graded within a week and returned before the next lecture. Pointers for answers will be uploaded to the course website before grades are given back to students. If you have questions about your grade you should look at the pointers for answers that will be provided after the due date of each homework. If questions subsist, contact the TA that graded your homework to discuss your answers. Discussing the answers with the TAs is a great way to learn even further. If you and the TA agree on a change of grade, I will revise it and, usually, I accept the change. If you and the TA cannot agree, you bring the case to me and I will make a final determination

A term project, to be executed in groups of 5 students, counts 50% for the final grade. The structure and expectations for the final report are discussed during the first lecture. In short, the project asks students to design, implement and analyze outcomes from a A/B test of their choice. Policy for late submission of the final project is the same as for homework assignments.

Other:

All students are urged to follow CMU's policies for academic integrity and plagiarism. Students are encouraged to discuss homework questions among themselves but then required to submit individual answers crafted by each student individually using her/his own words.

Course attendance:

not mandatory but highly encouraged on a regular basis.

Contacts:

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Teaching assistants: TBD