Module 17: Practical Application 3

Video Transcripts

Video 1: Practical Application 3

Welcome to your third practical application module. By this point, you probably know the drill. There are two career components before and a mentor component after this module. The career components this time focus on interviewing and salary discussions. The mentoring component will delve a little deeper into networking.

For your practical application this module, you will compare the performance of the classification methods we encountered in this section of the program. Namely k-nearest neighbors, logistic regression, decision trees, and support vector machines. You will utilize a dataset related to marketing bank products over the telephone.

Video 2: Needing a Counterfactual

Before you listen to this lesson, go to Google and try searching for the keyword Amazon. You'll probably notice that the top two listings are both for Amazon's website, with the first appearing with the word Ad and bold above it. If you click on that link, a paid search ad. Amazon will pay Google for attracting your business. If you click on the second link, Amazon gets your business, but Google gets nothing. Try other big-name brands. And you'll likely see the same thing.

Companies spend millions of dollars on what’s known as search engine marketing. And today I want to talk about measuring the returns to search

engine marketing campaigns using an example from the technology company eBay. A few years ago, researchers at eBay were considering the same questions, wondering how to measure the efficacy of search engine marketing dollars. The marketing team suggested that they could compare the revenues from consumers coming to their website via the paid link to the money that eBay paid Google for these same consumers. Economist at eBay said, "Wait a minute, that metric doesn't tell you anything about what would have happened if eBay didn't pay Google for add links?" Said differently, we don't know the counterfactual.

It's quite possible that anyone who is typing eBay into the Google search window would have gone to eBay in the absence of the paid link. To drive home this point, the researchers shut off paid links between July 1st and August 1st to see what happened to eBay site visits. As you can see from the figure, when the paid links were shut off, consumers simply came through the natural search link instead. The Economist then suggested that to understand the impact of ad spending on revenue, we need to run an experiment or randomized control trial.

Experiments let an analyst observe causal effects of the treatment, in this case, advertising spending compared to the control or counterfactual. In this case, the researchers conducted what's known as a cluster randomized control trial, where they randomly assigned some markets into the treatment group where they turned ad spending off and other markets to the control group where they continued to purchase ads. And they could then compare differences in revenue between these two groups. You can see the results in the following figure. Halfway through the graph on the left, the attributed sales from the test group falls all the way to 0. This is a result

of the experiment, as consumers in the test group could no longer access eBay's site through the paid links.

The main results of the experiment come from the graph on the right. As you can see, the difference between the treatment group and the control group measured in a few different ways in this figure, do not meaningfully change when the experiment turns on. Said differently, when the researchers turned off the paid search in the treatment group, the revenues remain the same. Thus, paid search for keywords like eBay does nothing except waste eBay's money. Go ahead and type *eBay* into the Google search window. Do you see a paid ad link? The answer is no because the company learned from this experiment that they were wasting money.

The punchline for this course is that no matter what fancy predictive machine learning tools you develop or use, you always want to use experiments with these new tools to understand their ultimate impact in the wild. Randomized control trials, such as the one described here are the gold standard for testing and are straightforward to implement.

A second takeaway is that even a data savvy companies such as eBay can get things wrong, if they're not careful considering counterfactuals i.e. what would revenues look like if we didn't pay Google for ad purchases? Whenever you are going to change something in a business or organization, it's useful to pilot or experiment with that technology to better understand the causal effect of the technology on the outcomes you care about. You should do this using a randomized control trial or an AB test.