Exploring Uncertainty Algorithms in the Context of Internet Advertisement

Group: Risk Takers

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Executive Summary

Internet advertisement has become a huge industry and companies spend millions on small pieces of screen time or space to display their product. Many times these marketing strategies are unsuccessful but some strategies that the companies employ bring in quite a bit of consumer traffic. In our global economy, companies rely on internet advertising to make their product known to the consumers they are targeting.

In our project we intend to use three algorithms: Explore and Exploit, Monte Carlo algorithms with advertising strategies similar to options, and Game Theory.

Explore and exploit algorithms can be used while deciding to explore new advertising strategies or to exploit proven strategies. This is important in online advertising as advertisers need to constantly experiment with new strategies to stay ahead of competitors, but they also cannot spend vast amounts of money on strategies that simply will not work.

Monte Carlo algorithms can be used to model the performance of different advertising strategies, by simulating the behavior of users and the effectiveness of different ads. This allows advertisers to estimate the expected return on investment of different advertising strategies, and to optimize their budget allocation accordingly. Very similar to European options, the value of the strategies is determined at the end of its run online.

Game theory can be used to model the interactions between advertisers and users, and to predict the behavior of competitors. In online advertising, advertisers compete against each other for a user's attention and game theory can be used to model this competition and to develop optimal bidding strategies.

Problem Statement

The problem with online advertising is it deals directly with people who get bored easily. When a user has seen the same advertisement hundreds of times, it does not have the same effect on them as it did the first few times. Additionally with a newer development of people being able to skip ads they do not want to see, having an effective advertising strategy is important for making companies money.

Relevance and Importance of the Project

The algorithms that we will implement will enable companies to determine if the advertising strategies they are using are worth continuing to use and help them spend their budget on advertising much more wisely.

Project design and methods

Project design

Our data will primarily be simulated with random number generators. This will simulate how users will respond to an advertising strategy as most companies do not reveal their success and fail rates of an ad run. Despite this we aim to make it so a company could plug in their own numbers so it would be specific to them.

Methods and Sources

Describe the tools, procedures, participants and sources of the research. When, where and how will you collect, select and analyze data?

We aim to implement each algorithm separately as each one helps to solve a different aspect of the larger problem of trying to make money as an online advertiser.

The Explore and Exploit algorithm will use simulated results based on how users might respond to an ad. Sometimes an advertisement might not hit right while the strategy itself is actually pretty good. To simulate this we will use a normal distribution for the profits of a strategy.

On the Monte Carlo algorithm we will use advertising space as if it were an option. Values of the advertising space will be determined by the advertising space. For example, if we were to advertise on google it would be about $2 for every click. We would then take this price value and see how much the advertising space is worth to the advertiser.

For the Game Theory Algorithm, we will simulate how advertisement competitors should fight for an advertising space. Each company will have a specific budget that they can't go over when advertising and will try to maximize their revenue from different advertising spaces. When two companies compete for the same space, the price of the space will increase thus decreasing the profit that is possible from that space.

Deliverables

At the end of this project we will have three programs that will be able to answer these questions in the online advertisement sector. Each of these will be able to be customized to a company by having the company enter their data in for the algorithm.

Research schedule

Research phase	Objectives	Deadline
Learning/ Proposal	Learn about different strategies and revise plans based on proposal feedback.	April 14
Explore and Exploit	Complete development for an explore and exploit algorithm.	April 17
Monte Carlo	Complete development for a monte carlo algorithm.	April 19
Game Theory	Complete development for a game theory algorithm.	April 21
Cleanup	Refine project and create a presentable report based off of our findings.	April 24