Motiv Optimize

Software Engineering Department, University of Calgary (2023)

Motiv Digital

About

Project Manager
Eduardo Benetti

Front-end Developers
Minji Kim
Eddie Kim
Christina Truong

Data & Infrastructure
Garth Slaney

Back-end Developer
Jiho Kim

Industry Sponsor
Clark Lai / Motiv

Academic Advisor
Jonathan Hudson

Teaching Assistant
Manuel Lopez

Introduction

In today's digital age, the success of businesses depends heavily on their ability to effectively navigate the online landscape. As a result, an efficient web design process has become critical for marketing teams seeking to enhance their company's digital presence. Traditionally, marketing teams create multiple variations of their website pages and run experiments with different groups of customers to analyze website effectiveness. To quantify that, a series of different metrics can be used, most commonly the conversion rates. This ratio represents if a conversion (i.e. completed checkout) was made, or not, on that specific design under test.

However, this process can be costly, time-consuming and it lacks real-time customer data leading to increased customer churn rates and an overall absence of efficiency. In response to this challenge, our project aims to develop a web application that provides efficient, real-time and automated testing to empower marketing teams to take data-driven decisions about their company's digital presence.

Objective and Scope

To create a product aiming to improve the gaps of A/B testing, the team developed a simplified and user-friendly platform for marketing teams to easily upload and retrieve information about their campaigns. Through a web application, our users should be able to create campaigns, composed of multiple designs to be tested based on a pre-established conversion action such as a button click or page access. By setting up a conversion action, the Multi Armed Bandit (MAB) Algorithm can digest the information from the user's journey inside the designs and combine them with their respective conversions' history. As a result, the program should output a through, detailed and organized analysis of the designs under each campaign

Real time data
Using user's real time interaction with efficient traffic allocation

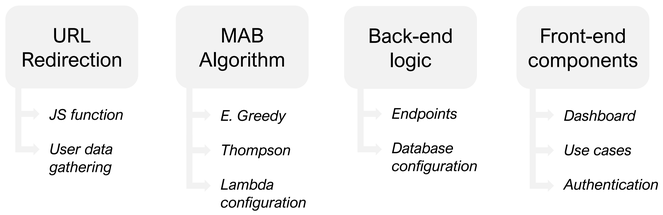
Automated
Minimal user input information and continuous optimization

Financially effective
Reduce customer churn and increase conversion, avoiding risk of suboptimal decisions

To facilitate the organization of the data, the application outputs a dashboard with direct insights about each campaign and design created. With that, the team aims to empower marketing groups to analyze separately all the designs being tested and better understand customer behavior on each one of them. Information such as total visitors, date breakdown, conversion rates and more will all be displayed and available for analysis at any time as customer access the designs under test.

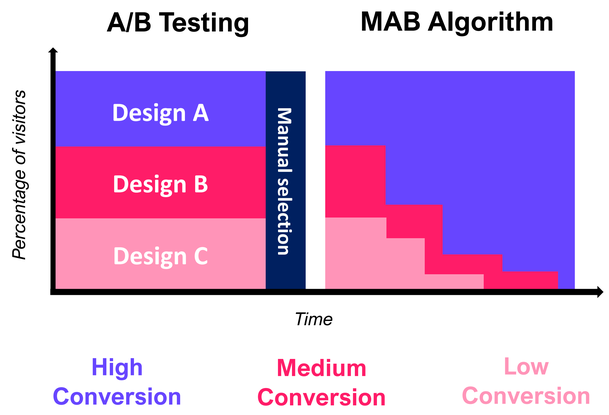
Methodology

The team began with a detailed analysis of the project requirements to ensure a complete understanding of the project scope. Following this, an extensive research phase was conducted to explore various solutions to the problem at hand. The culmination of information at this stage lead to a division of the project into more manageable components: URL redirection, MAB algorithm, back-end logic and front-end components. With the use of version control, agile development and software testing techniques the team worked in groups of 2 people to build the individual components up to a functional piece of software, before merging and testing its final version.



Throughout the second sprint, the individual components were ready to be tested. With the use of artificially created data, tests were conducted to experiment the effectiveness and reliability of the product components. With that in hand, the team rapidly noticed the potential of the MAB Algorithm to improve user conversion in comparison to A/B Testing. However, this algorithm can follow two different strategies: Epsilon Greedy and Thompson Sampling, which can consequently output different results. This led the team to further analyze both approaches and include them as options for the user to choose when creating campaigns.

The following graph portrays the comparison between MAB Algorithm and A/B testing:



Finally, after completing the testing process, the team began to integrate the components. As expected, there were errors and issues to be fixed before having a complete functional software product. This debugging process was made as a team to facilitate communication and increase the effectiveness of getting them fixed. As a result, the team delivered a product which utilizes all the following technologies to successfully deliver its functionalities:

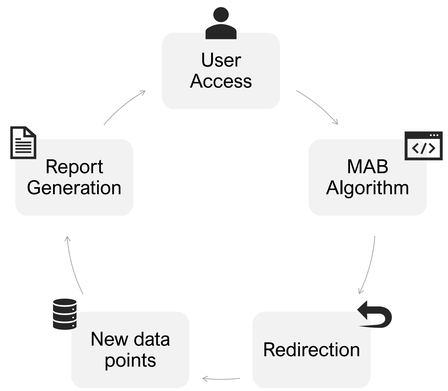
AWS Lambda · Vercel · AWS RDS · React JS · Typescript

Results

The result of the project was that the team was able to develop a fully integrated product that utilized the potential of the MAB Algorithm while making it easy for any marketing collaborator to use it. The product's website shows useful statistics and allows easy editing of different designs as well as the ability to set up multiple campaigns for different web pages to be tested. With configurations ranging from definition of conversion, type of algorithm and more, users of this platform should be able to experiment a variety of different web designs faster and more efficient.

Some possible improvements that can be done on the product would be to allow more control over the algorithms. Currently the product has some of the value hard set to recommend and do not allow the user to directly alter them, and possibly output misleading insights. This was a decision based off the idea that a certain level of algorithmic knowledge would be needed to change these values appropriately. The team could add a feature that would allow users more experienced with algorithms to edit certain key parameters to change its outputs. Indeed, there will be cases where changing this parameters can lead to better results, yet it will also have trade offs that can negatively impact its output.

The overall architectural performance of our product is quite strong as it has many industry standard functions. A great example would be the use of an AWS API gateway which allows for API keys for each website. Furthermore, for credential management the team used a hash algorithm so that no password is ever stored directly in the database, avoiding data breach and meeting basic data privacy standards used in industry. Lastly, the system has been designed on a very modular architecture. Allowing it to expand into new functionalities without impacting the overall performances and results of the current ones.



Conclusions

The team has been able to develop a product that will allow marketing teams to identify quickly their best performing designs while optimizing for real time visitors. Utilizing two possible algorithms it allows marketing teams to try different ways to increase their conversion rates with the knowledge that poorly performing webpages will not affect their bottom line. Lastly, it provides a more detailed and effective set of insights which facilitate the understanding of why certain designs perform better than others with greater accuracy.

References

CMO, Y. N., Navot, Y., & Cmo. (2020, November 16). Beyond A/B testing: Multi-armed bandit experiments. Dynamic Yield. Retrieved March 21, 2023, from https://www.dynamicyield.com/lesson/contextual-bandit-

Multi-armed bandit. Optimizely. (n.d.). Retrieved March 21, 2023, from https://www.optimizely.com/optimization-glossary/multi-armed-