**(Cover Page Image)**

**DSC5101 Group Assignment 3**

A study on historical surveys using Multi-Arm Bandit Techniques



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# **Executive Summary**

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# **Multi-Arm Bandits**

In probability theory, the **multi-armed bandit problem** (sometimes called the *K*- or *N*-armed bandit problem) is a problem in which a fixed limited set of resources must be allocated between competing (alternative) choices in a way that maximizes their expected gain, when each choice's properties are only partially known at the time of allocation, and may become better understood as time passes or by allocating resources to the choice. This is a classic reinforcement learning problem that exemplifies the exploration-exploitation tradeoff dilemma. The name comes from imagining a gambler at a row of slot machines (sometimes known as "one-armed bandits"), who has to decide which machines to play, how many times to play each machine and in which order to play them, and whether to continue with the current machine or try a different machine. The multi-armed bandit problem also falls into the broad category of stochastic scheduling. [1]

Source: <https://en.wikipedia.org/wiki/Multi-armed_bandit>

# **Campaign**

The director of the Obama 2008 campaign sought to raise the potential president’s ratings & profile by helping the campaign make better decisions. One of the means of doing so was the campaign website which also provided rich grounds for A/B testing and website optimization.

With the aim of testing the sigh-up rate, the campaign tried 4 different buttons & 6 different background media (a total combination of 24 test cases). It was a randomized control trial conducted on roughly 310,000 visitors, with each iteration being visible to around 13,000 visitors.

The winning variation had a sign-up rate of 11.6% against the average of 8.26% - an improvement of 40.6% in sign-ups. With this increased sign-up rate, roughly 10 million people signed up against the 7.12 million, if the original page had not been changed. With an average donation of $21, this difference translated to an additional $60 million in donations.

Source: <https://blog.optimizely.com/2010/11/29/how-obama-raised-60-million-by-running-a-simple-experiment/>

# **UCB1 Sampling vs. Thompson vs. Original**

# **Website Conversion Rate**

# **6 Summary & Recommendations**

# **Appendix**