



NATIONAL RESEARCH
UNIVERSITY

School of Data Analysis and Artificial
Intelligence Department of Computer Science

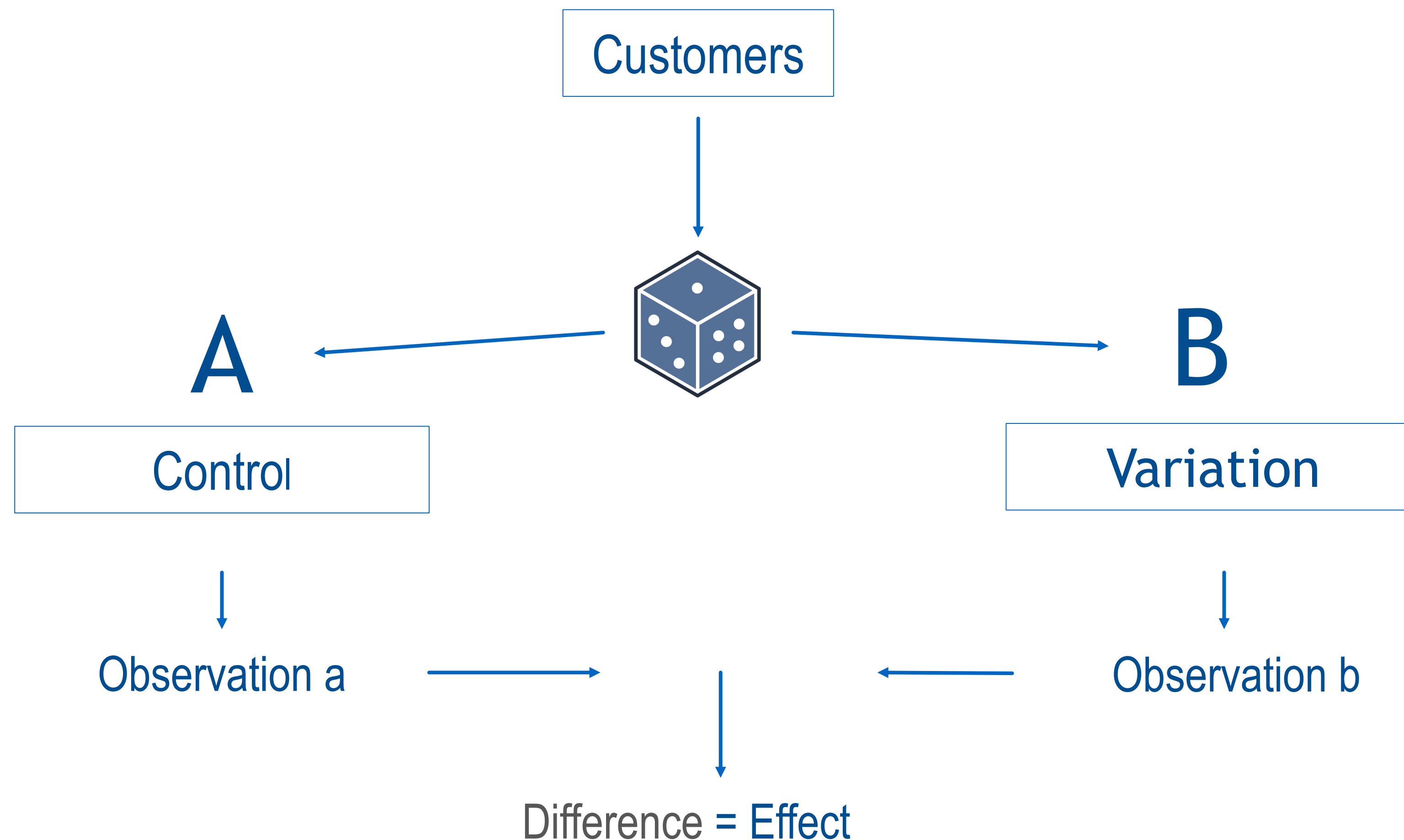
DATA SCIENCE FOR BUSINESS

Lecture 7. Design of experiments

Moscow, June 3rd, 2022.

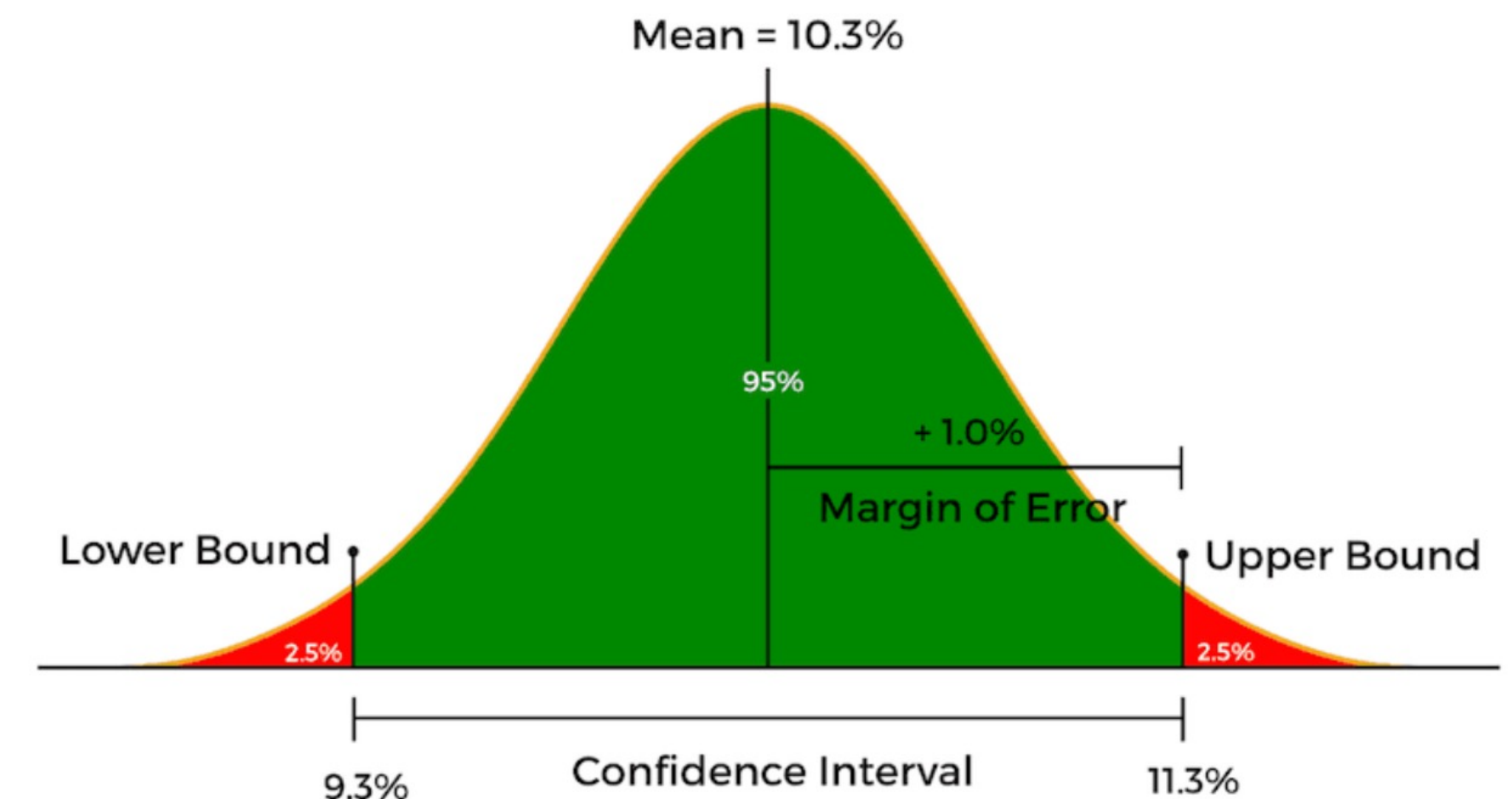
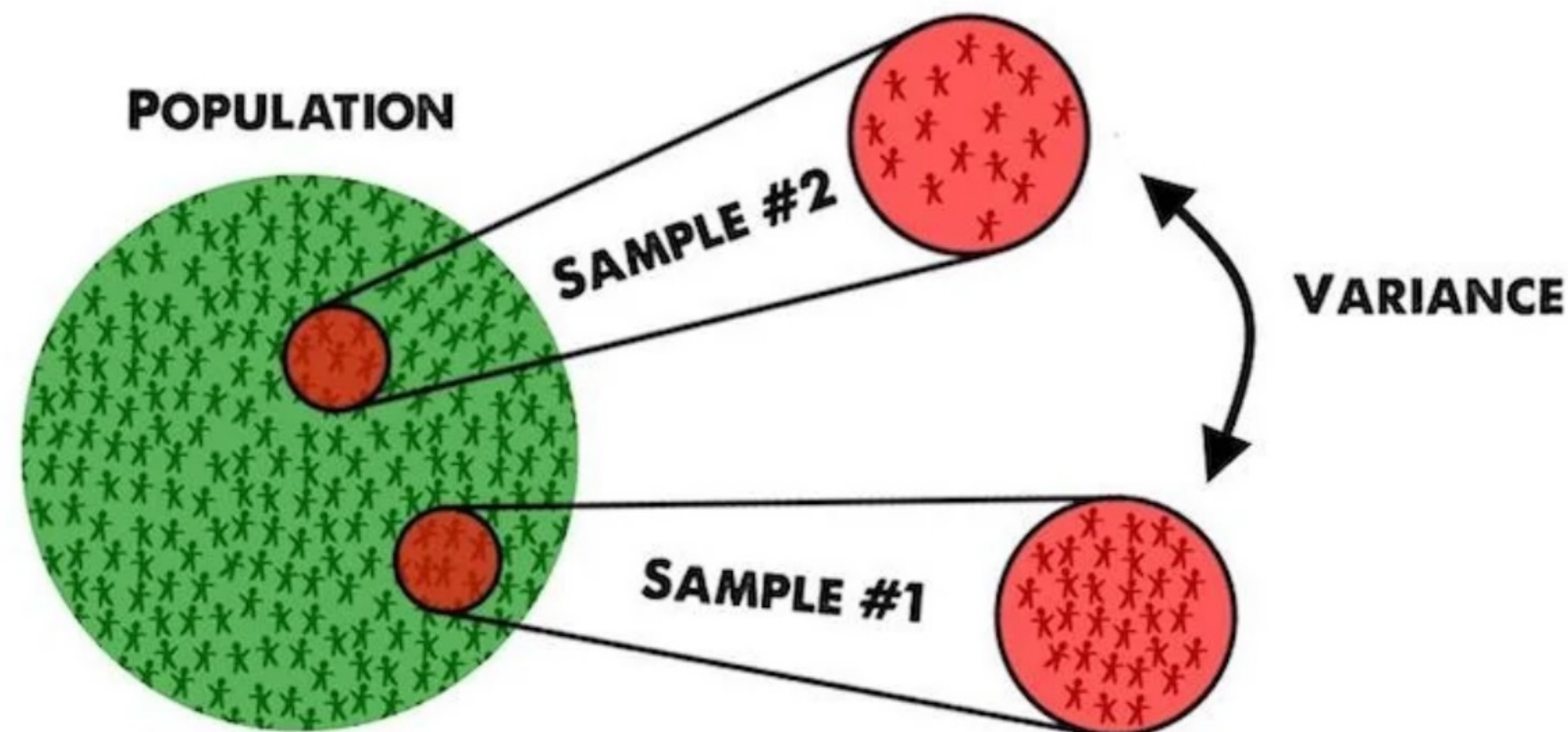
DESIGN OF EXPERIMENTS

Randomized experiments allows us to measure the true effect of proposed solutions



STATISTICAL SAMPLING

A/B testing set up



The “**population**” is the group we want information about.

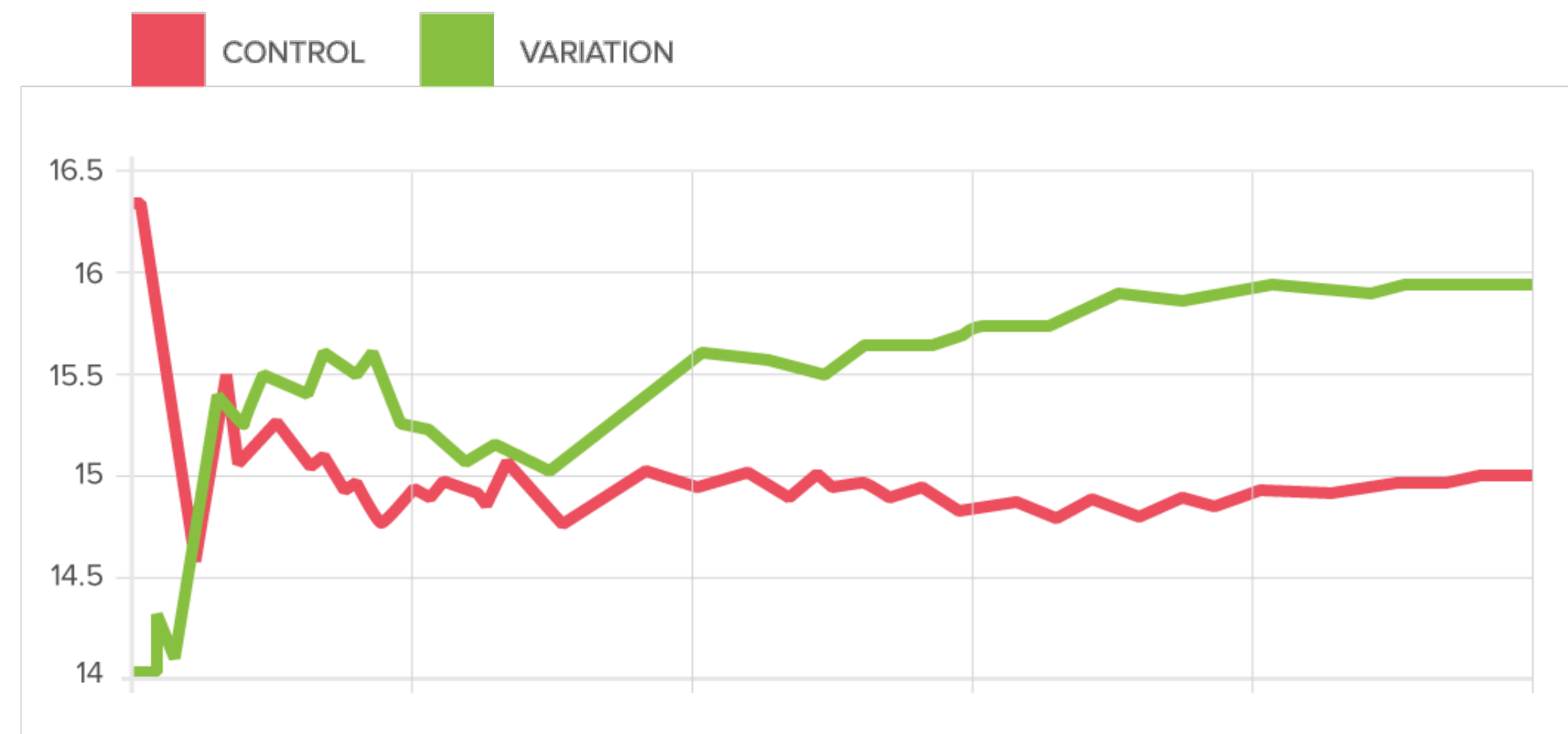
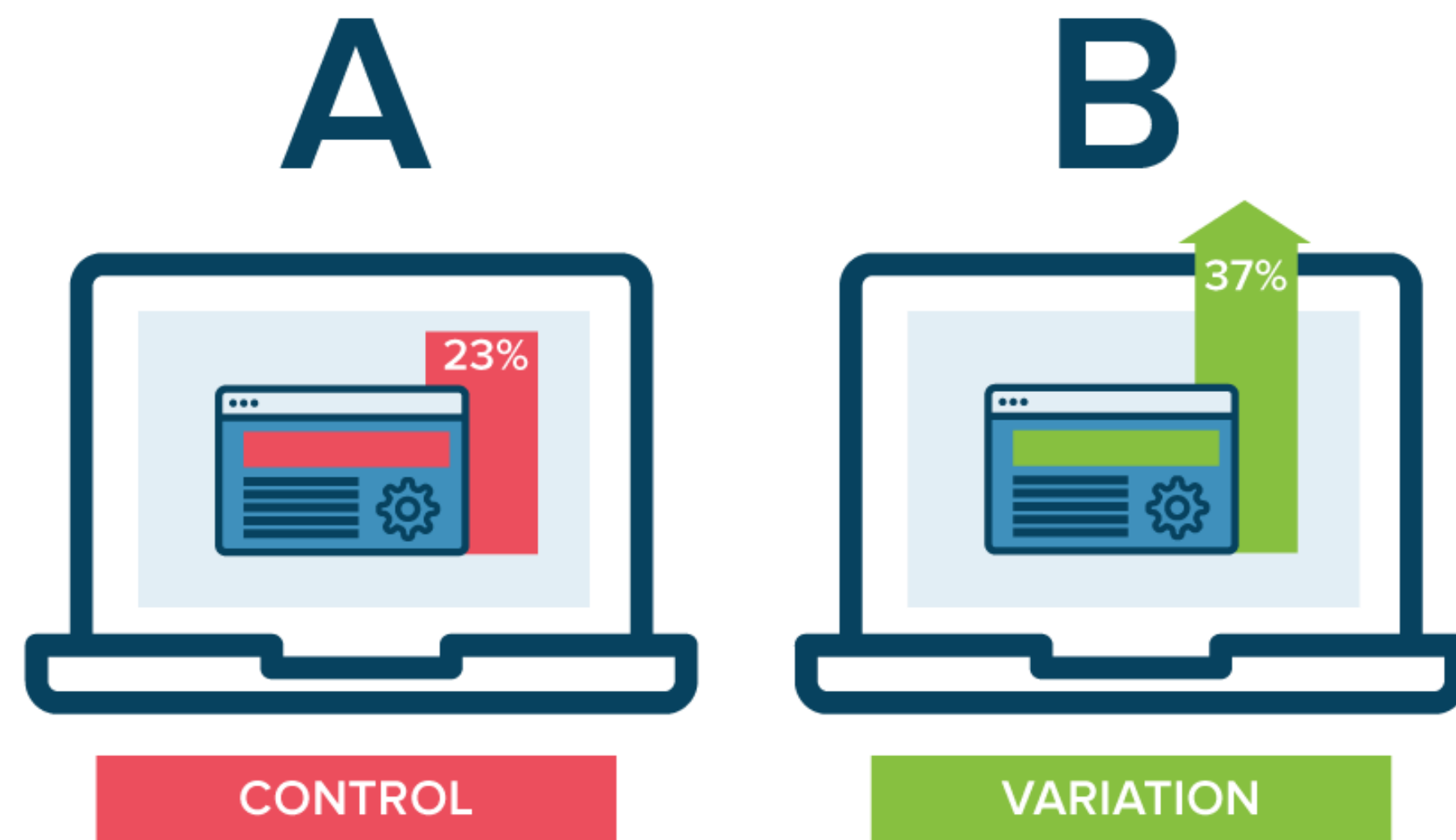
The “**sample**” is a small portion of the larger population.

The variability across samples is expressed as a unit called the “**variance**”,

The higher the variance, the more variable the mean will be across samples

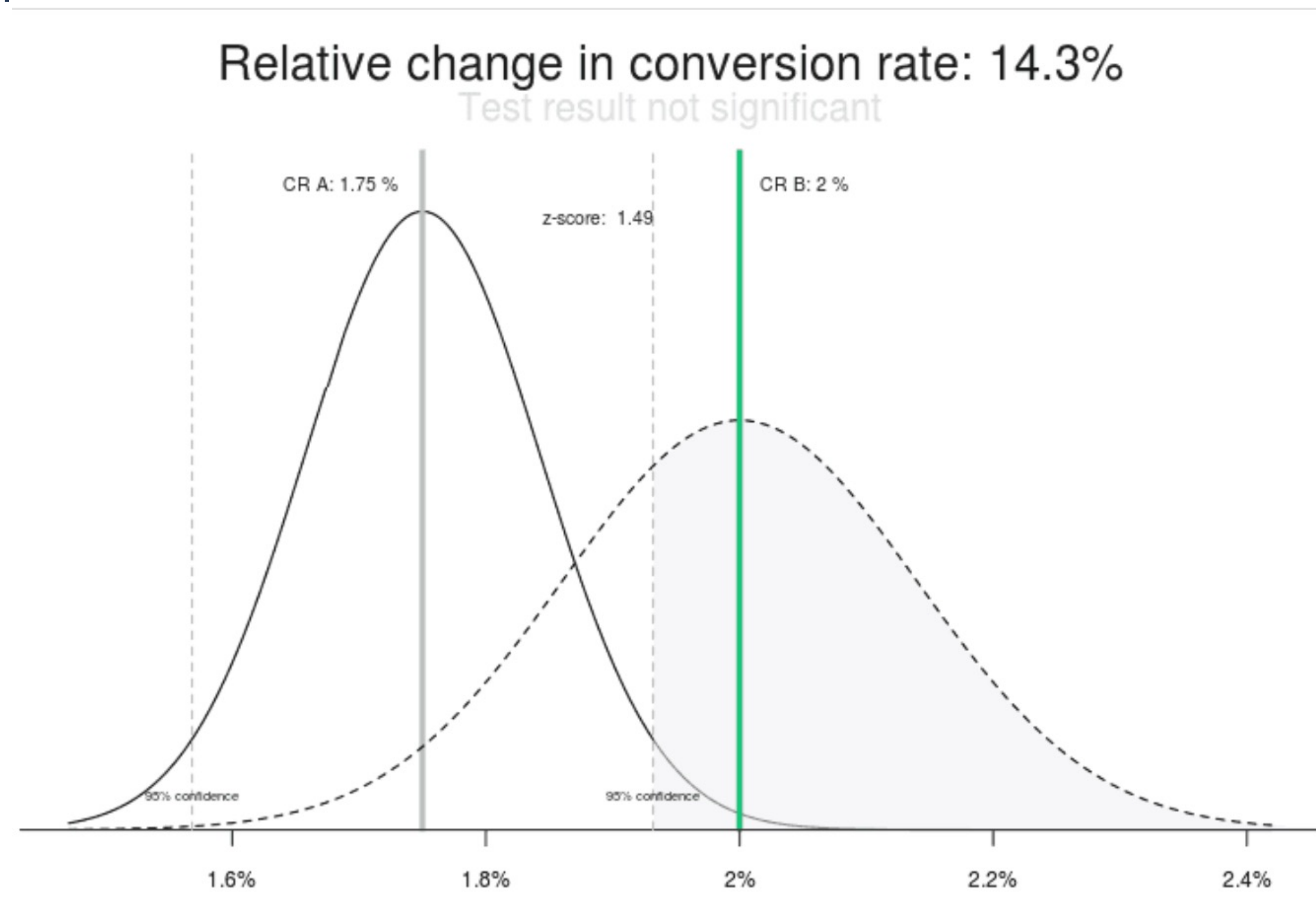
DESIGN OF EXPERIMENTS – A/B TESTING

A/B testing set up



INTERPRETING THE RESULTS

A/B testing set up



INTERPRETING THE RESULTS



INTERPRETING THE RESULTS

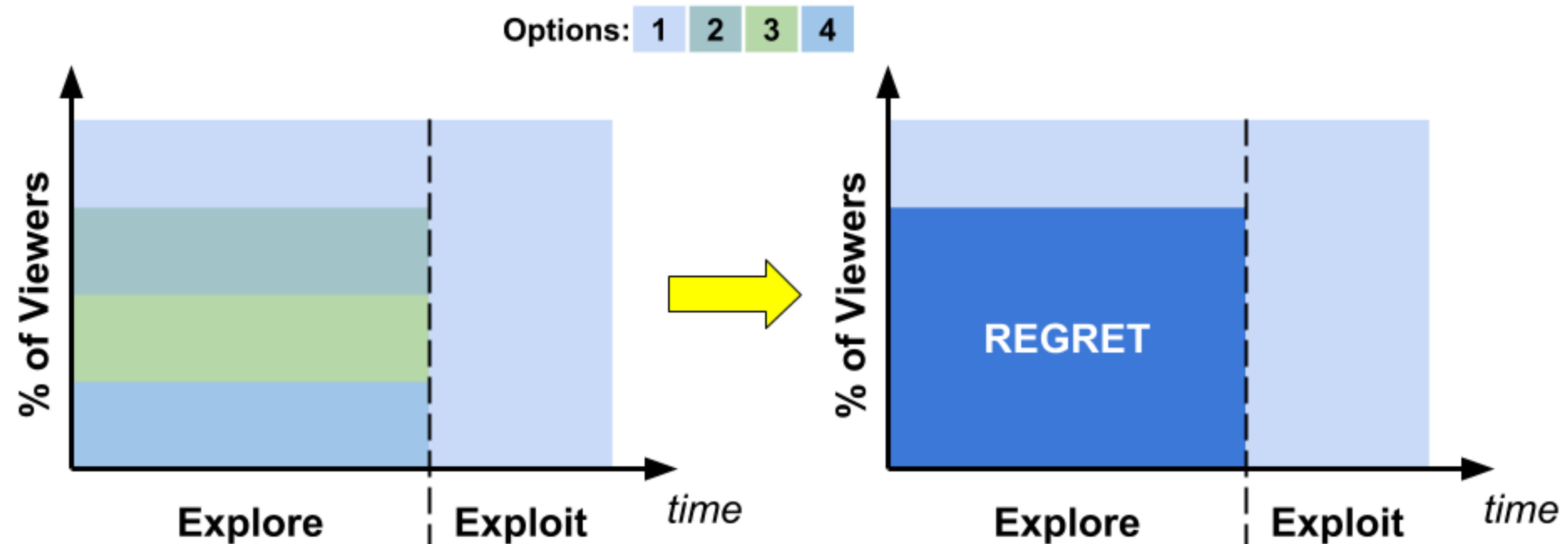


INTERPRETING THE RESULTS



EXPLORE-EXPLOIT DILEMMA

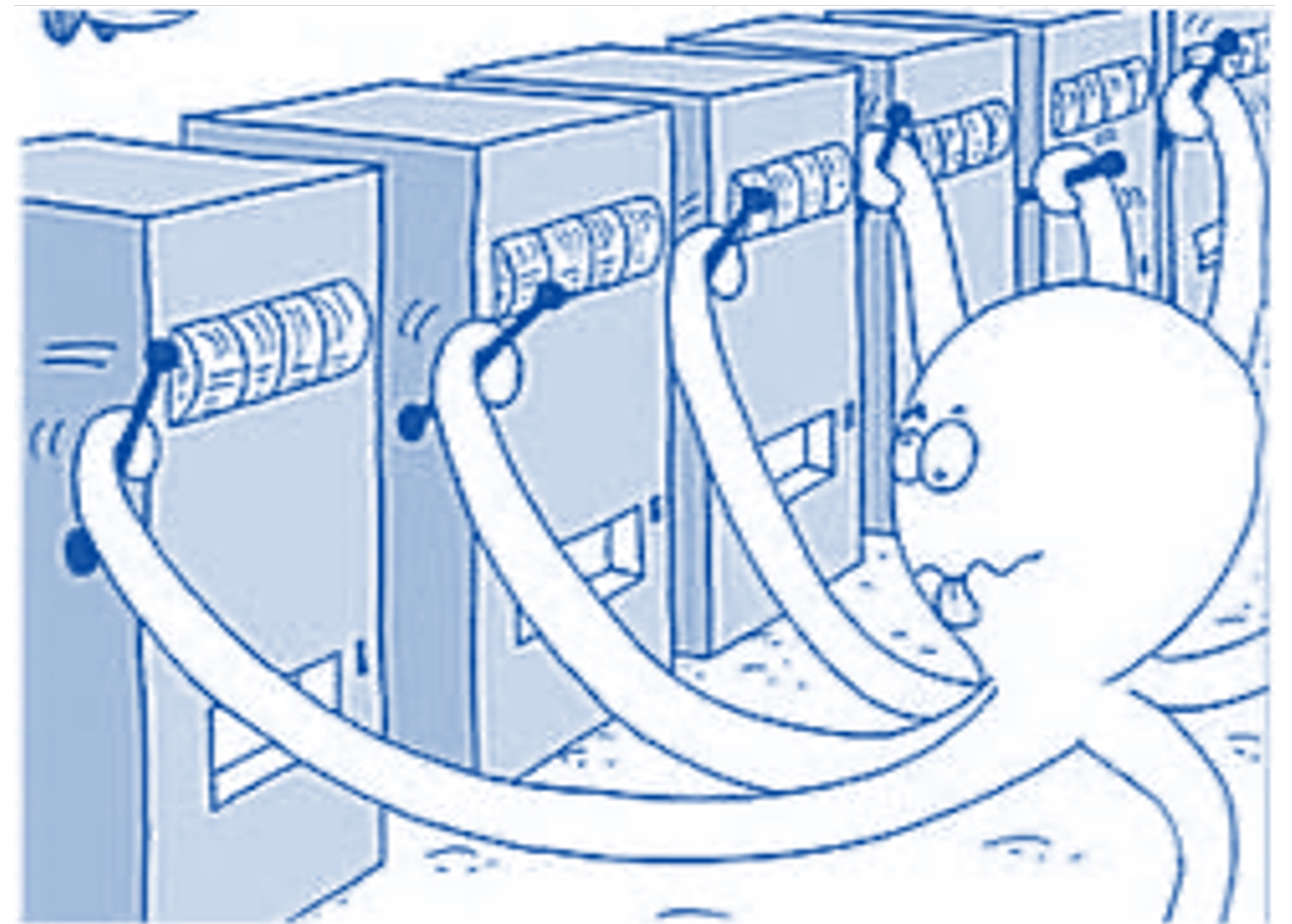
A/B/C... testing



MULTI-ARMED BANDITS (MAB)

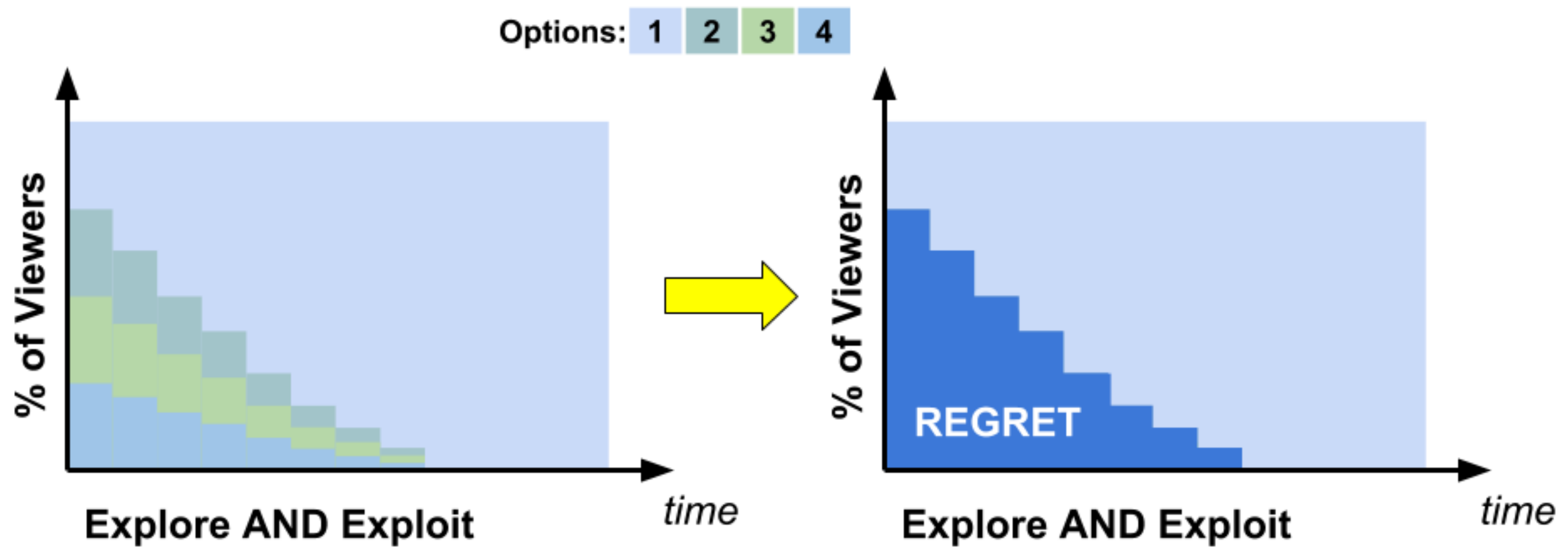
Dynamically adjust the allocation

"Multi-armed bandit" - a hypothetical experiment where a person must choose between multiple actions – which slot machine to pull, in which order and how many times, each with an unknown payout. The goal is to obtain the most profitable outcome through a series of improving choices.



EXPLORE-EXPLOIT DILEMMA

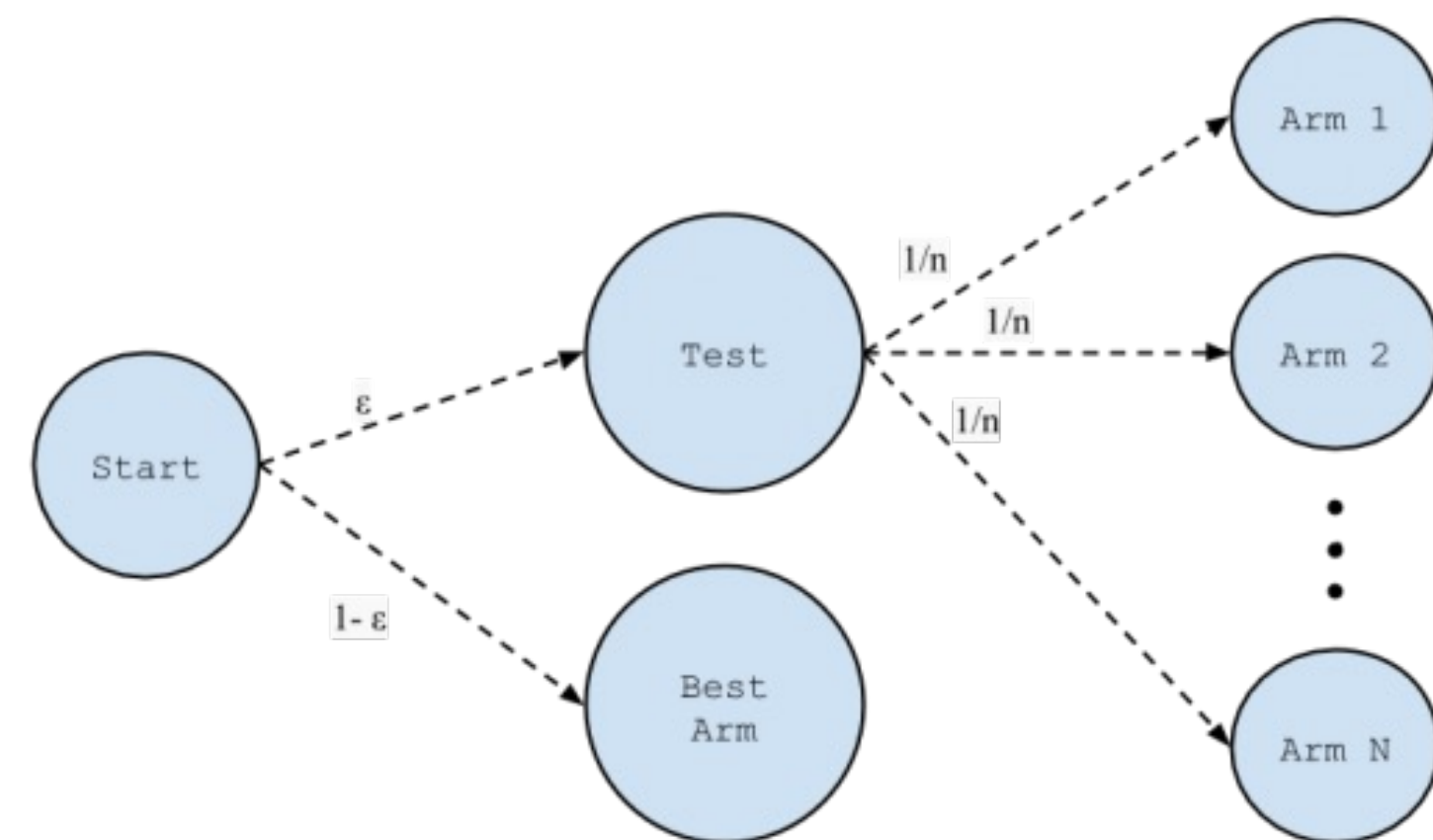
Multi-arm bandits



MULTI-ARMED BANDITS

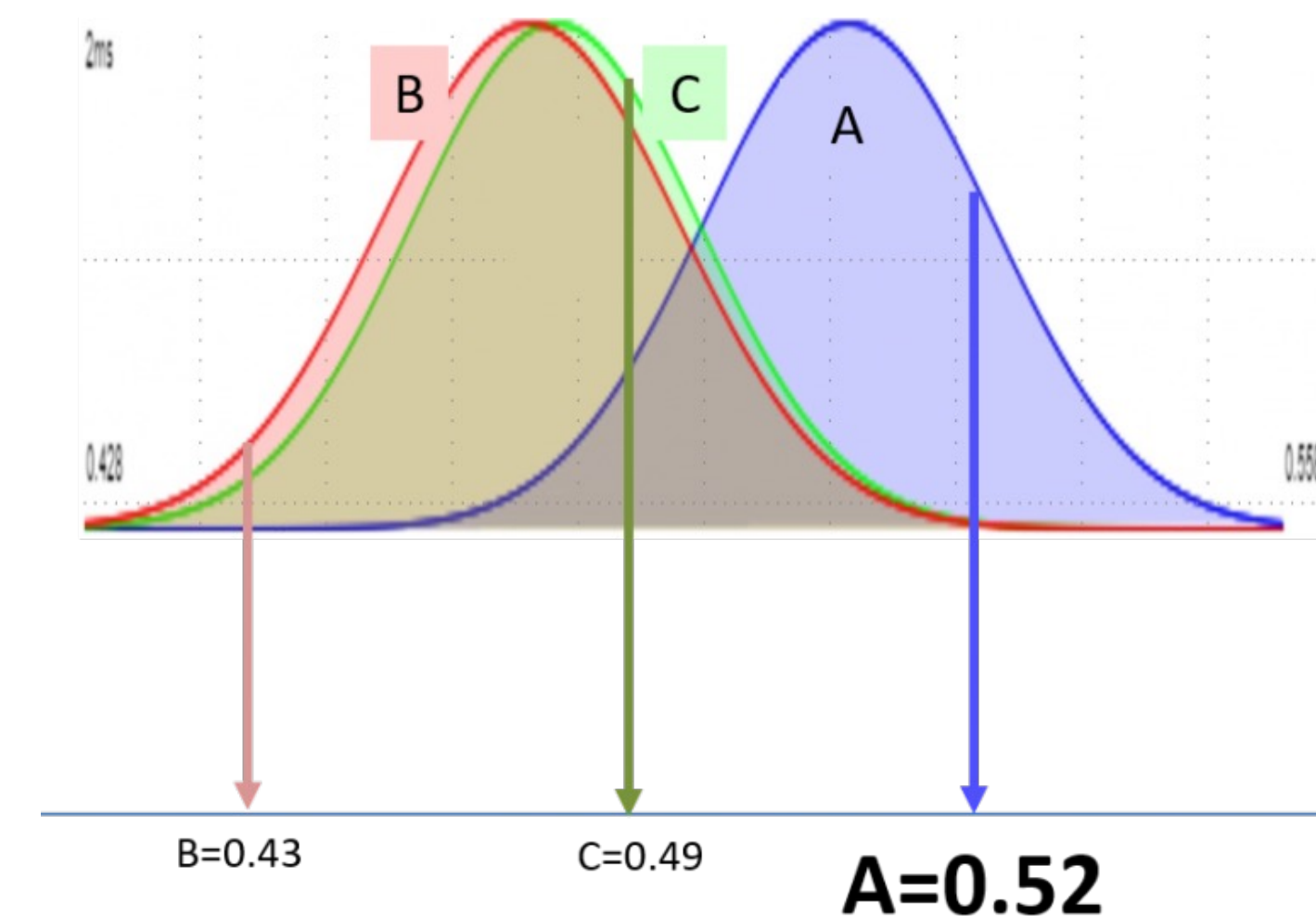
Solution strategies

Epsilon-greedy algorithm



- On every step select the higher expected mean reward option with probability $1 - \epsilon$ (exploit) and others with ϵ/n , ϵ –probability of explore
- Update mean rewards
- Most time exploiting

Thompson sampling

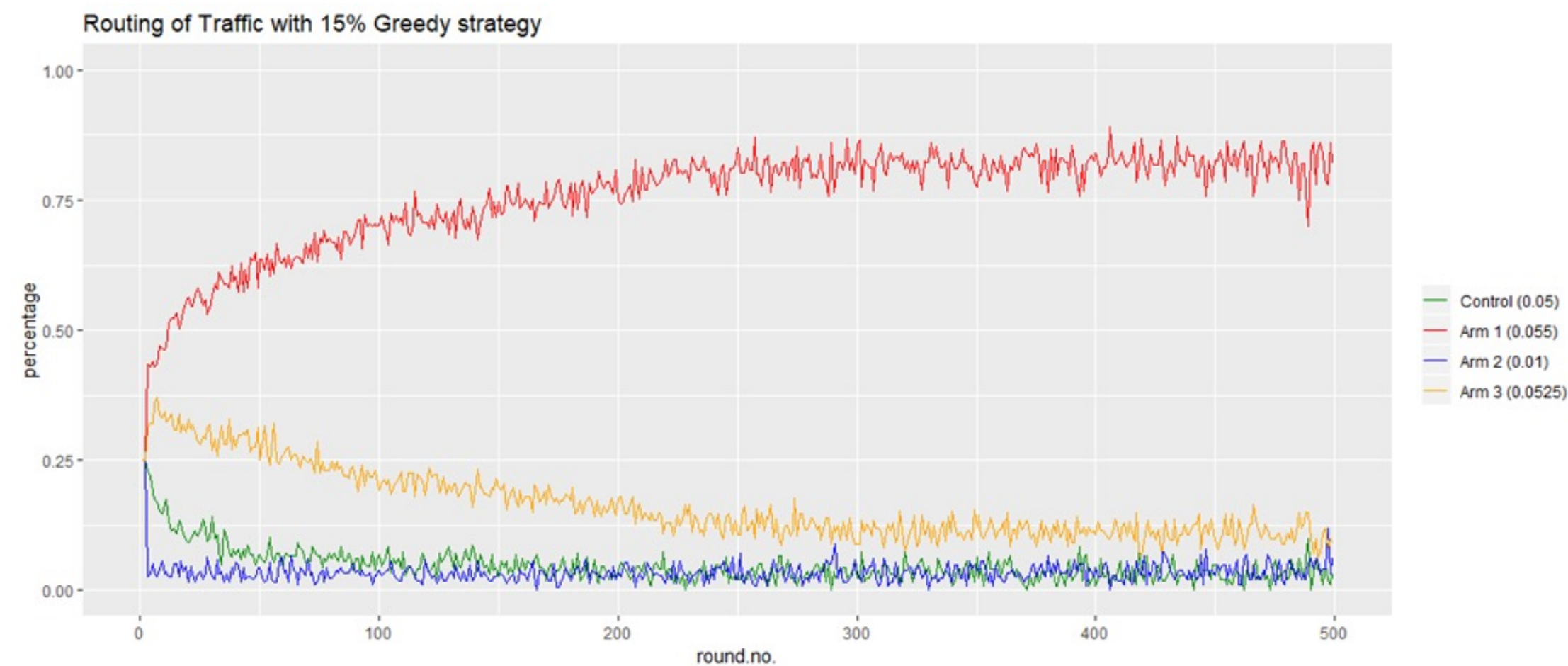


- On every step sample from the distribution of expected rewards and choose one with largest sample.
- Update posterior distributions

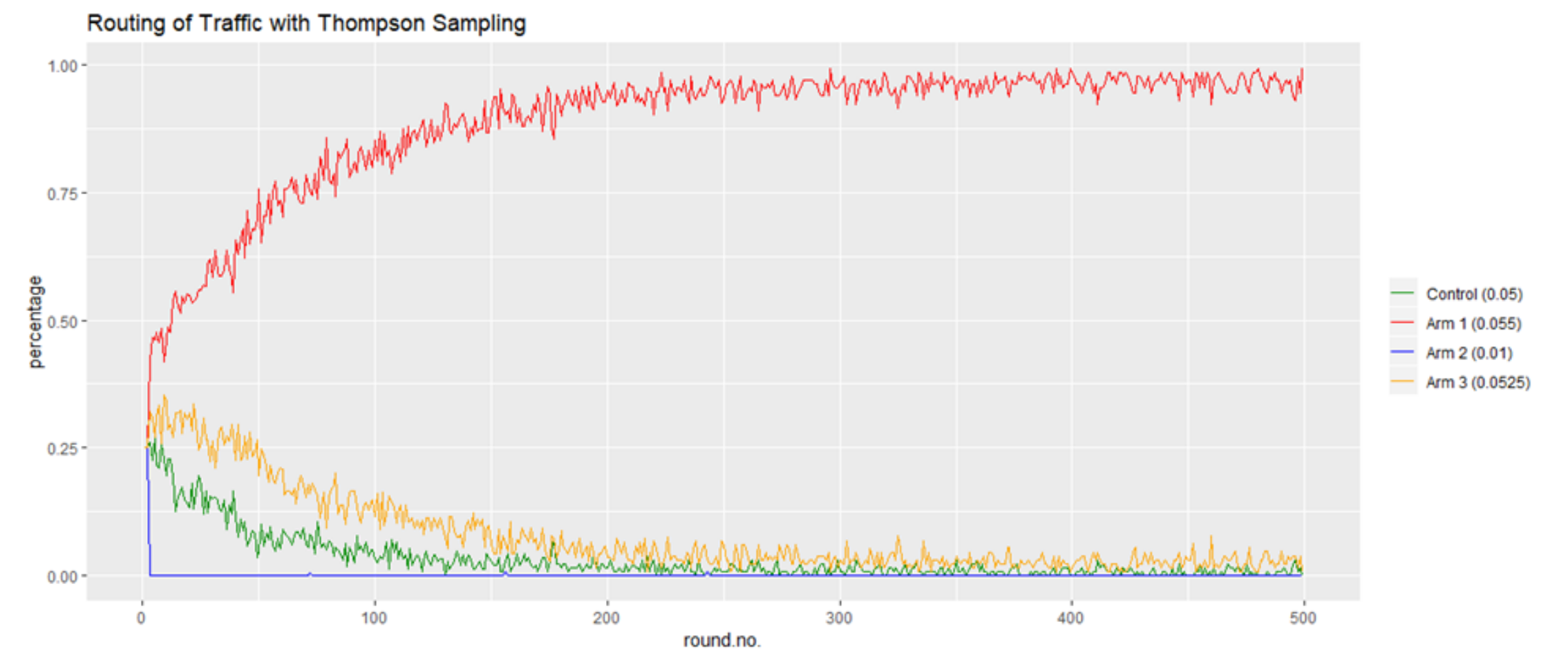
MULTI-ARMED BANDITS

Solution strategies

Epsilon-greedy algorithm

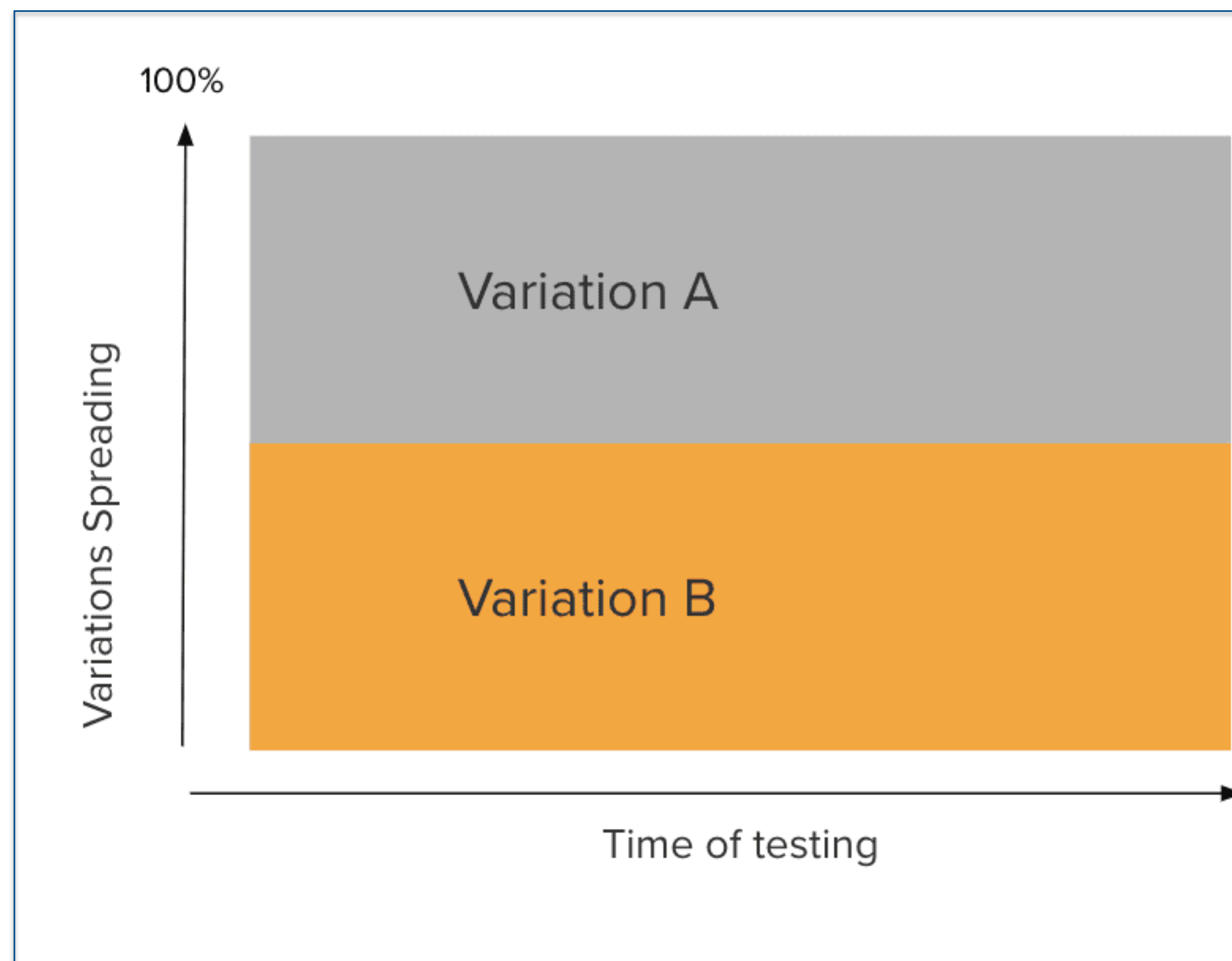


Thompson sampling

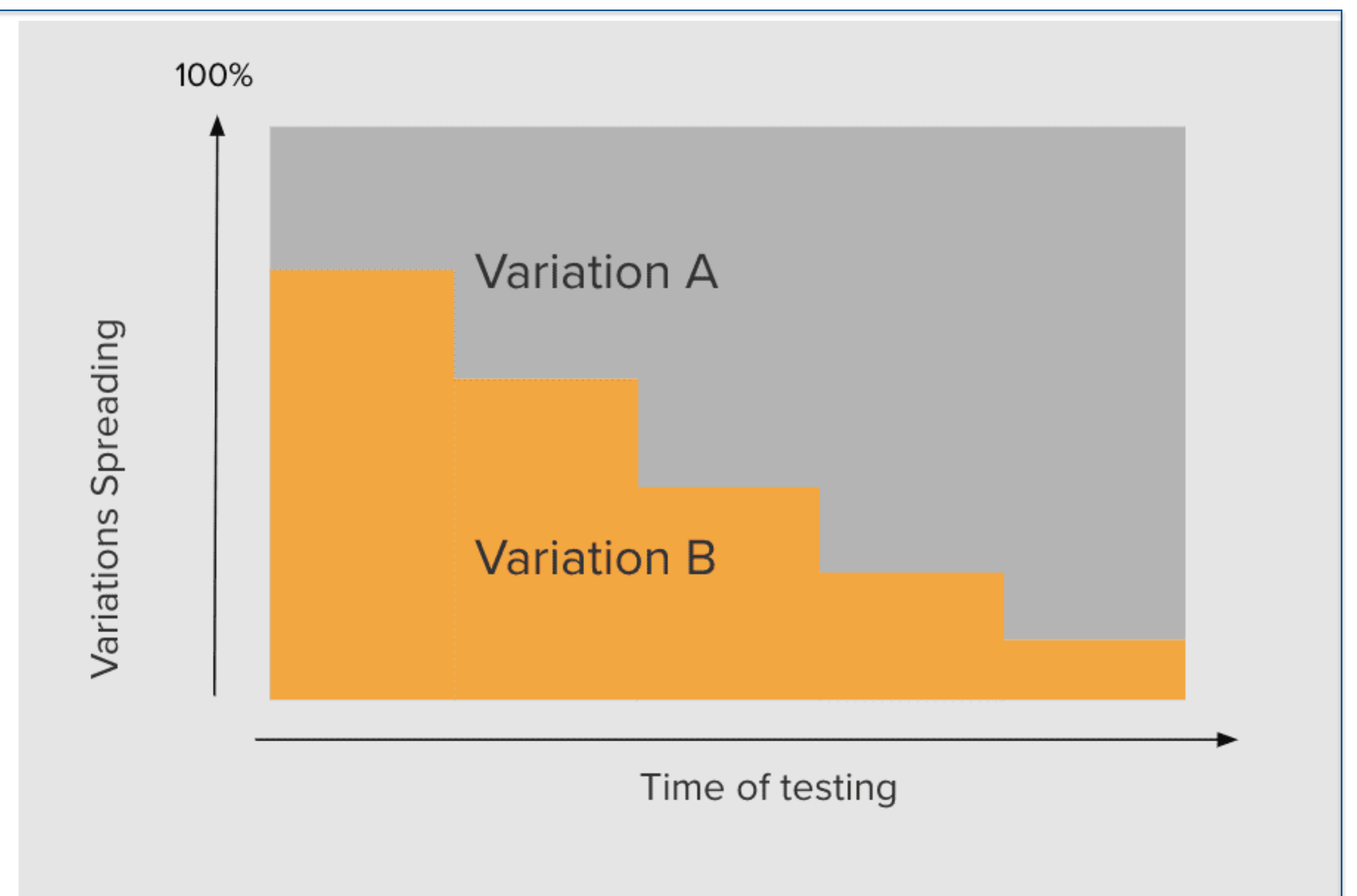


DESIGN OF EXPERIMENTS

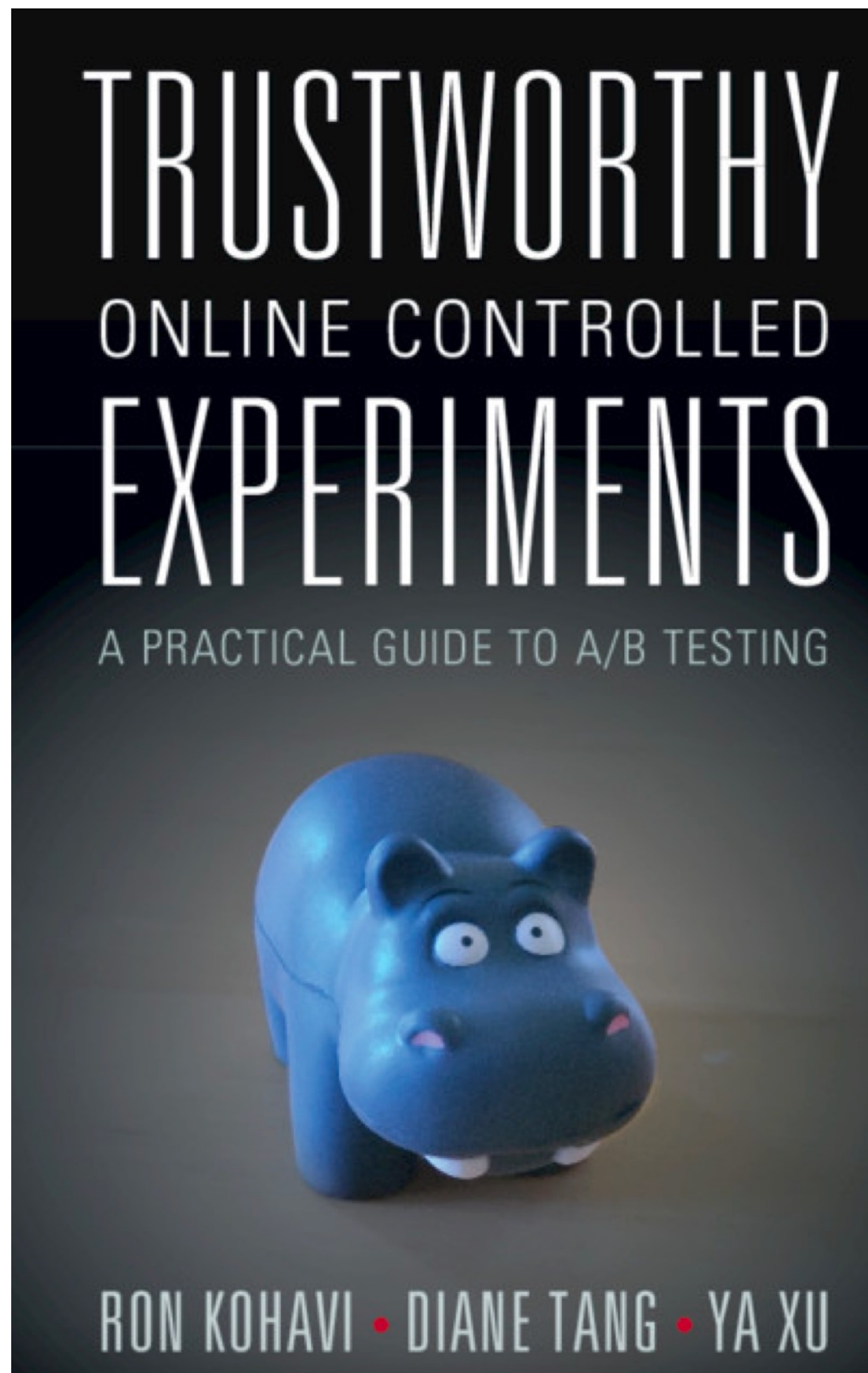
A/B testing



Multi-armed bandits



MORE READING





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