

Multiarmed Bandit Algorithm

Shortfalls of Hypothesis testing

- When Comparing 3 or more treatments
- Can't make any inference dynamically when results starts coming in
- Can't make any changes to experiment once started based on initial data!
- Can't know which is best
- Can only see if they are different

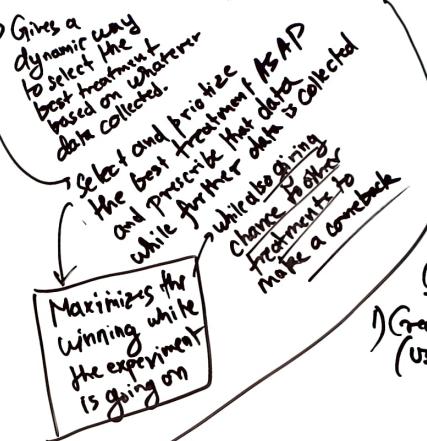
Epsilon Greedy Algorithm

treatments: $\rightarrow A, B$

for some ϵ of prisioner

$\hookrightarrow d = \text{Random}(0, 1)$

$\begin{cases} \text{ACE} & \text{NO} \\ \text{Con loss} & \text{give best} \\ \text{for } A_i & \text{of } A \text{ or } B \\ \text{selection} & (\text{from data}) \\ \text{when } \epsilon = 1: \text{ normal A/B testing} \\ \epsilon = 0: \text{purely greedy} & [\text{no noise testing}] \end{cases}$



Power: probability of detecting an effect of some give Effect-size with given # of samples

Moving Parts (given any three, can estimate fourth)

\hookrightarrow Power \rightarrow effect size

\hookrightarrow Sample size $\rightarrow \alpha$ (stat significance threshold)



Get Power

1) Create a hypothetical dataset $\rightarrow A$ (Using info on the existing treatment)

Create new treatment dataset B by adding the effect size

Step 2:

$\begin{array}{ccc} A & \xrightarrow{\text{Bootstrap}} & B' \\ \xleftarrow{P_2 \rightarrow \text{Power}} & & \xrightarrow{\text{param test}} P_2 = (P < \alpha) \end{array}$

Get Sample Size

Assume a sample size and iterate power estimation till find suitable size.