Multiarm Bandit Algorithm

→ Gives a dynamic way to select the best treatment based on whatever data collected.

→ Select and prioritize the best treatment ASAP and prescribe that data while further data is collected

→ while also giving chance to other treatments to make a comeback

Maximizes the winning while the experiment is going on

Shortfalls of Hypothesis testing

→ When Comparing 3 or more treatments

- Can't make any inference dynamically when results starts coming in
- Can't Know which is best
- Can only see if they are different

→ Can't make any changes to experiment once started based on initial data

Epsilon greedy Algorithm

treatments :→ A, B

for some ϵ prescription

↳ α = Random(0,1)

↓

$\alpha > \epsilon$? NO → give best of A or B (from data till now)

↓ Yes

Coin toss for A, B selection

when $\epsilon = 1$: normal A/B testing

$\epsilon = 0$: Purely greedy [no more testing happening]

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

→ minimum size of difference in statistical effect while A/B testing

Moving Parts (given any three, can estimate fourth)

- ↳ Power → effect size
- ↳ Sample size → α (stat significance threshold)

Get Power

1) Create a hypothetical dataset → A (Using info on the existing treatment)

→ Create new treatment dataset B by adding the effect size

Step 2 :→

Bootstrap → A' ..... B'

permutation test → $P_2 = (P < \alpha)$

P_2 % → Power

Get Sample Size

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