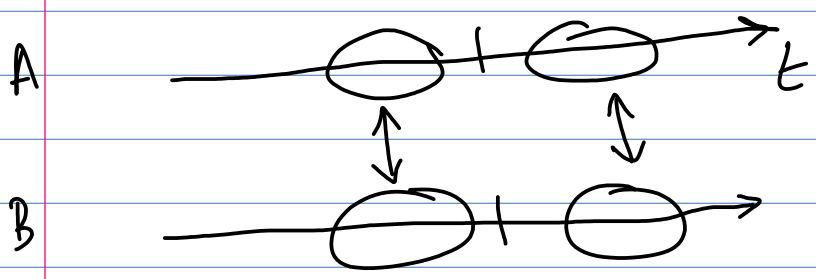
A\B Testing



H_0 is not rej

H_0 is rejected

Power = $1 - \beta$

↑

$P(H_0 \text{ is not rej} \mid H_0 \text{ is false})$

$H_0: \mu_1 = \mu_2$ $\quad H_a: \mu_1 - \mu_2 \neq 0$

1) Effect size $\quad \hat{p} = 0,1$

2) Sample Size $\quad n = 10 \quad H_0: p=0$

p-value = 0,2 $\quad H_0$ is not rej

α 3) Significance $\quad n = 1000 \quad H_0$ is rej

$1-\beta$ 4) Statical Power $\quad$ p-value = 0,02

Power Analysis

Min Sample Size

$$\left\{ \bar{X} \pm z_{1-\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} \right\} \qquad \left\{ \hat{p} \pm z_{1-\frac{\alpha}{2}} \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right\}$$

$z_{1-\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$ → E - margin of error

$$|\bar{X} - \mu| \leq E$$

$$n \geq \left(\frac{z_{\alpha/2} \cdot \hat{\sigma}}{E} \right)^2 \qquad n \geq \left(\frac{z_{\alpha/2}}{E} \right)^2 \cdot \hat{p}(1-\hat{p})$$

Mann Whitney Test

τ - Kendall

$$U = \sum_{i=1}^{n} \sum_{j=1}^{m} S(X_i, Y_j)$$

$$S = \begin{cases} 1 & , \ Y_i < X_i \\ 1/2 & , \ X_i = Y_i \\ 0 & , \ Y_i > X_i \end{cases}$$

X	Y	rank(X)	rank(Y)
①	2	1	2,5
2	3	2,5	4,5
3	④	4,5	6

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2}$$

n_1 - sample size (1" 1^n)

R_1 - sum of rank

$$z = \frac{U - m_u}{\sigma_u} \sim N(0,1)$$

$$m_u = \frac{n_1 \cdot n_2}{2}$$

$$\sigma_u = \sqrt{\frac{n_1 \cdot n_2 \cdot (n_1 + n_2 + 1)}{12}}$$