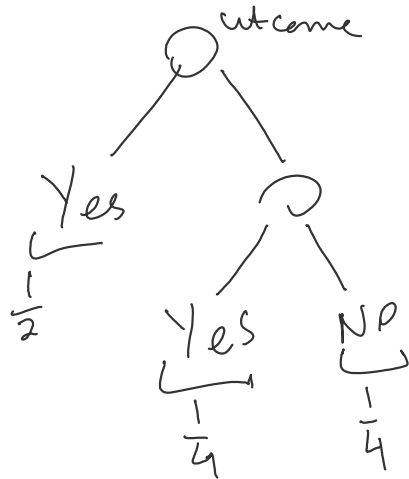


Randomized Response is 2-DP

Truth = Yes



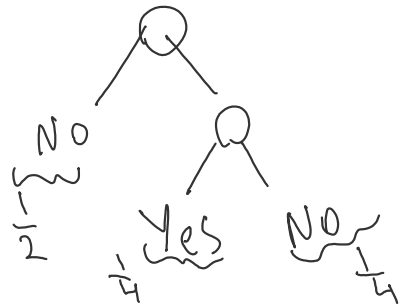
$$\Pr[\text{outcome} = \text{Yes} \mid \text{Truth} = \text{Yes}] = \frac{3}{4}$$

$$\Pr[\text{outcome} = \text{No} \mid \text{Truth} = \text{Yes}] = \frac{1}{4}$$

$$\Pr[\text{outcome} = \text{No} \mid \text{Truth} = \text{No}] = \frac{3}{4}$$

$$\Pr[\text{outcome} = \text{Yes} \mid \text{Truth} = \text{No}] = \frac{1}{4}$$

Truth = No



2-DP:

It is for any outcome  $r$  and  $\text{Truth} = X$

$$\Pr[\text{outcome} = r \mid \text{Truth} = X] \leq (1 + 2) \Pr[\text{outcome} = r \mid \text{Truth} = \neg X]$$

Yes 1 - (1 + 2) Pr[...]

$$\Pr \left[ \text{Outcome} = \text{Yes} \mid \text{Truth} = \text{Yes} \right] \leq (1+2) \Pr \left[ \text{Outcome} = \text{Yes} \mid \text{Truth} = \text{No} \right]$$

$\frac{3}{4}$ 
 $\frac{1}{4}$

$$\Pr \left[ \text{Outcome} = \text{No} \mid \text{Truth} = \text{No} \right] \leq (1+2) \times \Pr \left[ \text{Outcome} = \text{No} \mid \text{Truth} = \text{Yes} \right]$$

$p$ : fraction of people where <sup>true</sup> response is = Yes

$$p \times \frac{3}{4} + (1-p) \times \frac{1}{4} = \hat{p} \quad \implies \quad p = 2\hat{p} - \frac{1}{2}$$

$$\hat{p}: 0.479 \dots \implies p = 0.45$$