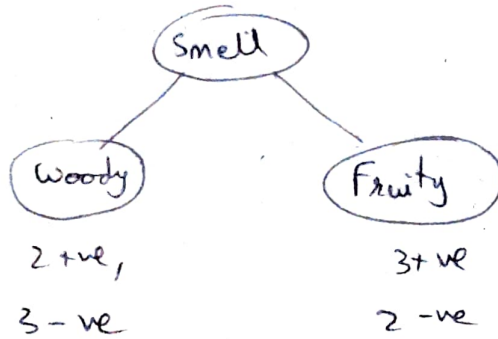


(5) Ans

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1st split

(i) Split based on smell



$$E(\text{woody}) = -\frac{2}{5} \log\left(\frac{2}{5}\right) - \frac{3}{5} \log\left(\frac{3}{5}\right)$$

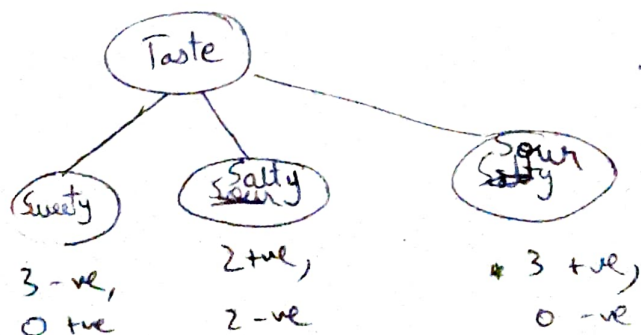
$$E(\text{fruity}) = -\frac{3}{5} \log\left(\frac{3}{5}\right) - \frac{2}{5} \log\left(\frac{2}{5}\right)$$

$$E(\text{before split}) = -\frac{1}{2} \log\left(\frac{1}{2}\right) - \frac{1}{2} \log\left(\frac{1}{2}\right) \\ = \log(2)$$

$$\Delta_i(\text{smell}) = E(\text{before split}) - E(\text{woody}) - E(\text{fruity}) \\ = \log(2) - \left(-\frac{4}{5} \log\left(\frac{2}{5}\right) - \frac{6}{5} \log\left(\frac{3}{5}\right)\right)$$

$$\Delta_i(\text{smell}) = \cancel{0.2835} \quad 0.4154$$

(ii) Split based on taste



$$E(\text{sweet}) = -1 \log(1) = 0$$

$$E(\text{sour}) = -\frac{3}{3} \log(\frac{3}{3}) = 0$$

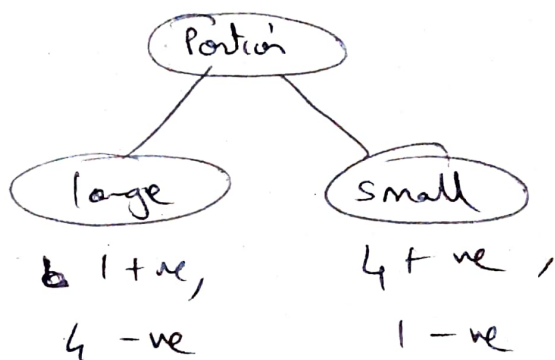
$$E(\text{salty}) = -\frac{1}{2} \log(\frac{1}{2}) - \frac{1}{2} \log(\frac{1}{2}) = \log(2)$$

$$\Delta_i(\text{taste}) = E(\text{before}) - (E(\text{sweet}) + E(\text{salty}) + E(\text{sour}))$$

$$= \log(2) - \log(2)$$

$$\Delta_i(\text{taste}) = 0$$

⑥ Split based on Portion



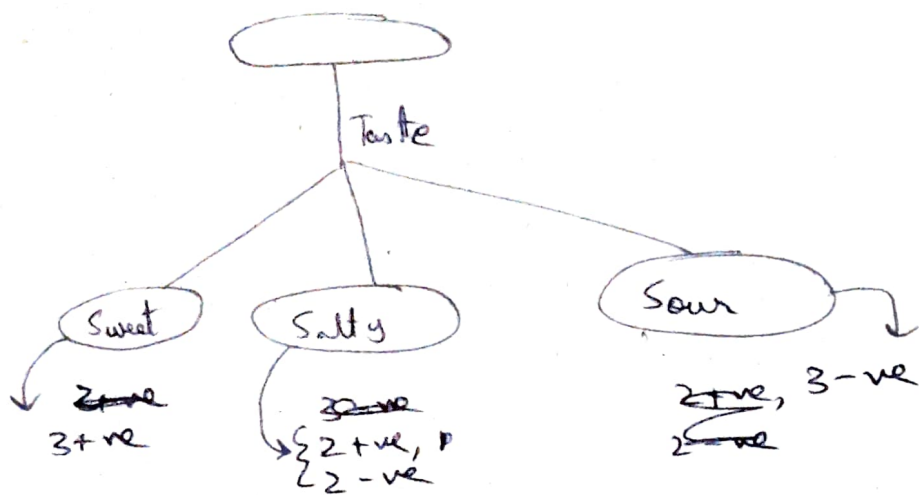
$$E(\text{large}) = -\frac{1}{5} \log(\frac{1}{5}) - \frac{4}{5} \log(\frac{4}{5})$$

$$E(\text{small}) = -\frac{4}{5} \log(\frac{4}{5}) - \frac{1}{5} \log(\frac{1}{5})$$

$$\Delta_i(\text{Portion}) = \log(2) - \left(-\frac{2}{5} \log(\frac{1}{5}) - \frac{2}{5} \log(\frac{4}{5}) \right)$$

$$= -0.1336 \quad 0.5654$$

From above calculations, we see that Δ_i is highest for taste \therefore we split based on taste



Now, ~~salty~~ ~~sour~~ section can be further split ~~is~~ based on

Now, salty section can be further split based on "Portion" as that produces highest Δ_i

$$\Delta_i = \log(2) - 0 - 0 = \log_2(2) = 1$$

\Rightarrow

