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Optimal Assignment  (Assignment 5)

Q1. Entropy $H(Y) = -\sum_{i=1}^{K} p(Y=y_i) \log_2 p(Y=y_i)$

Finding the entropy of taste

$p(taste = Meh) = \dfrac{5}{10}$

$p(taste = Yummy) = \dfrac{5}{10}$

hence

$H(Y) = -\dfrac{5}{10} \log_2 \left(\dfrac{5}{10}\right) - \dfrac{5}{10} \log_2 \left(\dfrac{5}{10}\right)$

$= \underline{\underline{1.0}}$

## Q2.

Information gain given visual defects as root of decision tree.

Information gain $IG$ (visual defects) $= H(\quad) - \quad$

$H(taste) - H(taste | visual defect)$

Visual defects

some $-3$, all 3 are meh

None $- 4 <\begin{array}{l} 2 - meh \\ 2 - yummy \end{array}$

many $= 3$, 3 are yummy

$H(taste | visual defect) =$

$$\frac{3}{10}(-3/3 \log_2 3/3) + \frac{4}{10}(-2/4 \log_2 2/4 - 2/4 \log_2 2/4) +$$

$$3/10(-3/3 \log_2 3/3) = \boxed{0.4}$$

Information gain $\Rightarrow H(taste) - 0.4$

$$= 1.0 - 0.4$$

$$= \boxed{0.6}$$

②

# Question 3

## entropy

(a) H (Taste | Visual defect == some)

Visual defects

some —3 $\left\{\begin{array}{l} \text{meh} = 3 \\ \text{yummy} = 0 \end{array}\right.$

$\Rightarrow \quad -\frac{3}{3} \log_2 \left(\frac{3}{3}\right) - 0 \log_2 (0)$

$= \quad -1 \log_2 (1) - 0 \log_2 (0)$

$= \boxed{0}$

(b) visual defects :

H (Taste | Visual defect == none)

Visual defects

none — 4 $\left\{\begin{array}{l} \text{meh} = 2 \\ \text{yummy} = 2 \end{array}\right.$

$\Rightarrow \quad -\frac{2}{4} \log_2 \left(\frac{2}{4}\right) - \frac{2}{4} \log_2 \left(\frac{2}{4}\right)$

$= \quad -\frac{1}{2} - \frac{1}{2} = \boxed{1}$

③