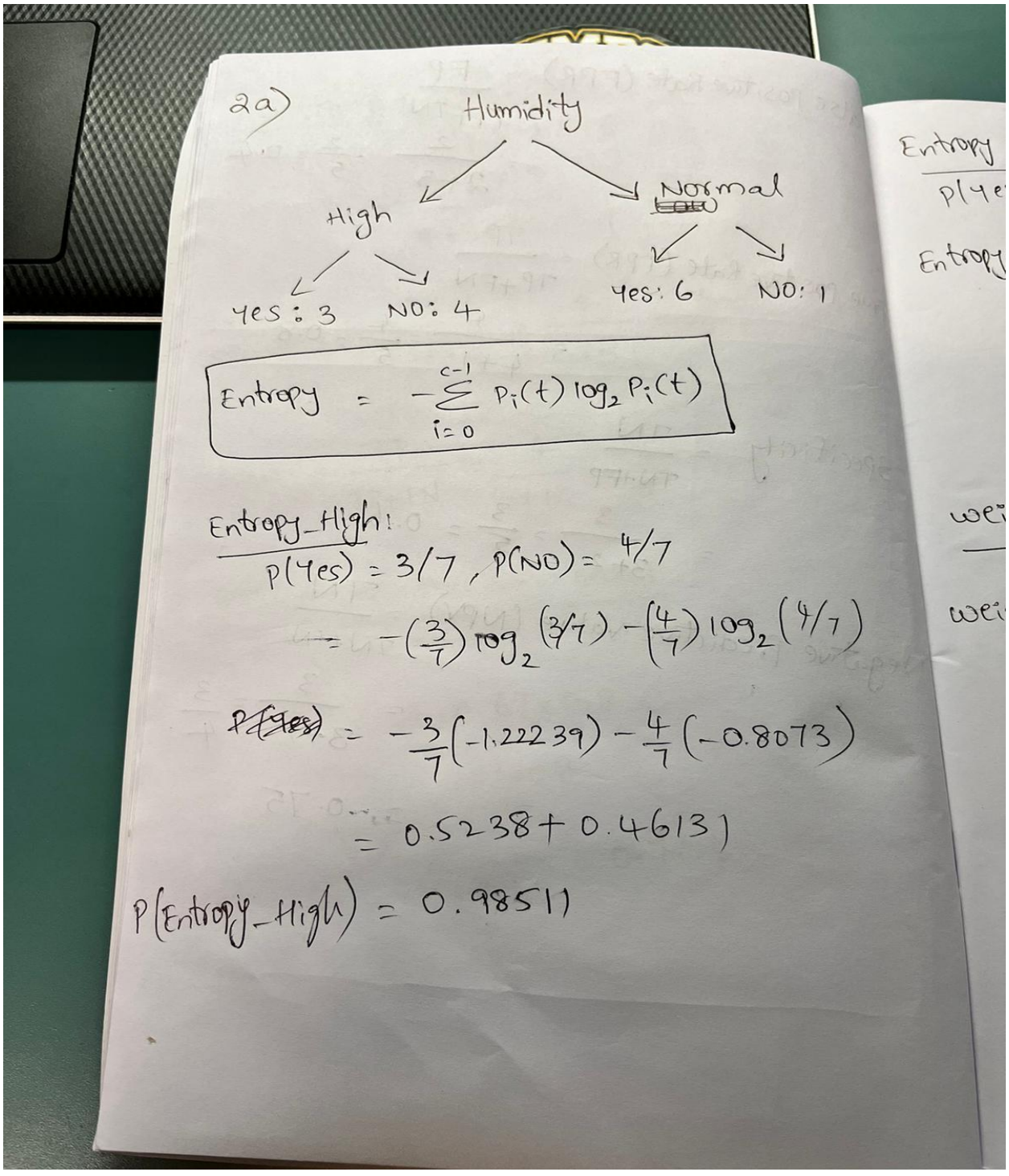
IS 733 Lab_Week_4

Task-2a:



Entropy Normal:

$P(\text{Yes}) = 6/7$, $P(\text{No}) = 1/7$

Entropy Normal $= -\frac{6}{7}\log_2(6/7) - (\frac{1}{7})\log_2(1/7)$

$= -(\frac{6}{7})(-0.22239) - (\frac{1}{7})(-2.80735)$

$= 0.19062 + 0.40105$

$= 0.59167$

weighted Average:

weighted Average of conditional entrophies:

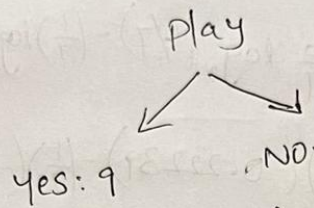
$$\left(\frac{7}{14}\right) \times \text{Entropy\_High} + \left(\frac{7}{14}\right) \times \text{Entropy\_Normal}$$

$= (\frac{7}{14})(0.98511) + (\frac{7}{14})(0.59167)$

$= 0.4925 + 0.2958$

$= 0.7883$

Information gain = Entropy play - weighted Condition



$P(yes) = 9/14$, $P(NO) = 5/14$

$$\text{Entropy(play)} = \left(\frac{-9}{14}\right)\log_2(9/14) - \left(\frac{5}{14}\right)\log_2(5/14)$$

$$= \left(\frac{-9}{14}\right)(-0.6374) - \frac{5}{14}(-1.4854)$$

$$= 0.4097 + 0.5305$$

$$\text{Entropy (play)} = 0.9402$$

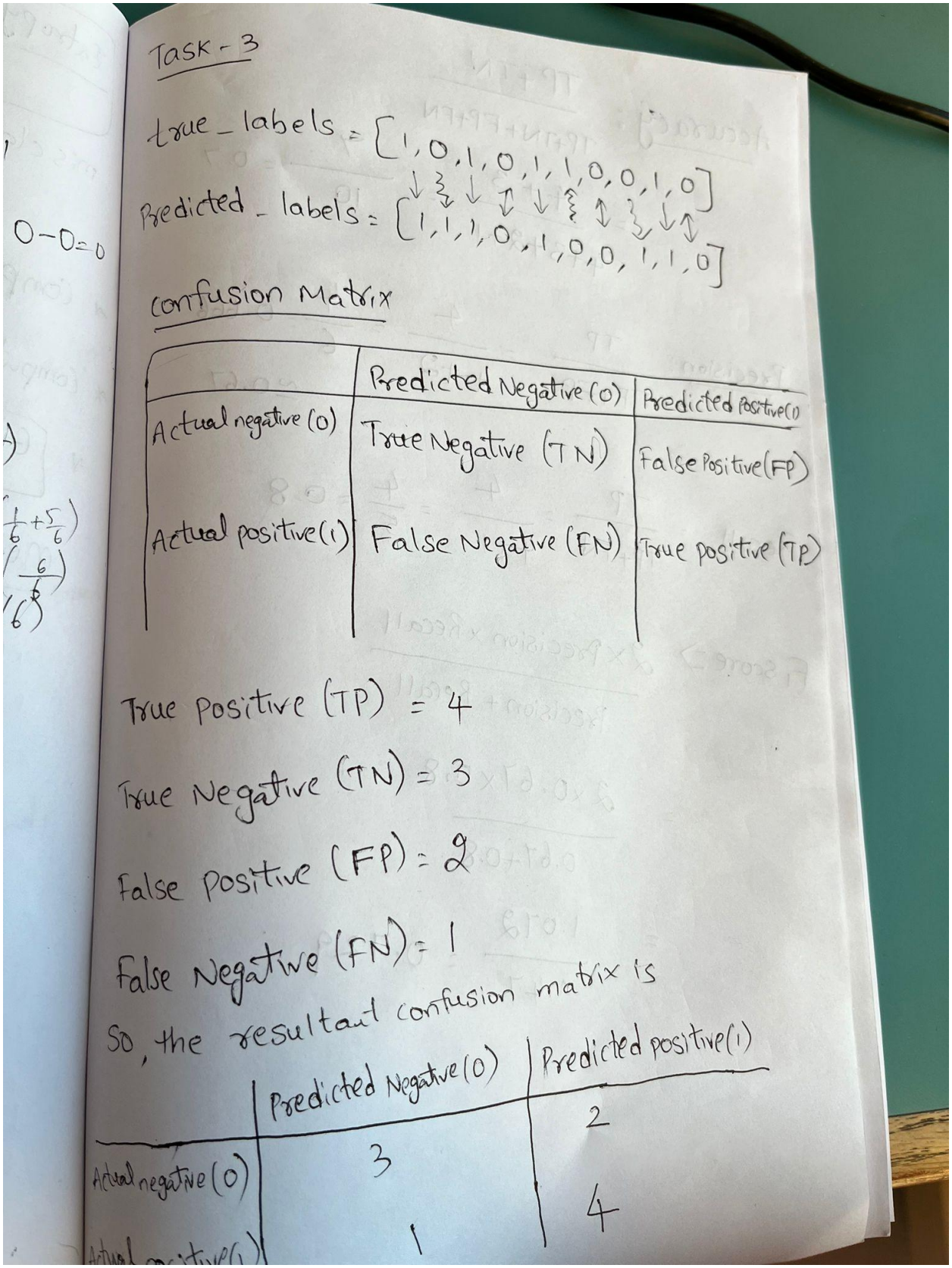
Therefore,

Information gain of humidity

$$= 0.9402 - 0.7883$$

$$= 0.1519$$

.Task-3a:



Task - 3

true_labels = [1, 0, 1, 0, 1, 1, 0, 0, 1, 0]

Predicted_labels = [1, 1, 1, 0, 1, 0, 0, 1, 1, 0]

Confusion Matrix

	Predicted Negative (0)	Predicted Positive (1)
Actual negative (0)	True Negative (TN)	False Positive (FP)
Actual positive (1)	False Negative (FN)	True positive (TP)

True Positive (TP) = 4

True Negative (TN) = 3

False Positive (FP) = 2

False Negative (FN) = 1

So, the resultant confusion matrix is

	Predicted Negative (0)	Predicted positive (1)
Actual negative (0)	3	2
Actual positive (1)	1	4

Accuracy: $\frac{TP+TN}{TP+TN+FP+FN}$

$= \frac{4+3}{4+3+2+1} = \frac{7}{10} = 0.7$

Precision: $\frac{TP}{TP+FP} = \frac{4}{4+2} = \frac{4}{6} = 0.666$

$\simeq 0.67$

Recall $= \frac{TP}{TP+FN} = \frac{4}{4+1} = \frac{4}{5} = 0.8$

F_1 score $\Rightarrow \frac{2 \times \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$

$= \frac{2 \times 0.67 \times 0.8}{0.67+0.8}$

$= \frac{1.072}{1.47} = 0.729$

False Positive Rate (FPR) $= \frac{FP}{FP+TN}$

$= \frac{2}{2+3} = \frac{2}{5} = 0.4$

True positive Rate (TPR) $= \frac{TP}{TP+FN}$

$= \frac{4}{4+1} = \frac{4}{5} = 0.8$

Specificity $= \frac{TN}{TN+FP}$

$= \frac{3}{3+2} = \frac{3}{5} = 0.6$

Negative Predictive Value (NPV) $= \frac{TN}{TN+FN}$

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

$= 0.75$

Chat GPT History Link:
https://chat.openai.com/share/8bea5b28-7d72-41cf-830b-6cf4735f0550