EBU4203 Introduction to AI – Week 1 Tutorial 2023

Q1: STATE and EXPLAIN the THREE ways that an experiment can fail when uncertainties are not considered appropriately.

Q2: STATE and EXPLAIN the THREE main types of learning in AI.

Q3: Discuss the challenges and limitations of current AI technologies.

Q4: In class, 30% of students study History, 45% study Maths, and 15% study both History and Maths. If a student is randomly selected, what is the probability that he/she study History or maths?

Q5: Suppose that 10% of the registered patients of a chest clinic have been diagnosed with cancer. Also based on the clinic's data, 50% of its registered patients are smokers, and 80% of patients diagnosed with cancer are smokers. Suppose that patient X comes into the clinic for the first time. What is the probability that X will be diagnosed with cancer if we know that he is a smoker?

Q6: The dataset in the table below has 10 observations belonging to two classes 'Yes' and 'No'. In the outcome, 6 observations belong to the class 'Yes', and 4 observations belong to class 'No'. Answer the following questions accordingly:

Grade	Colour	Outcome
Low	Red	Yes
Low	Red	No
Low	Yellow	Yes
Low	Yellow	Yes
Low	Red	Yes
High	Yellow	Yes
High	Red	No
High	Red	No
High	Red	Yes
High	Yellow	No

i)   Compute the entropy of the outcome H($outcome$).
ii) Explain what will happen to the Entropy for H($outcome$) if all 10 observations belong to 1 class only, e.g., all outcomes are 'Yes'.
iii) Compute the entropy for H($outcome|colour$) and H($outcome|observations$).
iv) Based on your answers in iii), Compute the Information Gain for both conditions.
v)   Based on your answers in iv), state which attribute should be used as the root of a decision tree?