National University of Computer & Emerging Sciences, Karachi
Spring -2024
AI-2002 Artificial Intelligence
Assignment# 03

Due Date: 8th May 2024 **Max Marks**:10 points

Decision Tree

Q-01: A cricketer has three attributes:

- Batting ability, with values Amazing, OK, Useless
- Bowling type, with values Fast, Spinner
- Fielding position, with values Wickie, Close-in, Outfield

Given the following data that show whether or not the cricketer was selected for the team, use decision tree learning to build an optimal decision tree that predicts whether or not a player will be selected. Show all your working. Draw the final decision tree.

Player	Batting	Bowling	Fielding	Selected
1	Amazing	Spinner	Outfield	Selected
2	OK	Fast	Outfield	Left-out
3	Useless	Spinner	Outfield	Selected
4	Amazing	Spinner	Wickie	Left-out
5	Amazing	Fast	Outfield	Selected
6	OK	Fast	Outfield	Left-out
7	OK	Fast	Outfield	Left-out
8	Amazing	Spinner	Close-in	Selected
9	Amazing	Fast	Close-in	Selected
10	Useless	Fast	Wickie	Left-out

Uncertainty

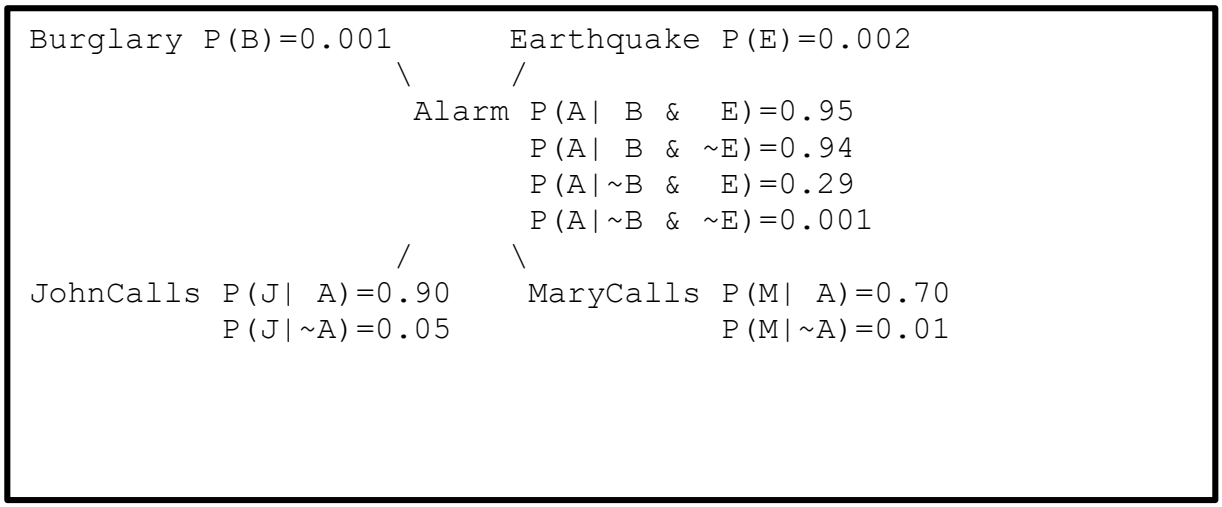
Q-02: Find out the probabilities of the following given joint

	sunny	rainy	cloudy	snowing
cold	0.01	0.10	0.04	0.20
hot	0.50	0.05	0.10	0.00

P(cold v rainy) and P(cold|rainy)

Q-03: If 60% of hardworking people are rich, 50% of people are hardworking, 90% of people with rich parents are rich, and 20% of people have rich parents, what is the relative likelyhood of being hardworking vs. having rich parents, given that you are rich?

Q-04: Following the given belief network



calculate (showing your calculations) the probability that John does not call given that there's been burglary and an earthquake?

KNN

Q-05: Consider the below training data shown in table for a binary classification. Predict whether a loan applicant will repay his/her loan obligation or defaulting on his/her loan.

Tid	Home Owner	Marital Status	Annual Income	Defaulted Borrower
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

Predict the class label for X = (Home Owner = No, Marital Status = Married, Income = $120K).

LOGISTIC REGRESSION

Q-06: A hospital wants to predict the likelihood of patients developing complications after a surgical procedure based on various factors such as age, pre-existing health conditions, and type of surgery. They have collected data on 500 patients who underwent the same surgical procedure in the past year. For each patient, they recorded their age, presence of diabetes, presence of hypertension, whether they smoke, and the type of surgery performed (coded as 1 for minor surgery and 2 for major surgery), as well as whether they experienced complications post-surgery (coded as 1 for yes and 0 for no).

Age	Diabetes	Hypertension	Smoker	Surgery Type	Complications
45	0	1	1	1	0
60	1	1	0	2	1
55	1	0	1	1	1
70	0	1	0	2	1
50	1	1	1	1	0

use the model to predict the probability of complications for a new patient who is 60 years old, has diabetes and hypertension, is a smoker, and is undergoing major surgery.