

Artificial Intelligence Course – 2021

Assignment 2

1. Supposed you are given a coin that lands *the figure of Prof. Herman Johannes* with probability a and *the number of 100 rupiah* with probability $1 - a$. Are the outcomes of successive flips of the coin independent of each other given that you know the value of a ? Are the outcomes of successive flips of the coin independent of each other if you do not know the value of a ? explain your answer (5 points)
2. Suppose you saw an accident involving a car in Citra Land area. All cars in Citra Land are white or black. You are certain that the car that hit the victim was white. Extensive testing shows that, under the dim lighting condition, the difference between white and black is 80% reliable.
 - a. Is it possible to calculate the most likely colour of the car? Explain your answer with mathematical procedure. (3 points)
 - b. What if you know that 9 out of 10 cars in Citra Land are black? (2 points)
3. In a smart home system, there is an alarm that senses when a temperature in the kitchen is too high. The dashboard measures the temperature of the kitchen. Consider Boolean variable A (alarm sounds), F_a (alarm is faulty), F_d (dashboard is faulty), and multi valued nodes D (dashboard reading) and K (actual kitchen temperature).
 - a. Draw a Bayesian network for this smart home system, given that the dashboard is more likely to fail when the kitchen temperature is too high. (5 points)
 - b. Suppose there are just two possible actual and measured temperatures, normal and high; the probability that the dashboard gives the correct temperature is x when it is working, but y when it is faulty. Give conditional probability table associated with A . (5 points)
4. With your own language, explain the difference between supervised and unsupervised learning. (5 points)
5. Identify the type of machine learning task (clustering/classification/regression) of the following case and explain your reason (10 points – 2.5 points for each)
 - a. Deciding whether a customer will continue the subscription of entertainment streaming provider.
 - b. Finding the number of people who will take a CPNS test in a certain ministry.
 - c. Identifying the factors for forecasting the number of corn harvest.

- d. Identifying the segmentation of customer from internet provider based on their 24 hours activities.
6. What are the advantages (give at least two) of Reinforcement Learning? (5 points)
7. Based on Fuel Consumption data on the attributes `ENGINE SIZE`, `CYLINDERS`, `FUELCONSUMPTION_COMB` with 80% training and 20% testing
 - a. Calculate MSE from the model for predicting emission (10 points)
 - b. What is the value for each attribute? (10 points)
 - c. Calculate the predicted emission when `ENGINE SIZE` = 2, `CYLINDERS` = 5, and `FUELCONSUMPTION_COMB` = 3 (10 points)
8. Create an AI program using KNN algorithm that is able to predict whether a customer will complete a purchase. In order to do so, you need to complete the implementation of `load_data`, `train_model`, and `evaluate` in `shopping.py`
 - a. Load data (10 points)

This function should accept the CSV filename and return a tuple (evidence, labels) where evidence should be the list of evidence for each data points, and labels should be a list of all of the labels for each data point.

 - Example of evidence: [0, 0.0, 0, 0.0, 1, 0.0, 0.2, 0.2, 0.0, 0.0, 1, 1, 1, 1, 1, 1, 0]
 - Example of label: 0
 - b. Train model (10 points)

This function should accept a list of evidence and list of labels, return a nearest-neighbour classifier fitted on that training data.
 - c. Evaluate (10 points)

This function should accept a list of labels and a list of predictions and return two floating-point values (sensitivity, specificity). You may assume each label will be 1 for positive result or 0 for negative result.