HW 2

Question 1:

Draw the full decision tree for the parity function of four Boolean attributes, A, B, C, and D. Is it possible to simplify the tree?

A picture containing text, crossword puzzle

Description automatically generated

Question 2:

Consider the training examples show in the below table for a binary classification problem

(a). Compute the Gini index for the overall collection of training examples.

(b). Compute the Gini index for the Customer ID attribute.

(c). Compute the Gini index for the Gender attribute.

Table

Description automatically generated

Question 3: Consider the following dataset for a binary class problem.

Calculate the information gain when splitting on A and B. Which attribute would the decision tree induction algorithm choose?

A picture containing text, device

Description automatically generated

Question 4:

C4.5 rules is an implementation of an indirect method for generating rules from a decision tree. RIPPER is an implementation of a direct method for generating rules directly from data.

(a). Discuss the strengths and weaknesses of both methods.

(b). Consider a dataset that has a large difference in the class size (i.e., some classes are much bigger than others). Which method (between C4.5 rules and RIPPER) is better in terms of finding high accuracy rules for the small classes?

Question 5:

Consider a binary classification problem with the following set of attributes and attribute values.

Air conditioner = {working, broken}

Engine = {Good, Bad}

Mileage = {High, Medium, Low}

Rust = {Yes, No}

Suppose a rule-based classifier produces the following rule set:

(a). Are the rules mutually exclusive?

(b). Is the rule set exhaustive?

(c). Is ordering needed for this set of rules?

(d). Do you need a default class for the rule set?

Text

Description automatically generated

Question 6:

Given the attached data, use Weka to explore the possible association rules as well as classify and predict data. Summarize, analyze and interpret the results.