

MODULE 2 – DECISION TREE LEARNING

1. What is decision tree and decision tree learning?
2. Explain representation of decision tree with example.
3. What are appropriate problems for Decision tree learning?
4. Explain the concepts of Entropy and Information gain.
5. Describe the ID3 algorithm for decision tree learning with example
6. Give Decision trees to represent the Boolean Functions:
 - a) $A \&\& \sim B$
 - b) $A \vee [B \&\& C]$
 - c) $A \text{ XOR } B$
 - d) $[A\&\&B] \vee [C\&\&D]$
7. Give Decision trees for the following set of training examples

Day	Outlook	Temperature	Humidity	Wind	PlayTennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

8. Consider the following set of training examples.
 - a) What is the entropy of this collection of training example with respect to the target function classification?
 - b) What is the information gain of a_2 relative to these training examples?

Instance	Classification	a ₁	a ₂
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

9. Identify the entropy, information gain and draw the decision trees for the following set of training examples

Gender	Car ownership	Travel cost	Income Level	Transportation (Class)
Male	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Female	1	Cheap	Medium	Train
Female	0	Cheap	Low	Bus
Male	1	Cheap	Medium	Bus
Male	0	Standard	Medium	Train
Female	1	Standard	Medium	Train
Female	1	Expensive	High	Car
Male	2	Expensive	Medium	Car
Female	2	Expensive	High	Car

10. Discuss Hypothesis Space Search in Decision tree Learning.
11. Discuss Inductive Bias in Decision Tree Learning.
12. What are Restriction Biases and Preference Biases and differentiate between them.
13. Write a note on Occam's razor and minimum description principal.
14. What are issues in learning decision trees