# Homework # 1 — EECS-839

Q.No. 1:

Intervals

25 → 26

27 → 29.5

32 → 40

48 → 56.5

65

$\{A\}^* = \{\{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \{6\}, \{7\}\}$

$\{d\}^* = \{\{1,2,3,4\}, \{5,6,7\}\}$

$A^* \leq \{d\}^* \Rightarrow$ Dataset is consistent and hence we can proceed with MLEM2 algorithm.

Goal = (Hobby, fishing) $\Rightarrow \{1,2,3,4\}$

→ Goal ←

| (a, v) | [(a,v)] | {1,2,3,4} | {1,2,3,4} | {2,3,4} |
|---|---|---|---|---|
| (Age, 25..26) | {2, 4} | {2,4} | {2,4} | {2,4}$_2$ |
| (Age, 26..65) | {1, 3, 5, 6, 7} | {1,3} | {1,3} ✓ | {3} |
| (Age, 25..29.5) | {2,3,4,6} | {2,3,4} | {2,3,4}$_4$ | - |
| (Age, 29.5..65) | {1, 5, 7} | {1} | {1} | - |
| (Age, 25..40) | {1, 2, 3, 4, 6} | {1,2,3,4} | - | - |
| (Age, 40..65) | {5, 7} | - | - | - |
| (Age, 25..56.5) | {1,2,3,4,5,6} | {1,2,3,4} | - | - |
| (Age, 56.5..65) | {7} | - | - | - |
| (Gender, male) | {1, 3, 4, 5, 7} | {1,3,4} | {1,3,4}$_5$ | {3,4}$_5$ |
| (Gender, female) | {2, 6} | {2} | {2} | {2} |
| (Education, higher) | {1, 3} | {1,3} | {1,3} | {3} |
| (Education, primary) | {2,4,5,6,7} | {2,4} | {2,4} | {2,4}$_5$ |

$\{1,2,3,4,6\} \not\subseteq \{1,2,3,4\}$

New Goal: $\{1,2,3,4,6\} \cap \{1,2,3,4\} = \{1,2,3,4\}$

redundant

~~$\{1,2,3,4,6\}$~~ $\cap \{2,3,4,6\} = \{2,3,4,6\} \not\subseteq \{1,2,3,4\}$

New Goal: $\{1,2,3,4\} \cap \{2,3,4,6\} = \{2,3,4\}$

redundant

~~$\{2,3,4,6\}$~~ $\cap \{2,4\} = \{2,4\} \subseteq \{1,2,3,4\}$

$(Age, 25..26) \rightarrow (Hobby, fishing)$

New Goal: $G' = \{1,3\}$

| $(a,v)$ | $\{(a,v)\}$ | $\{1,3\}$ | $\{5,6,7\}$ | $\{5,6,7\}$ |
|---|---|---|---|---|
| (Age, 25..26) | $\{2,4\}$ | - | - | - |
| (Age, 26..65) | $\{1,3,5,6,7\}$ | $\{1,3\}_s$ | $\boxed{\{5,6,7\}_s}$ | - |
| (" , 25..29.5) | $\{2,3,4,6\}$ | $\{3\}$ | $\{6\}$ | $\{6\}$ |
| (" , 29.5..65) | $\{1,5,7\}$ | $\{1\}$ | $\{5,7\}$ | $\{5,7\}$ |
| (" , 25..40) | $\{1,2,3,4,6\}$ | $\{1,3\}_s$ | $\{6\}$ | $\{6\}$ |
| (" , 40..65) | $\{5,7\}$ | - | $\{5,7\}$ | $\{5,7\}$ |
| (" , 25..56.5) | $\{1,2,3,4,5,6\}$ | $\{1,3\}_s$ | $\{5,6\}$ | $\{5,6\}$ |
| (" , 56.5..65) | $\{7\}$ | - | $\{7\}$ | $\{7\}$ |
| (Gender, male) | $\{1,3,4,5,7\}$ | $\{1,3\}_s$ | $\{5,7\}$ | $\{5,7\}$ |
| (Gender, female) | $\{2,6\}$ | - | $\{6\}$ | $\{6\}$ |
| (Education, high) | $\{1,3\}$ | $\boxed{\{1,3\}_2}$ | - | - |
| (" , primary) | $\{2,4,5,6,7\}$ | - | $\{5,6,7\}_s$ | $\boxed{\{5,6,7\}}$ |

$\{1,3\} \subseteq \{1,3\}$

$(Education, higher) \rightarrow (Hobby, fishing)$

New Goal: $(Hobby, shooting) \Rightarrow \{5,6,7\}$

$\{1,3,5,6,7\} \not\subseteq \{5,6,7\}$

New Goal: $\{1,3,5,6,7\} \cap \{5,6,7\} = \{5,6,7\}$

$\{1,3,5,6,7\} \cap \{2,4,5,6,7\} = \{5,6,7\} \subseteq \{5,6,7\}$

Neither of the conditions can be eliminated!

(Age, 26 .. 65) & (Education, primary) → (Hobby, shooting)

Hence the final set of rules for the question are:

| Covers | | | |
|---|---|---|---|
| Cases: 2,4 | (Age, 25 .. 26) | → | (Hobby, fishing) |
| Cases: 1,3 | (Education, higher) | → | (Hobby, fishing) |
| Cases: 5,6,7 | (Age, 26 .. 65) & (Education, primary) | → | (Hobby, shooting) |

Q. No. 2:

Consider the following decision table:

| | Attributes | | Decisions | |
|---|---|---|---|---|
| | a | b | c | d |
| 1. | 0 | 0 | 0 | 0 |
| 2. | 0 | 0 | 0 | 0 |
| 3. | 0 | 0 | 0 | 1 |
| 4. | 1 | 1 | 1 | 1 |

(rows 1–2: X; rows 3–4: Y)

Let $X = \{1, 2, 3\}$ ; $Y = \{3, 4\}$
both are subsets of $U = \{1, 2, 3, 4\}$

$$A^* = \{\{1, 2, 3\}, \{4\}\}$$

$$\underline{A}X = \{1, 2, 3\} \quad ; \quad \underline{A}Y = \{4\}$$

$$X - Y = \{1, 2\}$$

$$\underline{A}(X - Y) = \emptyset \quad \ldots (a)$$

$$\underline{A}X - \underline{A}Y = \{1, 2, 3\} \quad \ldots (b)$$

from (a) and (b):

$$\underline{A}(X - Y) \neq \underline{A}X - \underline{A}Y$$