

Machine Learning Assignment-1

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1 Languages used

The entire code was written in C++.

2 Pre-processing

We process the data as follows:

1. Each attribute was assigned an index.
2. We also store the set of all possible values that each attribute can take corresponding to its assigned index. For boolean attributes, we store 1 in place of True and 0 in place of False.
3. The all possible attribute choice which is generally represented as '?' is coded as -1 and the attribute choice for no selection is coded as 100.

The indices for attributes is as follows:

Index	Corresponding attribute
0	hair
1	feathers
2	eggs
3	milk
4	airborne
5	aquatic
6	predator
7	toothed
8	backbone
9	breathes
10	venomous
11	fins
12	legs
13	tail
14	domestic
15	catsize
16	type

3 Compilation and Execution

Run the following commands in the terminal:-

1. `g++ -std=c++11 candidate_eli.cpp`
2. `./a.out`

4 Result

Classes for which concept could be learnt were:

1. Class 1

Set G:

$$(a) \{?, ?, ?, 1, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?\}$$

Set S:

$$(a) \{?, 0, ?, 1, ?, ?, ?, ?, 1, 1, 0, ?, ?, ?, ?, ?\}$$

2. Class 2

Set G:

$$(a) \{?, 1, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?\}$$

$$(b) \{0, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, 2, ?, ?, ?\}$$

$$(c) \{?, ?, 1, ?, ?, ?, ?, ?, ?, ?, 2, ?, ?, ?\}$$

$$(d) \{?, ?, ?, 0, ?, ?, ?, ?, ?, ?, 2, ?, ?, ?\}$$

$$(e) \{?, ?, ?, ?, ?, ?, 0, ?, ?, ?, 2, ?, ?, ?\}$$

Set S:

$$(a) \{0, 1, 1, 0, ?, ?, ?, 0, 1, 1, 0, 0, 2, 1, ?, ?\}$$

3. Class 4

Set G:

$$(a) \{?, ?, 1, ?, ?, ?, ?, ?, ?, 1, ?, ?, ?\}$$

$$(b) \{?, ?, ?, 0, ?, ?, ?, ?, ?, 1, ?, ?, ?\}$$

$$(c) \{?, ?, ?, ?, ?, ?, ?, 0, ?, 1, ?, ?, ?\}$$

$$(d) \{?, ?, 1, ?, ?, ?, 1, ?, 0, ?, ?, ?, ?, ?\}$$

- (e) $\{?, ?, 1, ?, ?, ?, ?, 1, 0, ?, ?, ?, ?, ?\}$
- (f) $\{?, ?, 1, ?, ?, ?, ?, ?, 0, ?, ?, ?, 1, ?, ?\}$
- (g) $\{?, ?, 1, ?, ?, 1, ?, 1, ?, ?, ?, ?, 0, ?, ?, ?\}$
- (h) $\{?, ?, 1, ?, ?, 1, ?, ?, 1, ?, ?, ?, 0, ?, ?, ?\}$
- (i) $\{?, ?, 1, ?, ?, 1, ?, ?, ?, ?, ?, ?, 0, 1, ?, ?\}$

Set S:

- (a) $\{0, 0, 1, 0, 0, 1, ?, 1, 1, 0, ?, 1, 0, 1, ?, ?\}$

4. Class 5

Set G:

- (a) $\{?, 0, ?, ?, ?, 1, ?, ?, ?, 1, ?, ?, ?, ?, 0\}$
- (b) $\{?, ?, ?, ?, 0, 1, ?, ?, ?, 1, ?, ?, ?, ?, 0\}$
- (c) $\{?, ?, ?, ?, ?, 1, ?, 1, ?, 1, ?, ?, ?, ?, 0\}$
- (d) $\{?, 0, ?, 0, ?, 1, ?, ?, ?, 1, ?, ?, ?, ?, ?\}$
- (e) $\{?, ?, ?, ?, ?, 1, ?, 1, ?, ?, ?, ?, 4, ?, ?, 0\}$
- (f) $\{?, ?, ?, ?, ?, 1, ?, ?, 1, ?, ?, ?, 4, ?, ?, 0\}$
- (g) $\{?, ?, ?, ?, ?, 1, ?, ?, ?, 1, ?, ?, 4, ?, ?, 0\}$
- (h) $\{0, 0, ?, ?, ?, 1, ?, ?, ?, 1, ?, 0, ?, ?, ?, ?\}$
- (i) $\{?, ?, 1, ?, ?, 1, ?, 1, ?, 1, ?, ?, ?, ?, ?\}$
- (j) $\{?, ?, 1, ?, ?, 1, ?, 1, ?, ?, ?, 0, ?, ?, ?, ?\}$
- (k) $\{?, ?, ?, 0, ?, 1, ?, 1, ?, 1, ?, ?, ?, ?, ?\}$
- (l) $\{0, 0, 1, ?, ?, 1, ?, ?, ?, 1, ?, ?, ?, ?, ?\}$
- (m) $\{?, 0, 1, ?, ?, 1, ?, ?, 1, ?, ?, 0, ?, ?, ?, 0\}$
- (n) $\{?, ?, 1, ?, 0, 1, ?, ?, 1, ?, ?, 0, ?, ?, ?, 0\}$
- (o) $\{0, ?, ?, ?, ?, 1, ?, 1, ?, 1, ?, 0, ?, ?, ?, ?\}$
- (p) $\{0, 0, 1, ?, ?, 1, ?, ?, 1, ?, ?, 0, ?, ?, ?, ?\}$
- (q) $\{?, 0, 1, 0, ?, 1, ?, ?, 1, ?, ?, 0, ?, ?, ?, ?\}$
- (r) $\{0, ?, ?, ?, ?, 1, ?, ?, 1, ?, ?, ?, 4, ?, ?, ?\}$
- (s) $\{0, ?, ?, ?, ?, 1, ?, ?, ?, 1, ?, ?, 4, ?, ?, ?\}$
- (t) $\{?, ?, ?, 0, ?, 1, ?, ?, 1, ?, ?, ?, 4, ?, ?, ?\}$
- (u) $\{?, ?, ?, 0, ?, 1, ?, ?, ?, 1, ?, ?, 4, ?, ?, ?\}$

(v) $\{0,?, ?, ?, ?, 1, ?, 1, ?, ?, ?, ?, 4, ?, ?, ?\}$

(w) $\{?, ?, 1, ?, ?, 1, ?, 1, ?, ?, ?, ?, 4, ?, ?, ?\}$

(x) $\{?, ?, ?, 0, ?, 1, ?, 1, ?, ?, ?, ?, 4, ?, ?, ?\}$

Set S:

(a) $\{0, 0, 1, 0, 0, 1, ?, 1, 1, 1, ?, 0, 4, ?, 0, 0\}$

5. Class 6

Set G:

(a) $\{?, ?, ?, ?, ?, 0, ?, ?, ?, ?, ?, 6, ?, ?, ?\}$

(b) $\{?, ?, ?, ?, ?, ?, ?, ?, 1, ?, ?, 6, ?, ?, ?\}$

Set S:

(a) $\{?, 0, 1, 0, ?, 0, ?, 0, 0, 1, ?, 0, 6, 0, ?, 0\}$

Concept could not be for the following classes:

1. Class 3

2. Class 7

NOTE: The G and S set are listed in increasing order of indices of attributes.