Data structures for pattern representation

(1) Patterns as vectors:

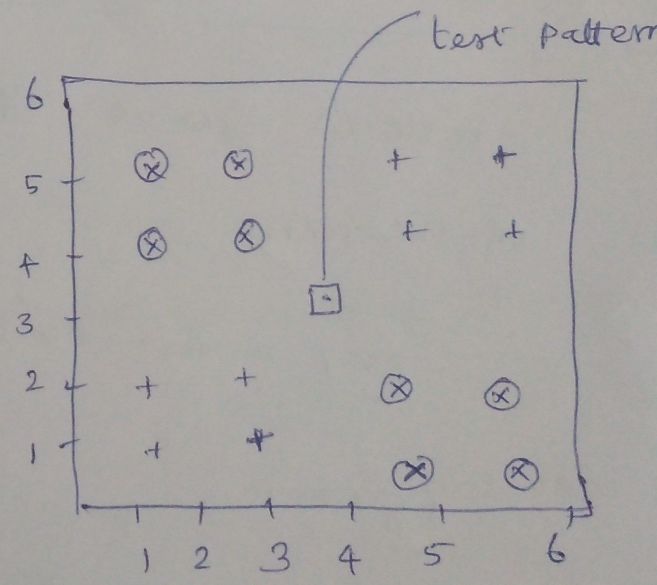
An obvious representation of a pattern will be a vector. Each element of the vector can represent one attribute of the pattern.

Eg: Spherical object (30, 1)
- 30 → weight
- 1 → diameter

(30, 1, 1) → class object.

Using vector representation a set of patterns, can be represented as

<1, 1, 1> ; <1, 2, 1>
<2, 1, 1> ; <2, 2, 1>
<4, 1, 2> ; <5, 1, 2>
<4, 2, 2> ; <5, 2, 2>
<1, 4, 2> ; <1, 5, 2>
<2, 4, 2> ; <2, 5, 2>
<4, 4, 1> ; <5, 5, 1>
<4, 5, 1> ; <5, 4, 1>



② Patterns as strings:

The string may be viewed as a sentence in a language. for ex: DNA sequence (or) a Protein sequence.

As an illustration, a gene can be defined as a region of the chromosomal DNA constructed with 4 nitrogenous bases.

A - adenine ; G - guanine ; C - cytosine and T - Thymine

Thymine

G A A G T C C A G - - -

③ Patterns as logical Descriptions:

Patterns can be represented as a logical description of the form.

$(x_1 = a_1 \ldots a_2) \wedge (x_2 = b_1 \ldots b_2) \wedge \ldots$

An Eg:

(Colour = red v white) ∧ (make = leather) ∧ (shape = sphere)

to represent 'cricket ball'.

(4) Fuzzy and Rough Pattern sets:

* Fuzziness is used where it is not possible to make precise statements. It is therefore used to model subjective, incomplete and imprecise data.

In a fuzzy set, the objects belong to the set depending on a membership value which varies from 0 to 1.

The set X is thus represented by a tuple $\{\underline{X}, \overline{X}\}$ which is composed of the lower and upper approximation.

Eg: "If x_1 is small and x_2 is large, then class 3"

$\langle$ small, large, 3$\rangle$

It can also be used in cases where there are uncertain (or) missing values.

$X = (?, 6.2, 7)$

$X = ([0,7], 6.2, 7)$ with no missing values.

* The values of the features may be rough values. Such F.v are called rough patterns.

A rough value consist of an upper and a lower bound.

Power 'P' can be represented as

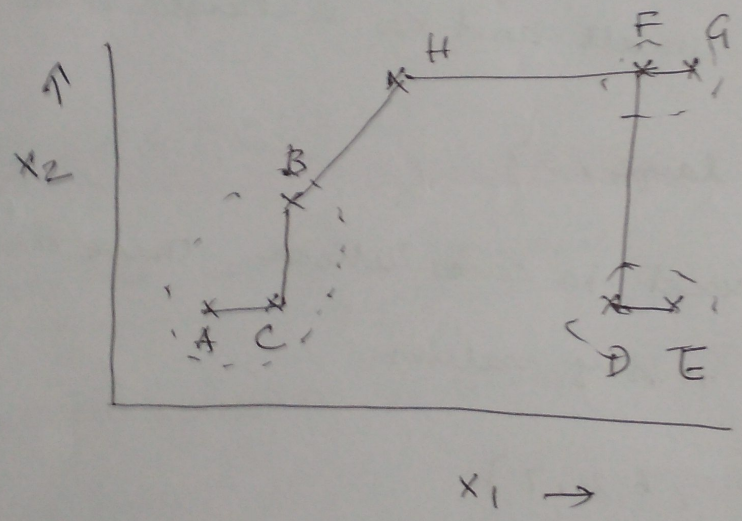
$\langle 230, 5.2, (\underline{50}, \overline{49, 51}) \rangle$

↓ V, ↓ C, ↓ frequency

(5) Patterns as Trees and Graphs:

Each node in the tree (or) graph may represent one (or) more patterns.

Eg: MST
Delauney tree
R-tree / Quad tree.
K-d tree
Frequency pattern (FP) tree.



Soft computing

Solutions of NP-Complete Problems can be derived in polynomial