COFFEE LEAF RUST SOLVING: WIRELESS SENSOR NETWORK, DATA STRUCTURES AND ALGORITHMS

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Designed data structure: Table

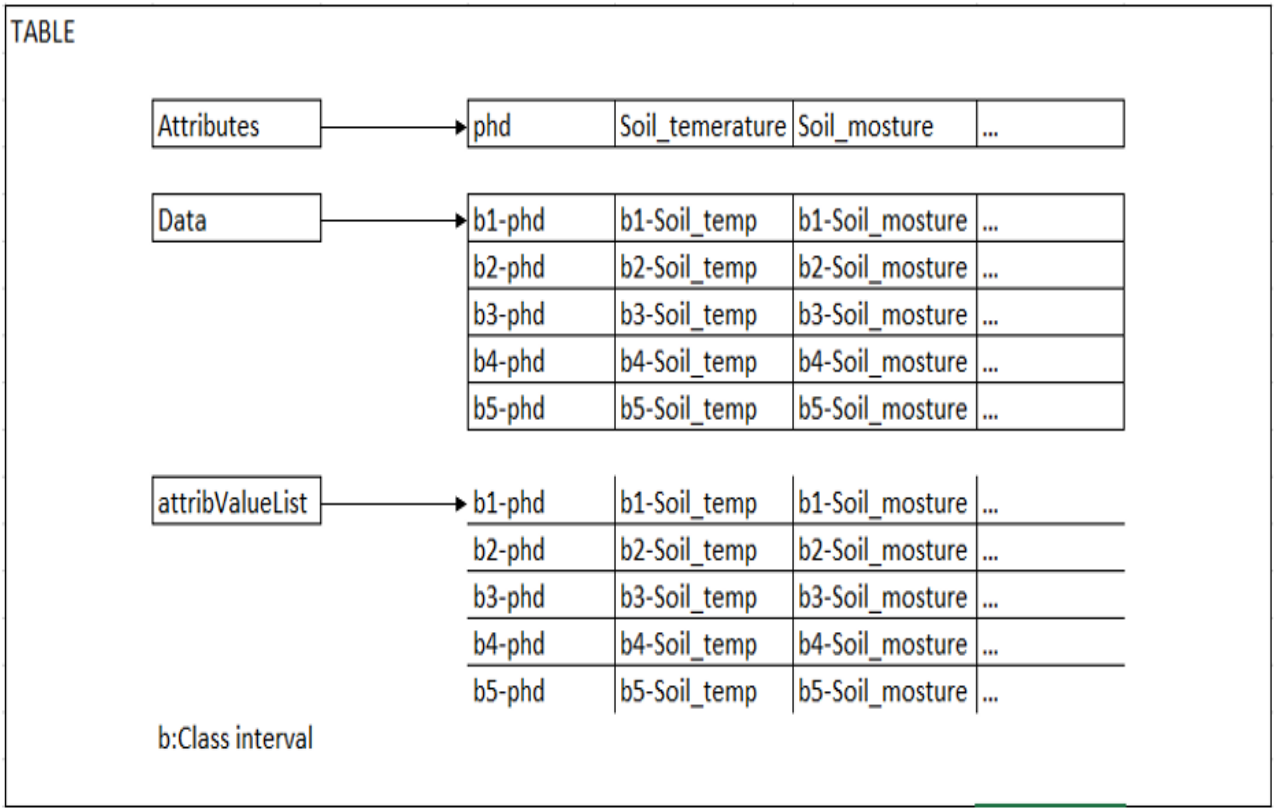


Figure 1: On the abstraction every data attribute represents a column and every data in the structure is allocated in a vector of vectors that represents the rows of the matrix

Data Structure Operations

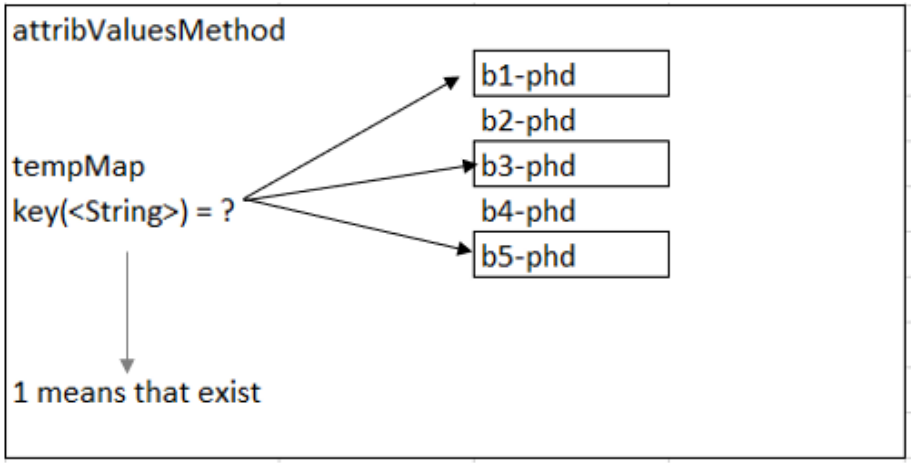


Figure 2: the attribValue Method contains only existent class intervals. It gives the categories on each column of the data set (already discretized).

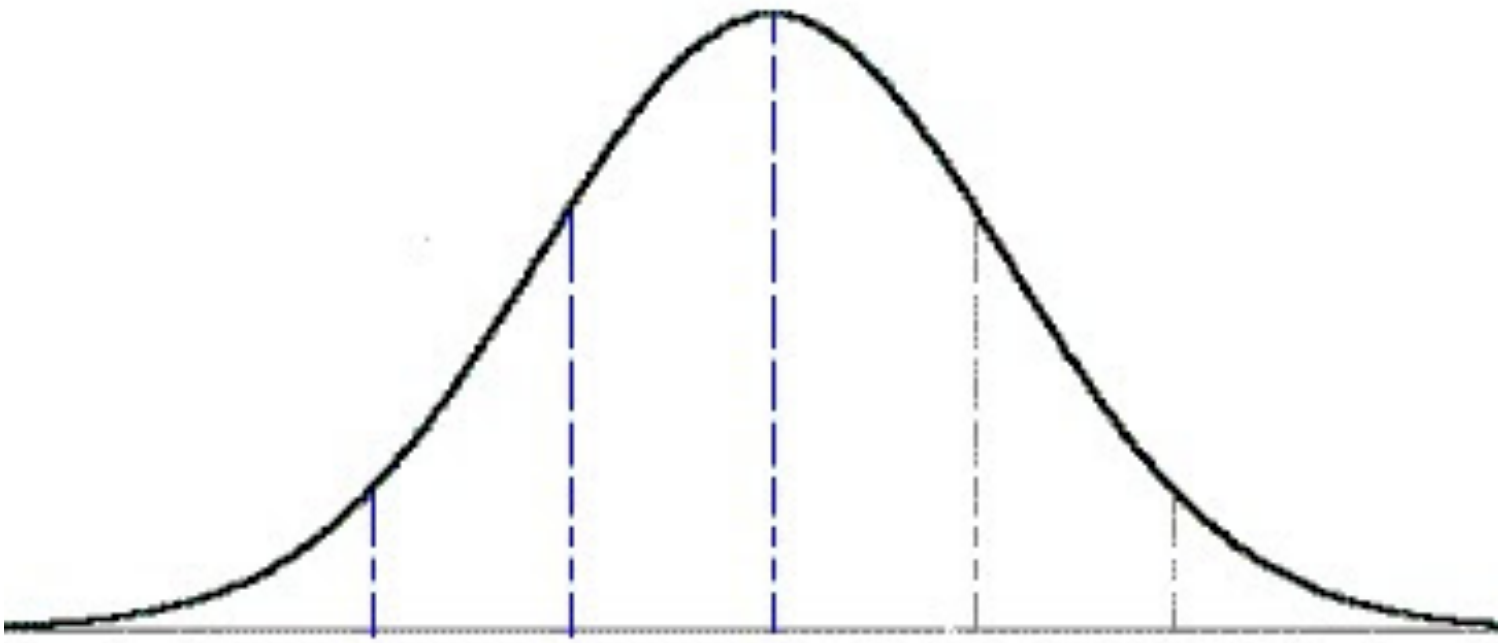
Figure 3 : Demonstrates how the data is discretized graphically.

discretizeData Method

phd	discretization	result
210,1		b1-phd
201,1		b2-phd
301,3		b1-phd
400,5		b1-phd
500,3		b3-phd
302,3		b2-phd

iluminance	discretization	result
11403		b1-illuminance
4000		b3-illuminance
2300,1		b2-illuminance
2000,1		b2-illuminance
4050		b3-illuminance
6000		b4-illuminance

Quartiles



Design Criteria of the Data Structure

Attributes: As string vectors.

Data: As vectors of string vectors.

Attribute List: As vectors of string vectors.

- The data values are stored in ArrayList to access the data in constant time and because its insert and delete qualities.
- The time complexity to access on ArrayList is O(1)
- ArrayList is suited to the way we want to address the problem
- On the abstraction the columns are represented by “Attributes” and the data categorization is represented by “Attribute List”

Designed Data Structure: BQPT

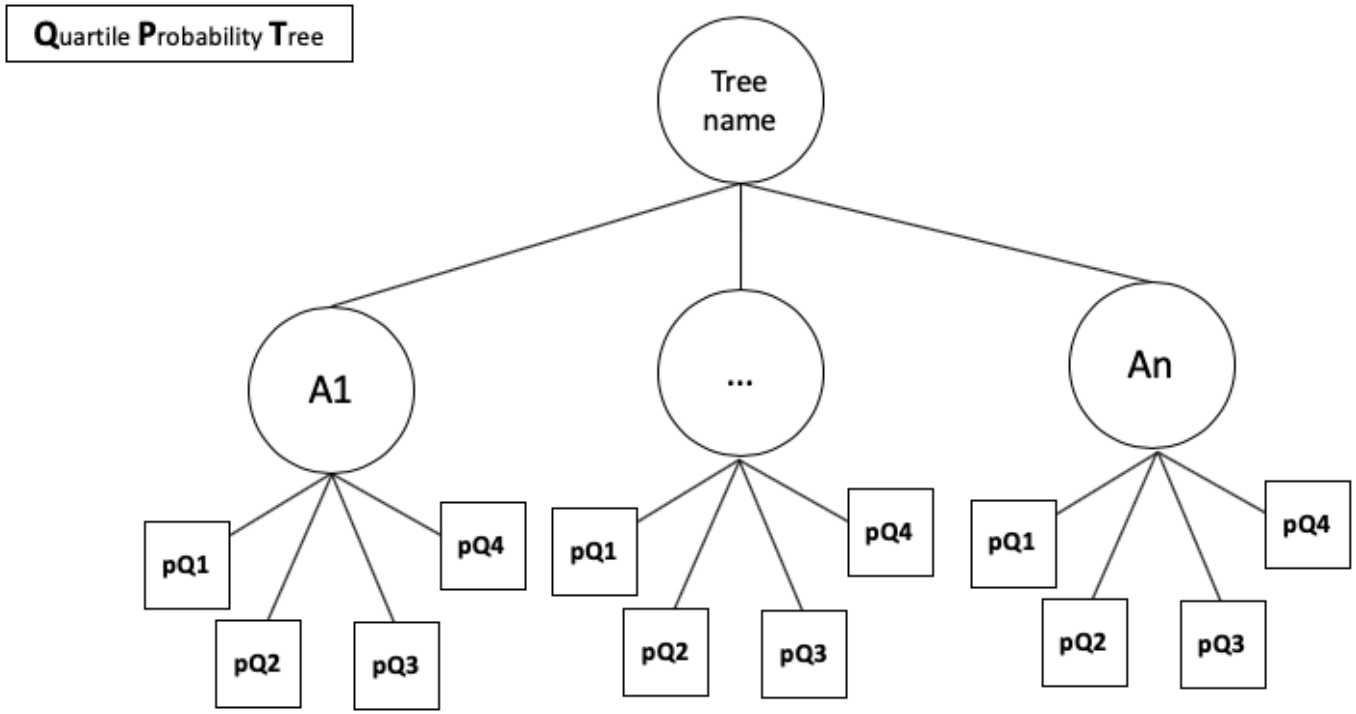
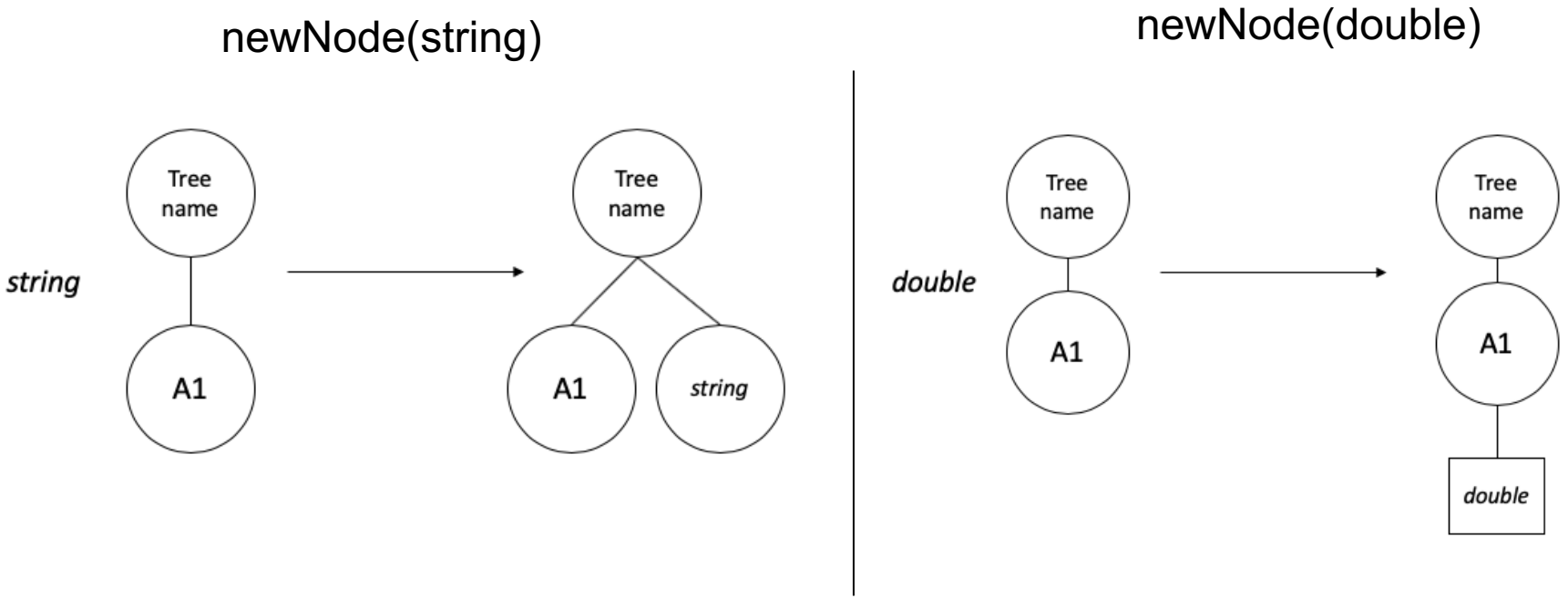


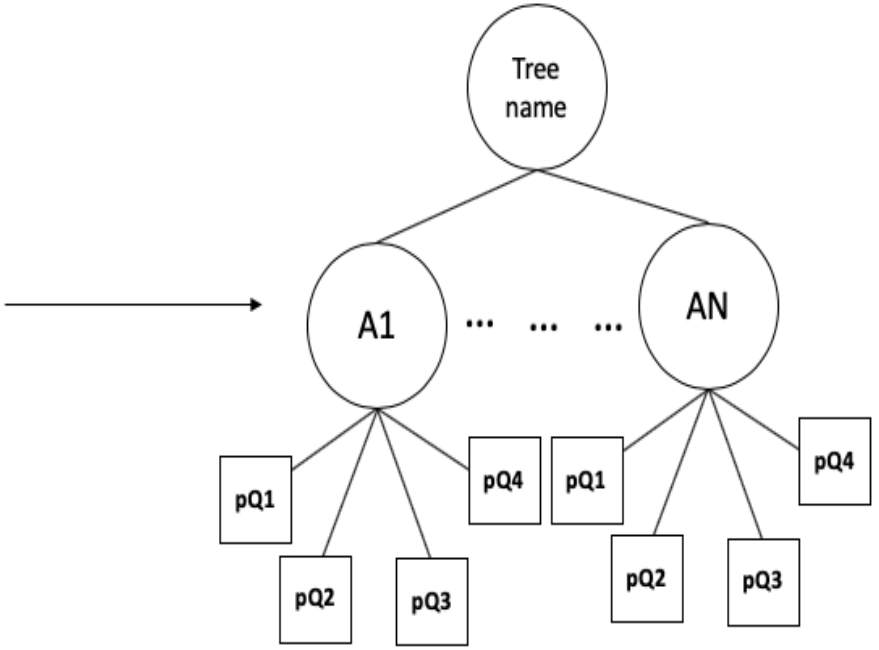
Figure 4: Abstraction of a Quartile probability tree. Each node represents a data attribute, all of them has 4 leaves; a leaf lodges a probability for the data in the class that the leaf represents

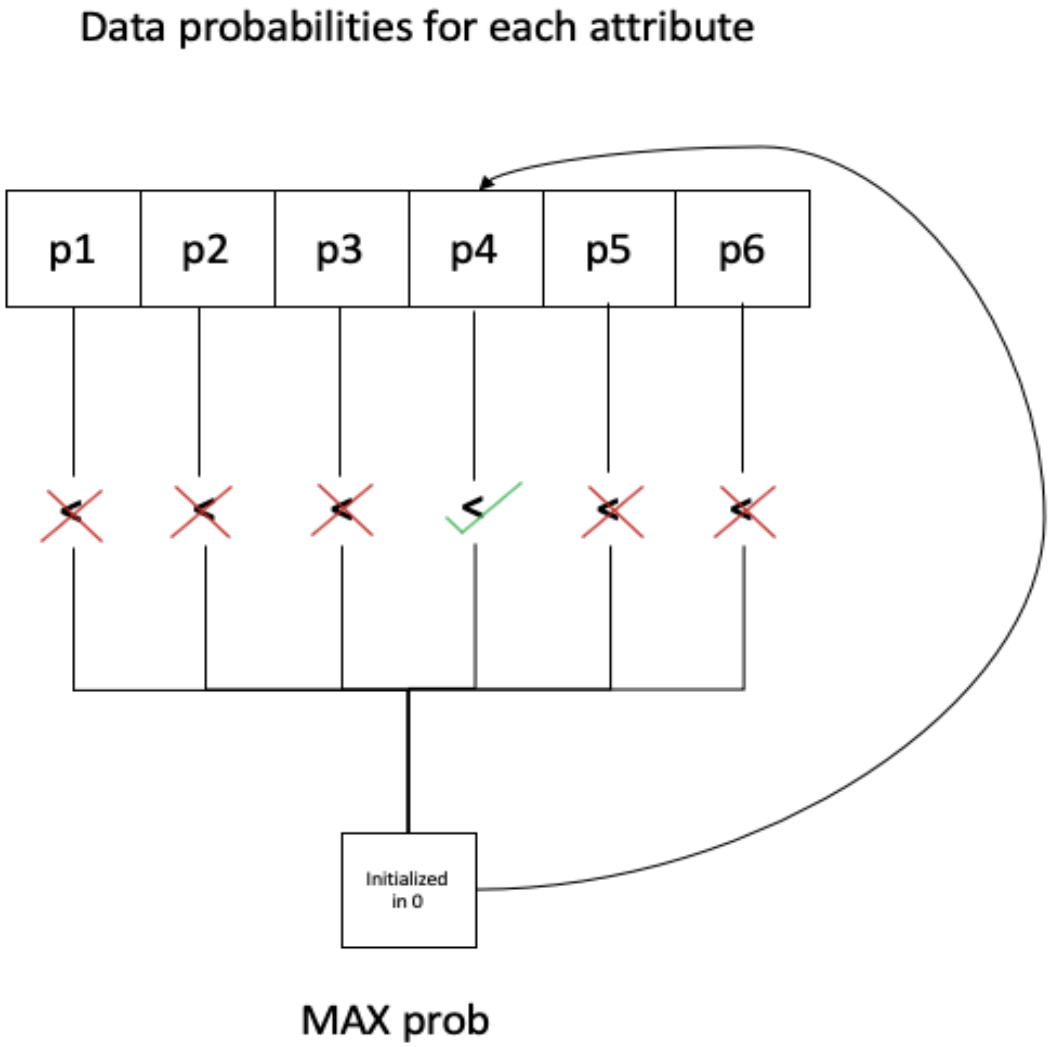
Data structure operations



make(DataFrame)

Attribute1	Attribute2	...	AttributeN
data1_A1	data1_A2	...	data1_AN
data2_A1	data2_A2	...	data2_AN
...	...	...	...
dataN_A1	dataN_A2	...	dataN_AN





decision(string)

Complexity Table

Method	Analysis
make()	O(crlog(r))
decision()	O(c2*r2)

c : Data frame columns used to train the tree

r : Data frame rows used to train the tree

c2 : Data frame columns used to predict

r2 : Data frame rows used to predict

Design Criteria of the Data Structure

- DataFrame:
  - Labels as string vectors
  - Data as vectors of double vectors
- Node:
  - Childs as vectors of nodes
  - Attribute as a string
  - Probability as double

- We need a structure that works as a tree
- Works for every dataset that can be a matrix n*s
- The distribution of the data in the class intervals using quartiles

Time and Memory Consumption

	DataSet1(300.csv)	DataSet2(373.csv)	DataSet3(457.csv)	DataSet4(673.csv)
make()	0.000131085s	0.000161801s	0.000197267s	0.000286038s
decision()	0.00299638s	0.00373048s	0.00449591s	0.00693759s

Table 4 : Execution time of the operations of the data structure BQPT for each data set

Table 5: Memory used for the implementation of the data structure and for each dataset

	DataSet1 (300.csv)	DataSet2(373.csv)	DataSet3(457.csv)	DataSet4(673.csv)
Memory Usage	3.2 MB	3.3 MB	3.6 MB	4 MB

Result Analysis

BQPT	Vectors	LinkedList
Creation	0.003011 - 0.00302 (s)	0.003011 - 0.00302 (s)
Memory Usage	3.2 - 4 (MB)	3.0 - 3.9 (MB)
Decision	0.0073 - 0.0016 (s)	0.0073 - 0.0016 (s)