Algorithm for prediction on the results of the ICFES Saber Pro exam results

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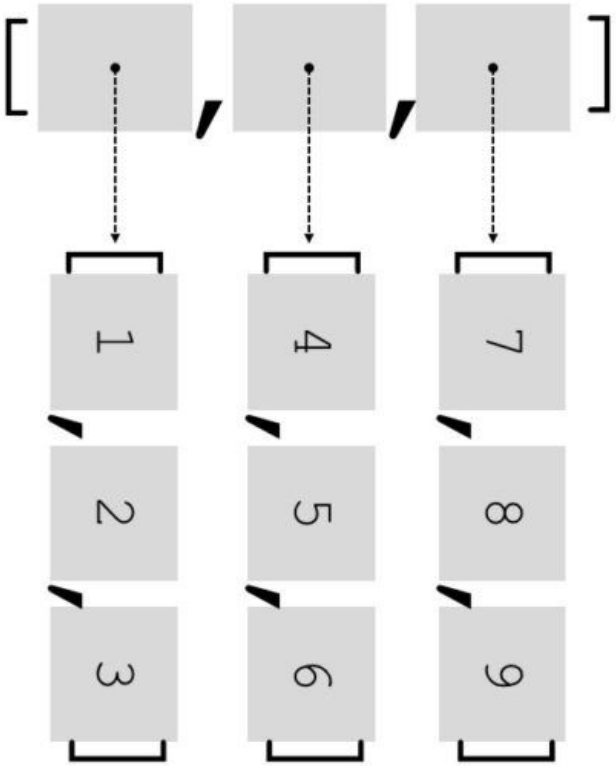
CART decision tree algorithm

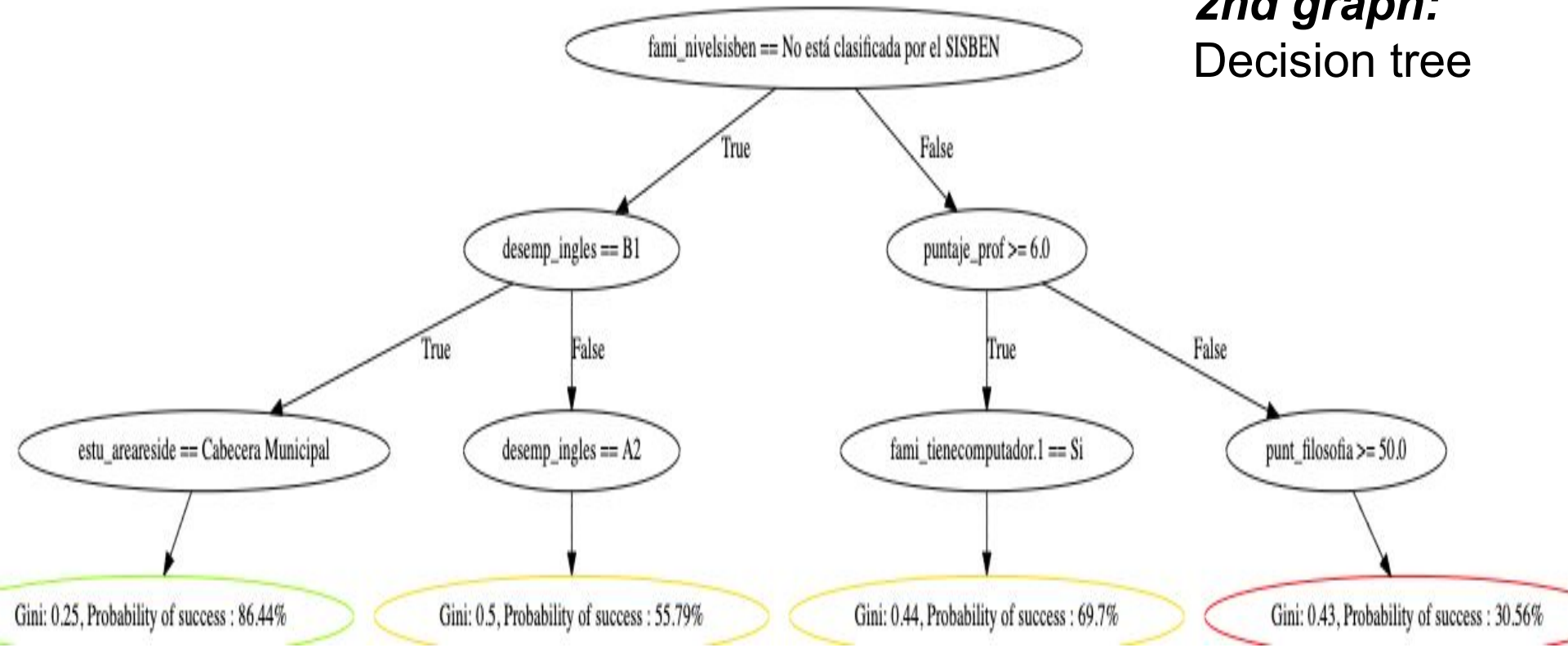


1st graph:

We used a list of lists to read and store the data.

CART decision tree algorithm

2nd graph:
Decision tree



Design Criteria of the Data Structure

The main elements of CART are:

1. Rules for splitting data at a node based on the value of one variable.
2. Stopping rules for deciding when a branch is terminal and can be split no more.
3. Finally, a prediction for the target variable in each terminal node.

Data Structure Operations

Function	Complexity	Function	Complexity
create_df	O(n)	information_gain	O(n x m)
labelling	O(n)	best_option	$O(n^2 \times m)$
is_number	O(1)	create_question	O(1)
best_value	O(n x m)	build_tree	$O(n^2 \times m)$
match	O(1)	print_tree	O(n x m)
partition	O(n)	predict	O(n)
gini	O(n)	classify	O(n x m)

Table 1: Time complexity for the data structure functions.

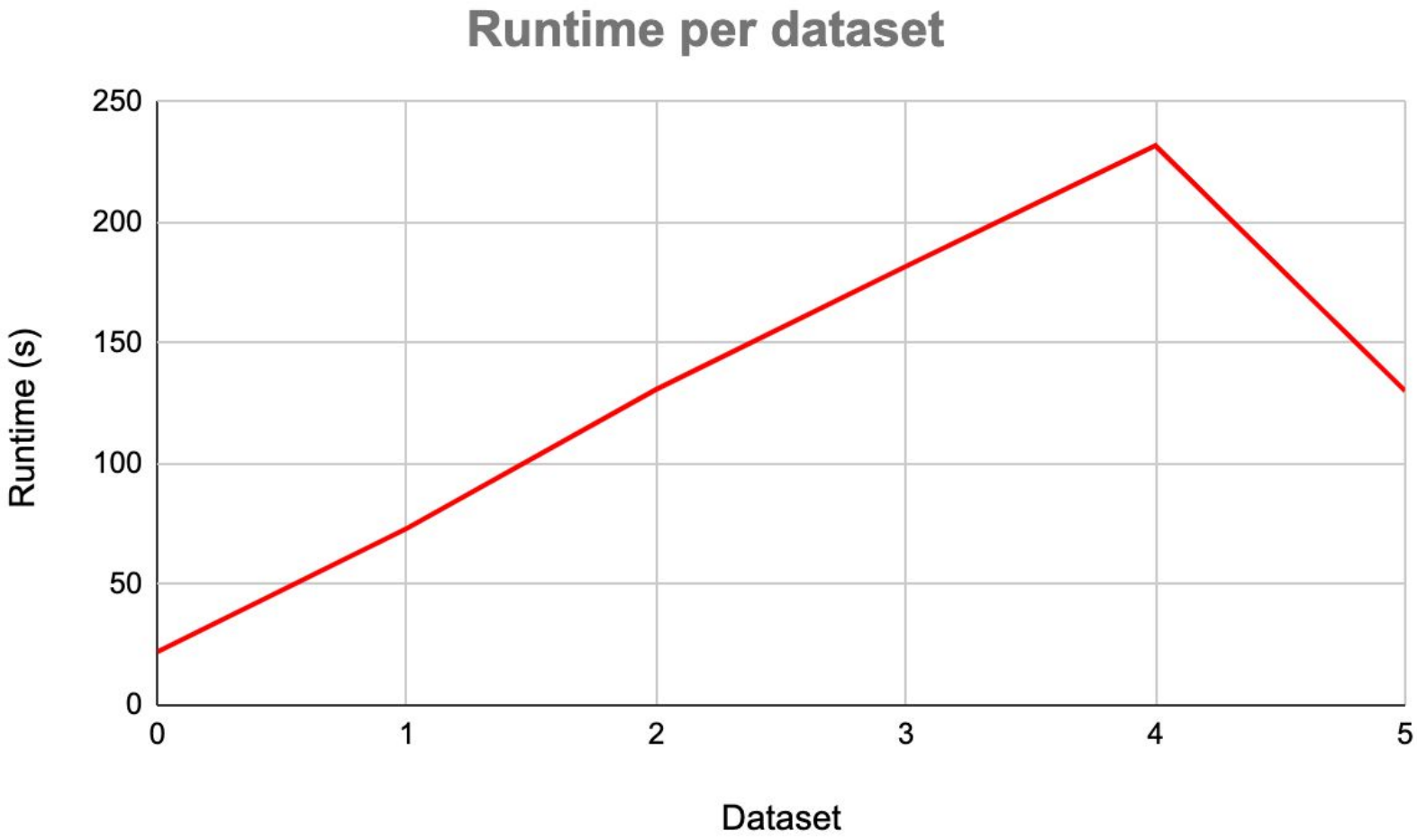
Total = $O(n^2 \times m)$

Time and Memory Consumption

Dataset	Runtime (S)	Memory Used (MB)	Accuracy (%)
0	22.08	74.20	71.22
1	73.29	194.74	71.86
2	130.95	314.88	70.74
3	181.91	435.09	72.26
4	231.89	555.46	70.85
5	130.31	244.06	70.91

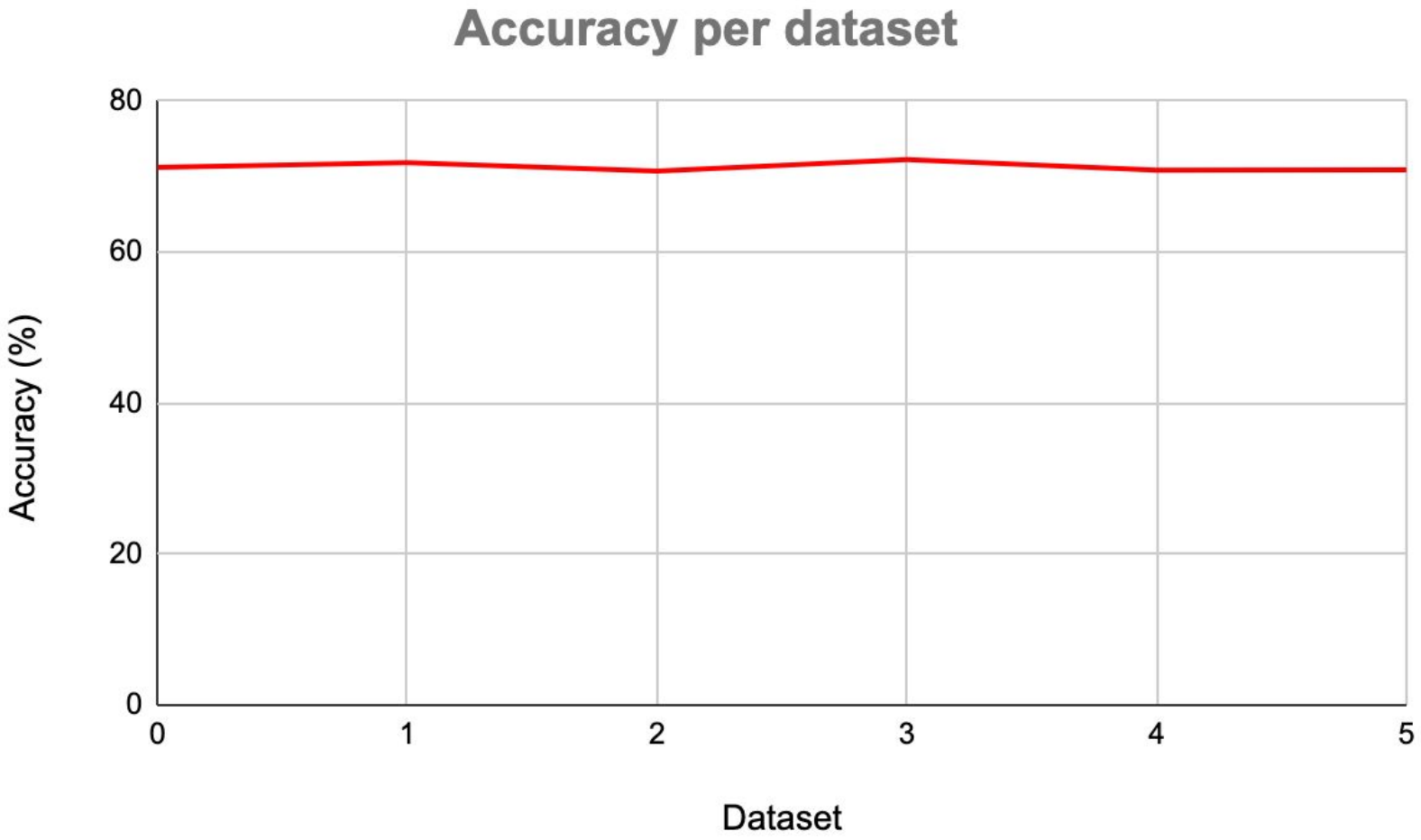
Table 2: Time and memory consumed by datasets of different sizes.

Time and Memory Consumption



Time and Memory Consumption

Prediction accuracy



Implementation

		Predicted by the algorithm	
		0	1
Actual Result	0	18733	3749
	1	9358	13160

Table 3: Confusion matrix