

Algorithmics	Student information	Date	Number of session
	UO: 293615		
	Surname: Lavelle		
	Name: Gersán		

## Activity 1. Explain proposed branching heuristic

The proposed branching heuristic aims to prioritize nodes that are closer to a complete path and whose cost is approaching the target cost, by combining cost deviation and path completeness into a single heuristic score.

## Activity 2. Time measurements

n	t_avg(ms)
20	0.04
...	...
100	0.3
...	...
150	0.68
...	...
200	1.15
...	...
250	1.8
...	...
300	2.65
...	...
350	3.58
...	...
400	4.63
...	...
450	5.81
...	...
500	7.55

These were the results I obtained when measuring the execution times of the branch and bound problem. The time complexity in the worse case in branch and bound is  $O(n!)$  but this is very problem dependent, and as we are working with random values when creating the weights matrix, it may not be as clear, but we can see that while the size grows, the times are getting much higher.

Algorithmics	Student information	Date	Number of session
	UO: 293615		
	Surname: Lavelle		
	Name: Gersán		

n	t_avg(ms)
200	21.93
205	22.84
210	24.07
...	...
250	34.12
255	35.55
260	37.35
...	...
300	49.21
305	50.63
310	52.77
...	...
350	66.83
355	70.64
360	69.99
..	...
400	87.19
405	87.47
410	91.93
...	...
450	114.82
455	115.39
460	118.13

These were the times obtained when using backtracking. As we can see, the times are higher than the branch and bound ones. That is because in backtracking we test every single possible path whether there is a possible solution or not, while in branch and bound we reduce it into only trying the paths that are better for leading to a solution.