Algorithmics	Student information	Date	Number of session
	UO: 299874	21/04/2025	10
	Surname: Puebla		
	Name: Álvaro		

Escuela de Ingeniería Informática
Universidad de Oviedo

Universidad de Oviedo
Universidá d'Uviéu
University of Oviedo

Activity 1. Branching heuristic

At each step you pick the next unvisited node whose edge-cost plus a cheap "best-case" estimate of the remaining tour is smallest. (Is taking the "best" unvisited node given a heuristic).

Before descending, you check if the current cost plus that estimate still could meet your target (within the tolerance). If not, you prune that branch.

This "best-bound" ordering and pruning makes you find a valid full tour much faster than pure backtracking.

Activity 2. Part D: Table

We measured average runtimes (in milliseconds) for two algorithms solving the NullPath problem as the number of nodes n increases:

n	t BaB (ms)	t Backtracking (ms)
20	161,774	0,080467
25	313,011	0,178919
30	564,334	0,32252
35	917,279	0,41224
40	1413,045	0,899015
45	OoT	2,014633
50	OoT	9,117259
55	OoT	2,94463
60	OoT	47,619499
65	OoT	11,25175
70	OoT	17,012901
75	OoT	110,366254
80	OoT	162,678025

Algorithmics	Student information	Date	Number of session
	UO: 299874	21/04/2025	10
	Surname: Puebla		
	Name: Álvaro		

Key observations:

1. **Initial advantage of Branch & Bound:**

   For n <= 20n, BaB completes in the hundreds of milliseconds, while backtracking finishes in under a millisecond.

2. **Rapid blow-up of BaB:**

   Between n=20 and n=40, BaB's runtime grows by almost an order of magnitude (from 0.16 S up to over 1.4 S) demonstrating its exponential sensitivity to problem size.

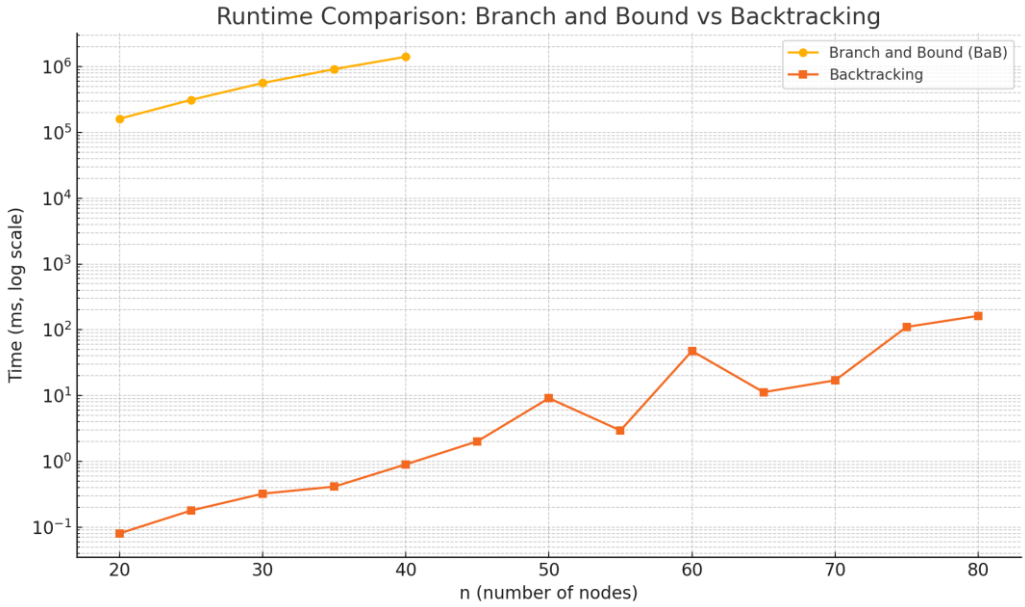
3. **Timeouts beyond n=40:**

   Starting at n=45, BaB fails to complete within our cutoff ("OoT"), whereas backtracking still manages to solve up to n=80 (albeit more slowly).

4. **Backtracking's steadier growth:**

   Although backtracking is far slower than BaB for small n, its runtime increases more gradually, peaking at ~163 mS for n=80, and never timing out in our experiments.

The log-scale comparison below



vividly shows BaB's steep rise and early collapse versus backtracking's gentler curve.