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Asymmetric traveling salesman problem

Afonso Fernandes nº93204
Duarte Correia nº93242
Miguel Milhazes nº93305

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Asymmetric traveling salesman problem - Algorithms

- Nearest Neighbour;
- Tabu Search;
- Ant Colony Optimization;

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Nearest Neighbour

Solution	Cost	Error
Best	8584	24.32%
Worst	10275	48.81%
Average	9319.87	34.97%
Benchmark	6905	–

Cost function results 53 nodes

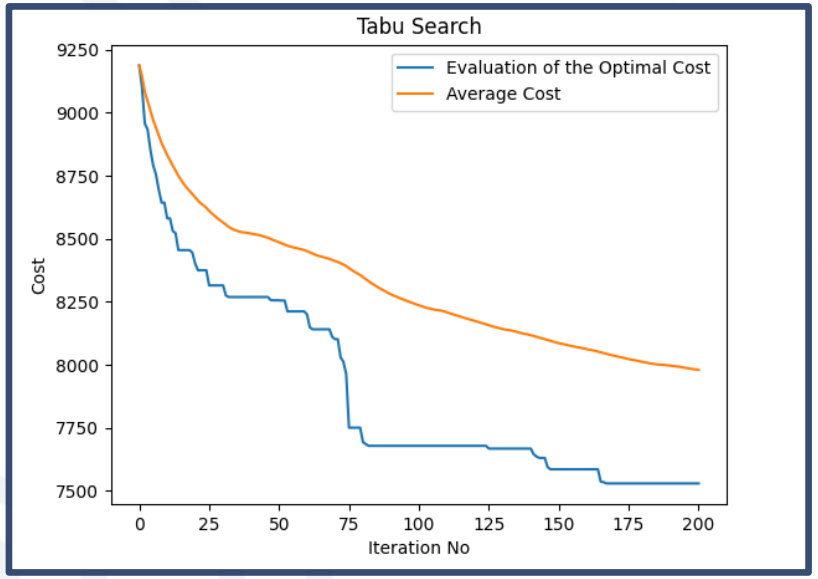
Solution	Cost	Error
Best	43316	19.56%
Worst	50587	39.63%
Average	46230.61	27.60%
Benchmark	36230	–

Cost function results 100 nodes

Tabu Search – 53 nodes

Solution	$n_{ite} = 50, \tau = 50$		$n_{ite} = 100, \tau = 50$		$n_{ite} = 200, \tau = 50$		$n_{ite} = 200, \tau = 10$	
	Cost	Error	Cost	Error	Cost	Error	Cost	Error
Best	8035	16.36%	7607	10.17%	7505	8.69%	7530	9.05%
Worst	8233	19.23%	8331	20.65%	8116	17.54%	8116	17.54%
Average	8121.8	17.62%	7947.3	15.09%	7796.9	12.92%	7799.4	12.95%
Benchmark	6905	–	6905	–	6905	–	6905	–

Cost function results 53 nodes

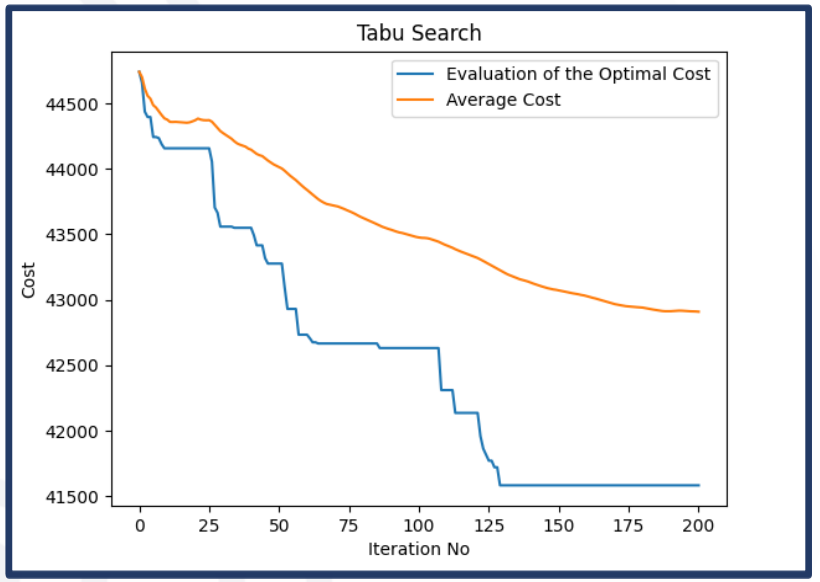


Variation of cost through iterations for 53 nodes

Tabu Search – 100 nodes

Solution	$n_{ite} = 50, \tau = 50$		$n_{ite} = 100, \tau = 50$		$n_{ite} = 200, \tau = 50$		$n_{ite} = 200, \tau = 10$	
	Cost	Error	Cost	Error	Cost	Error	Cost	Error
Best	41876	15.58%	41941	15.76%	40949	13.03%	40989	13.14%
Worst	43663	20.52%	42675	17.79%	42049	16.06%	42112	16.23%
Average	42697.6	17.85%	42422.8	17.09%	41636.4	14.92%	41749.4	15.23%
Benchmark	36230	–	36230	–	36230	–	36230	–

Cost function results 100 nodes



Variation of cost through iterations for 100 nodes

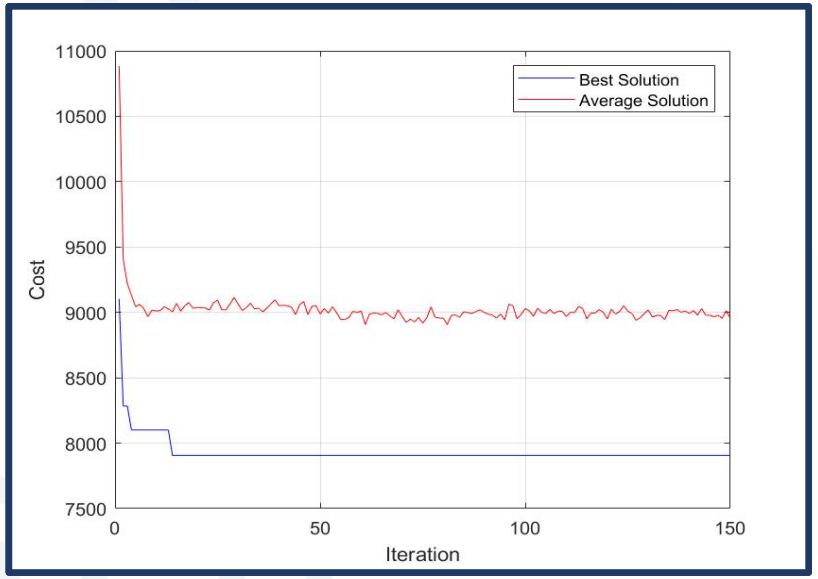
Ant Colony Optimization – 53 nodes

Solution	$n_{ite} = 100$, $n_{ant} = 50$		$n_{ite} = 100$, $n_{ant} = 100$		$n_{ite} = 150$, $n_{ant} = 150$	
	Cost	Error	Cost	Error	Cost	Error
Best	8447	22.32%	8306	20.29%	8223	19.09%
Worst	10256	48.53%	10149	46.98%	10226	48.10%
Average	9098	31.76%	8873.7	28.51%	8907.8	29.01%
Benchmark	6905	–	6905	–	6905	–

Solution	$\rho = 0.1$		$\rho = 0.3$		$\rho = 0.7$	
	Cost	Error	Cost	Error	Cost	Error
Best	8345	20.85%	8447	22.32%	8533	23.58%
Worst	10184	47.49%	10256	48.53%	10525	52.43%
Average	9074.1	31.41%	9098	31.76%	9127.9	32.19%
Benchmark	6905	–	6905	–	6905	–

Solution	$\alpha = 0$, $\beta = 5$		$\alpha = 2$, $\beta = 0$	
	Cost	Error	Cost	Error
Best	9523	37.91%	24930	261.04%
Worst	12460	80.45%	26602	285.26%
Average	10906	57.94%	25864	274.57%
Benchmark	6905	–	6905	–

Cost function results 53 nodes



Best and Average costs for best solution for 53 nodes

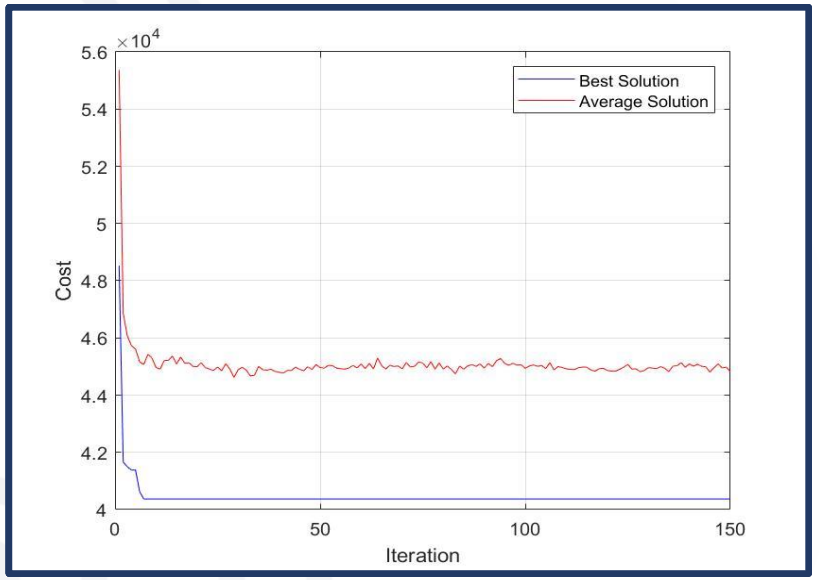
Ant Colony Optimization – 100 nodes

Solution	$n_{ite} = 50$, $n_{ant} = 100$		$n_{ite} = 100$, $n_{ant} = 100$		$n_{ite} = 150$, $n_{ant} = 150$	
	Cost	Error	Cost	Error	Cost	Error
Best	43496	20.06%	42394	17.01%	41536	14.65%
Worst	49478	36.57%	47965	32.39%	47951	32.35%
Average	45564	25.76%	44461	22.72%	43980	21.39%
Benchmark	36230	–	36230	–	36230	–

Solution	$\rho = 0.1$		$\rho = 0.3$		$\rho = 0.7$	
	Cost	Error	Cost	Error	Cost	Error
Best	42753	18.00%	43496	20.05%	42936	18.51%
Worst	48465	33.77%	49478	36.57%	49137	35.63%
Average	44815	23.70%	45564	25.76%	45331	25.12%
Benchmark	36230	–	36230	–	36230	–

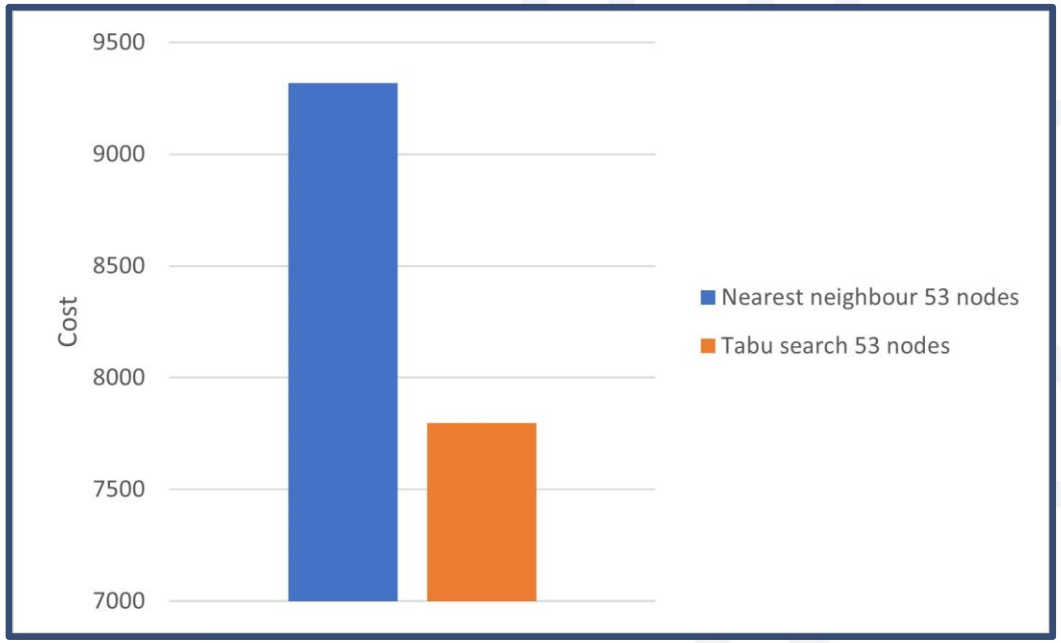
Solution	$\alpha = 0$, $\beta = 5$		$\alpha = 2$, $\beta = 0$	
	Cost	Error	Cost	Error
Best	49021	35.31%	186130	413.75%
Worst	61713	70.33%	192950	432.57%
Average	55259	52.52%	189540	423.16%
Benchmark	36230	–	36230	–

Cost function results 100 nodes

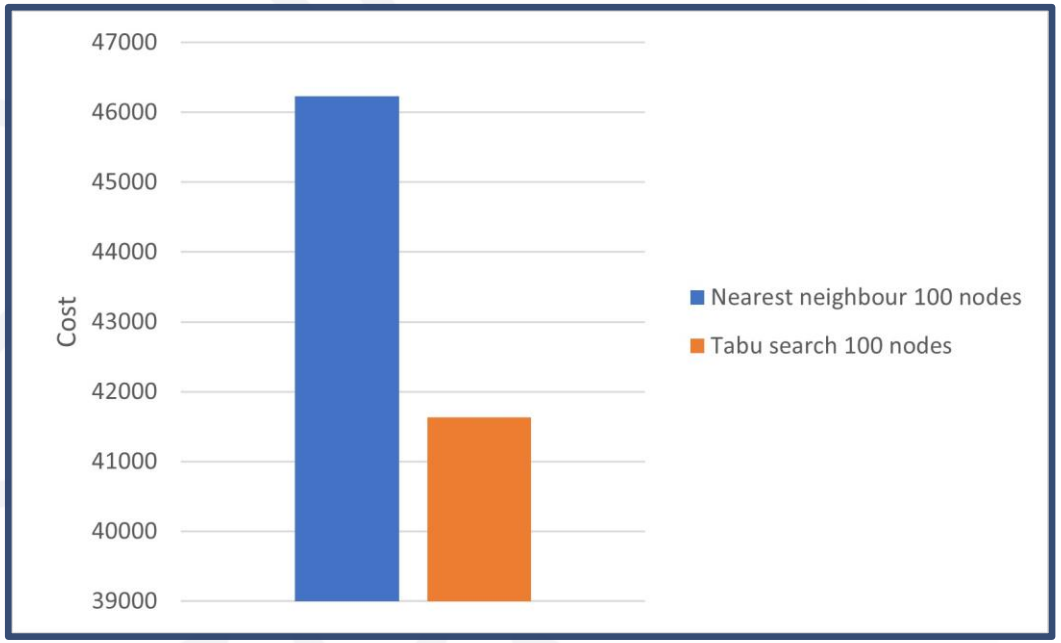


Best and Average costs for best solution for 100 nodes

Comparison of Results

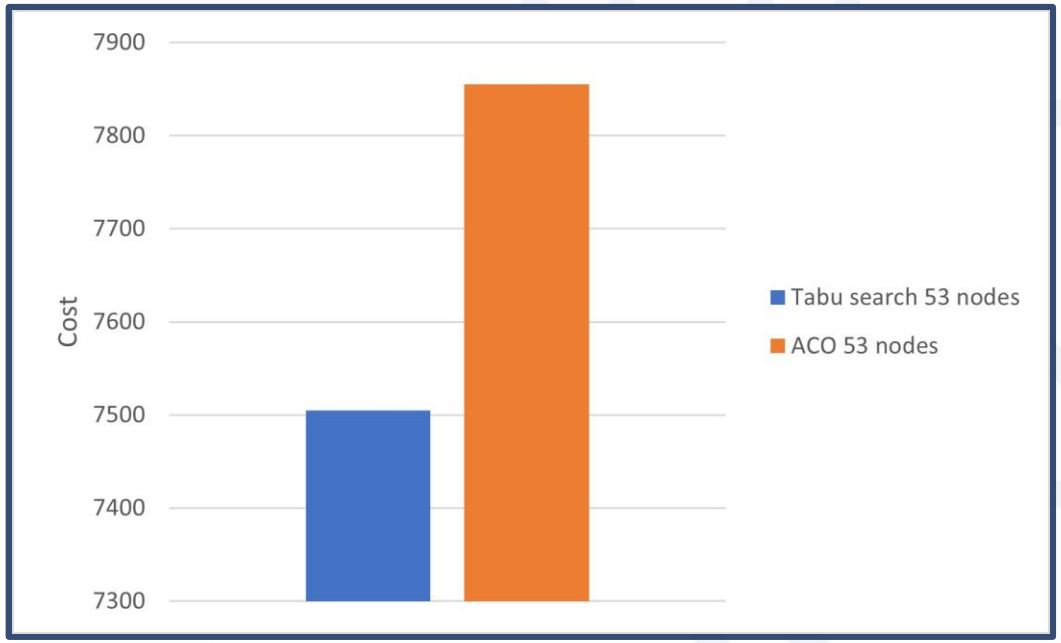


Comparison of NN and TS results for 53 nodes

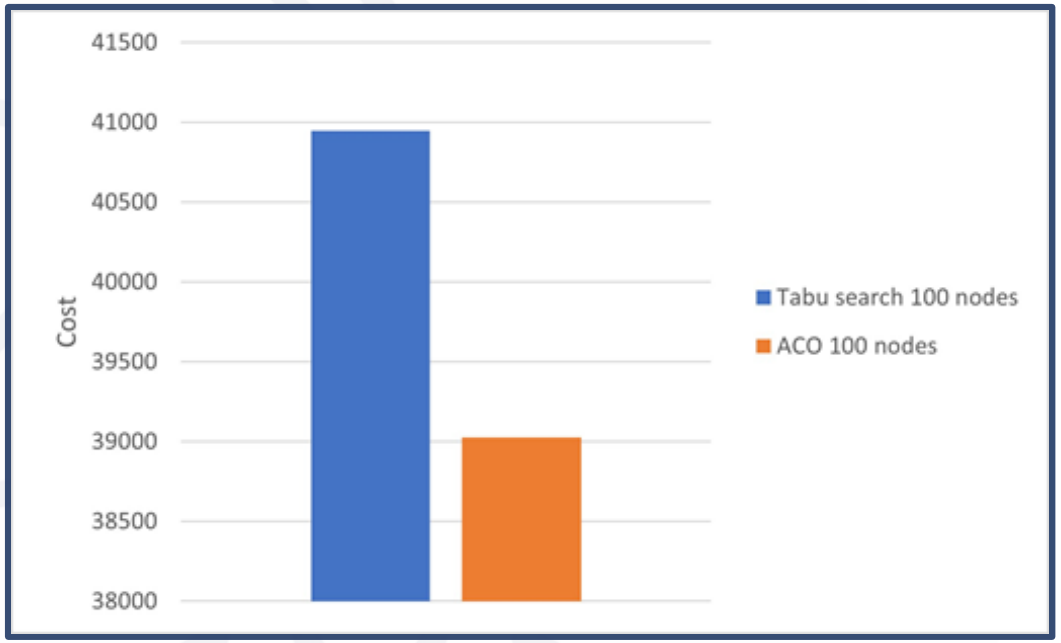


Comparison of NN and TS results for 100 nodes

Comparison of Results



Comparison of TS and ACO results for 53 nodes



Comparison of TS and ACO results for 100 nodes