Testlib200	GFACS				DeepACO				NeuFACO			
	min	mean	max	avg time	min	mean	max	avg time	min	mean	max	avg time
a280	2670 (3.53%)	2674 (3.68%)	2682 (3.99%)	16.76	2653 (2.87%)	2665 (3.37%)	2673 (3.64%)	16.99	**2642** (2.44%)	**2646** (2.61%)	**2663** (3.26%)	**0.67**
bier127	**118368** (0.07%)	**118368** (0.07%)	**118368** (0.07%)	5.20	**118368** (0.07%)	118450 (0.14%)	118575 (0.25%)	5.29	**118368** (0.07%)	**118368** (0.07%)	**118368** (0.07%)	**0.44**
ch130	6182 (1.18%)	**6186** (1.25%)	**6203** (1.52%)	5.41	6184 (1.21%)	6195 (1.39%)	6208 (1.60%)	5.31	**6177** (1.10%)	6188 (1.29%)	6232 (2.00%)	**0.43**
ch150	6631 (1.58%)	6638 (1.69%)	6646 (1.81%)	5.91	6639 (1.70%)	6652 (1.91%)	6678 (2.30%)	5.97	**6609** (1.24%)	**6619** (1.40%)	**6634** (1.62%)	**0.46**
d198	15930 (0.95%)	15937 (1.00%)	15945 (1.05%)	10.50	15933 (0.97%)	15965 (1.18%)	15990 (1.33%)	10.49	**15904** (0.79%)	**15911** (0.83%)	**15924** (0.91%)	**0.58**
eil101	**702** (11.61%)	703 (11.91%)	706 (12.24%)	4.36	**702** (11.61%)	706 (12.24%)	708 (12.56%)	4.33	**702** (11.61%)	**702** (11.67%)	**703** (11.76%)	**0.43**
gil262	2557 (7.53%)	2567 (7.99%)	2573 (8.20%)	15.01	2566 (7.91%)	2574 (8.25%)	2582 (8.58%)	15.28	**2542** (6.90%)	**2550** (7.25%)	**2558** (7.57%)	**0.59**
kroA100	**21346** (0.30%)	**21346** (0.30%)	**21346** (0.30%)	4.41	**21346** (0.30%)	**21346** (0.30%)	**21346** (0.30%)	4.33	**21346** (0.30%)	**21346** (0.30%)	**21346** (0.30%)	**0.52**
kroB100	**22185** (0.20%)	**22197** (0.26%)	**22225** (0.38%)	4.33	**22185** (0.20%)	22210 (0.31%)	22236 (0.43%)	4.32	**22185** (0.20%)	22201 (0.27%)	22243 (0.46%)	**0.54**
kroC100	**20802** (0.26%)	**20802** (0.26%)	**20802** (0.26%)	4.35	**20802** (0.26%)	20806 (0.28%)	20822 (0.35%)	4.36	**20802** (0.26%)	**20802** (0.26%)	**20802** (0.26%)	**0.51**
kroD100	**21347** (0.25%)	21373 (0.37%)	21403 (0.51%)	4.30	**21347** (0.25%)	21410 (0.55%)	21429 (0.63%)	4.38	**21347** (0.25%)	**21347** (0.25%)	**21347** (0.25%)	**0.51**
kroE100	22152 (0.38%)	22170 (0.47%)	22183 (0.52%)	4.32	**22123** (0.25%)	**22134** (0.30%)	**22161** (0.42%)	4.36	22152 (0.38%)	22170 (0.46%)	22174 (0.48%)	**0.52**
kroA150	**26609** (0.32%)	26648 (0.47%)	26729 (0.77%)	6.24	**26609** (0.32%)	26629 (0.40%)	26673 (0.56%)	6.11	**26609** (0.32%)	**26609** (0.32%)	**26609** (0.32%)	**0.45**
kroB150	26240 (0.42%)	26274 (0.55%)	26290 (0.61%)	6.12	26271 (0.54%)	26310 (0.69%)	26366 (0.90%)	6.15	**26207** (0.29%)	**26208** (0.30%)	**26209** (0.30%)	**0.46**
kroA200	29529 (0.55%)	29551 (0.62%)	29609 (0.82%)	9.39	29518 (0.51%)	29613 (0.84%)	29677 (1.05%)	9.46	**29480** (0.38%)	**29480** (0.38%)	**29480** (0.38%)	**0.60**
kroB200	29794 (1.21%)	29914 (1.62%)	30043 (2.06%)	9.40	29719 (0.96%)	29898 (1.57%)	30010 (1.95%)	9.56	**29552** (0.39%)	**29586** (0.51%)	**29844** (1.38%)	**0.60**
lin105	**14441** (0.43%)	**14441** (0.43%)	**14441** (0.43%)	4.61	**14441** (0.43%)	**14441** (0.43%)	**14441** (0.43%)	4.47	**14441** (0.43%)	**14441** (0.43%)	**14441** (0.43%)	**0.42**
pr107	**44329** (0.06%)	**44329** (0.06%)	**44329** (0.06%)	4.48	**44329** (0.06%)	**44329** (0.06%)	**44329** (0.06%)	4.53	**44329** (0.06%)	44337 (0.08%)	44415 (0.25%)	**0.42**
pr124	**59102** (0.12%)	**59102** (0.12%)	**59102** (0.12%)	4.91	**59102** (0.12%)	**59102** (0.12%)	**59102** (0.12%)	4.94	**59102** (0.12%)	**59102** (0.12%)	**59102** (0.12%)	**0.48**
pr136	**96832** (0.06%)	96923 (0.16%)	97021 (0.26%)	5.39	96839 (0.07%)	96942 (0.18%)	97014 (0.25%)	5.33	**96832** (0.06%)	**96850** (0.08%)	**96930** (0.16%)	**0.49**
pr144	**58641** (0.18%)	58644 (0.18%)	58675 (0.24%)	5.81	**58641** (0.18%)	**58641** (0.18%)	**58641** (0.18%)	5.98	**58641** (0.18%)	**58641** (0.18%)	**58641** (0.18%)	**0.67**
pr152	**73769** (0.12%)	**73769** (0.12%)	**73769** (0.12%)	6.25	**73769** (0.12%)	73769 (0.12%)	73772 (0.12%)	6.28	**73769** (0.12%)	73824 (0.19%)	73908 (0.31%)	**0.46**
pr226	80498 (0.16%)	80542 (0.22%)	80629 (0.32%)	12.06	80539 (0.21%)	80571 (0.25%)	80611 (0.30%)	12.04	**80457** (0.11%)	**80457** (0.11%)	**80457** (0.11%)	**0.58**
pr264	**49264** (0.26%)	**49264** (0.26%)	**49264** (0.26%)	14.95	**49264** (0.26%)	**49264** (0.26%)	**49264** (0.26%)	15.34	**49264** (0.26%)	**49264** (0.26%)	**49264** (0.26%)	**0.63**
pr299	48541 (0.73%)	48659 (0.97%)	48762 (1.18%)	20.72	48714 (1.09%)	48782 (1.23%)	48841 (1.35%)	20.30	**48334** (0.30%)	**48345** (0.32%)	**48432** (0.50%)	**0.68**
rat195	2470 (6.33%)	2476 (6.62%)	2484 (6.93%)	8.28	2485 (6.97%)	2495 (7.43%)	2506 (7.88%)	8.38	**2457** (5.77%)	**2457** (5.78%)	**2458** (5.81%)	**0.58**
rd100	**7958** (0.61%)	7959 (0.63%)	7964 (0.68%)	4.35	**7958** (0.61%)	7958 (0.61%)	7959 (0.62%)	4.34	**7958** (0.61%)	**7958** (0.61%)	**7958** (0.61%)	**0.53**
ts225	126927 (0.22%)	127092 (0.35%)	127218 (0.45%)	11.24	126930 (0.23%)	127086 (0.35%)	127219 (0.45%)	11.35	**126760** (0.09%)	**126774** (0.10%)	**126828** (0.15%)	**0.63**
tsp225	3958 (1.07%)	3969 (1.36%)	3986 (1.79%)	10.78	3970 (1.38%)	3975 (1.52%)	3987 (1.81%)	10.95	**3954** (0.97%)	**3959** (1.10%)	**3979** (1.61%)	**0.64**
u159	**42107** (0.06%)	42255 (0.42%)	42402 (0.77%)	6.47	**42107** (0.06%)	**42107** (0.06%)	**42107** (0.06%)	6.39	**42107** (0.06%)	**42107** (0.06%)	**42107** (0.06%)	**0.52**

Testlib500	GFACS				DeepACO				NeuFACO			
	min	mean	max	avg time	min	mean	max	avg time	min	mean	max	avg time
d493	35779 (2.22%)	35841 (2.40%)	35929 (2.65%)	66.22	35974 (2.78%)	36116 (3.18%)	36249 (3.56%)	71.86	**35338** (0.96%)	**35453** (1.29%)	**35513** (1.46%)	**1.10**
d657	50159 (2.55%)	50272 (2.78%)	50366 (2.97%)	140.31	50446 (3.14%)	50933 (4.13%)	51189 (4.66%)	140.61	**49476** (1.15%)	**49581** (1.37%)	**49644** (1.50%)	**1.35**
fl417	12174 (2.64%)	12184 (2.72%)	12190 (2.77%)	50.21	12185 (2.73%)	12195 (2.82%)	12206 (2.91%)	54.33	**12119** (2.18%)	**12122** (2.20%)	**12127** (2.24%)	**0.99**
lin318	42437 (0.97%)	42537 (1.21%)	**42654** (1.49%)	25.93	42811 (1.86%)	42891 (2.05%)	42950 (2.19%)	25.03	**42194** (0.39%)	**42439** (0.98%)	42696 (1.59%)	**0.83**
p654	34748 (0.30%)	35070 (1.23%)	35143 (1.44%)	164.44	**34512** (-0.38%)	35036 (1.13%)	35161 (1.50%)	162.94	34919 (0.80%)	**34930** (0.83%)	**34944** (0.87%)	**1.31**
pcb442	51469 (1.36%)	51606 (1.63%)	**51690** (1.80%)	50.51	51818 (2.05%)	51940 (2.29%)	52037 (2.48%)	44.47	**51232** (0.89%)	**51593** (1.61%)	51969 (2.35%)	**1.05**
pr439	107911 (0.65%)	**108104** (0.83%)	**108196** (0.91%)	50.94	108332 (1.04%)	108585 (1.28%)	108799 (1.48%)	47.12	**107469** (0.24%)	108129 (0.85%)	109522 (2.15%)	**1.13**
rat575	7226 (6.69%)	7246 (6.98%)	7266 (7.28%)	89.26	7378 (8.93%)	7399 (9.24%)	7413 (9.45%)	83.53	**7190** (6.16%)	**7209** (6.44%)	**7233** (6.79%)	**1.18**
rd400	15620 (2.22%)	15659 (2.47%)	15696 (2.72%)	43.26	15816 (3.50%)	15894 (4.01%)	15937 (4.29%)	37.70	**15521** (1.57%)	**15586** (2.00%)	**15648** (2.40%)	**0.96**
u574	37837 (2.53%)	37963 (2.87%)	38066 (3.15%)	94.13	38441 (4.16%)	38528 (4.40%)	38652 (4.73%)	88.98	**37343** (1.19%)	**37625** (1.95%)	**37749** (2.29%)	**1.16**

Method	Testlib200		Testlib500		Test200			Test500		
	Avg gap (%)	Avg time (s)	Avg gap (%)	Avg time (s)	Avg gap (%)	Avg time (s)	Avg cost	Avg gap (%)	Avg time (s)	Avg cost
DeepACO	1.55	7.91	3.45	75.66	0.97	9.44	10.80	1.98	64.16	17.03
GFACS	1.48	7.88	2.51	77.52	0.84	9.40	10.78	0.60	71.37	16.80
NeuFACO	**1.25**	**0.53**	**1.95**	**1.11**	**0.16**	**0.65**	**10.71**	0.74	**0.56**	16.83

	N	#	DeepACO	GFACS	NeuFACO(ours)
TSPLib	100–299	30	1.71%	1.25%	**1.21%**
	300–699	10	4.26%	2.70%	**2.60%**
	700–1499	12	7.01%	4.08%	**3.88%**
TSP	100–299	10	**2.50%**	3.27%	2.69%
	300–699	10	3.75%	4.22%	**3.71%**
	700–1001	128	4.64%	5.07%	**4.32%**

Method	TSP500 Obj.	Gap(%)	Time	TSP1000 Obj.	Gap(%)	Time	Method	CVRP500 Obj.	Gap(%)	Time	CVRP1000 Obj.	Gap(%)	Time
Concorde	16.55	–	10.7s	23.12	–	108s	PyVRP	62.96	–	21.0m	119.29	–	1.4h
LKH-3	16.55	0.02	31.7s	23.14	0.10	102s	LKH-3	63.07	0.18	18.6m	119.52	0.20	2.1h
AM*	21.46	29.07	0.6s	33.55	45.10	1.5s							
POMO*	20.57	24.40	0.6s	32.90	42.30	4.1s	POMO	68.69	9.08	2s	145.74	22.14	3s
+EAS	18.25	10.29	300s	30.77	33.06	600s	+EAS	64.76	2.85	5.0m	126.25	5.83	10.0m
+SGBS	18.86	13.98	318s	28.58	23.61	605s	+SGBS	65.44	3.93	5.2m	127.90	7.21	10.1m
DIMES*	17.01	2.78	11s	24.45	5.75	32s	Sym-NCO	68.81	9.28	2s	141.82	18.86	3s
SO*	16.94	2.40	15s	23.77	2.80	26s	+EAS	64.63	2.65	5.0m	125.58	5.27	10.0m
Pointerformer*	17.14	3.56	14s	24.80	7.90	40s	+SGBS	65.40	3.87	5.2m	127.53	6.90	10.1m
ACO	17.38	5.04	14s	24.76	7.09	57s	ACO	64.62	2.63	36s	122.82	2.96	1.3m
DeepACO	16.84	1.77	15s	23.78	2.87	66s	DeepACO	64.49	2.43	36s	122.15	2.40	1.3m
GFACS	**16.80**	**1.56**	**15s**	**23.72**	**2.63**	**66s**	GFACS	**64.19**	**1.95**	**36s**	**121.80**	**2.11**	**1.3m**

	N	#	DeepACO	GFACS	NeuFACO
	100–299	30	1.50%	1.44%	**1.39%**
			13.70s	13.75s	**0.22s**
TSP Lib	300–699	10	3.43%	2.46%	**2.06%**
			143.92s	150.49s	**0.48s**
	700–1499	12	4.86%	3.99%	**2.98%**
			1047.59s	1141.24s	**1.03s**
	200	64	1.91%	1.83%	**1.74%**
			16.78s	16.84s	**0.32s**
TSP Random	500	64	2.92%	**1.45%**	1.48%
			118.67s	140.87s	**0.77s**
	1000	32	4.53%	2.66%	**2.19%**
			652.46s	731.17s	**2.01s**

Dataset	N	#	DeepACO		GFACS		NeuFACO	
			Gap(%)	Time(s)	Gap(%)	Time(s)	Gap(%)	Time(s)
TSP Lib	$100-299$	30	1.50	13.70	1.44	13.75	**1.39**	**0.22**
	$300-699$	10	3.43	143.92	2.46	150.49	**2.06**	**0.48**
	$700-1499$	12	4.86	1047.59	3.99	1141.24	**2.98**	**1.03**
TSP Random	200	64	1.89	16.86	1.80	17.36	**1.66**	**0.28**
	500	64	3.03	119.58	1.54	136.14	**1.50**	**0.74**
	1000	32	4.44	652.46	2.57	731.17	**2.19**	**1.98**

Method	TSPLib200		TSPLib500		TSPLib1000		Method	TSP200		TSP500		TSP1000	
	Gap(%)	Time	Gap(%)	Time	Gap(%)	Time		Gap(%)	Time	Gap(%)	Time	Gap(%)	Time
DeepACO	1.50	13.70s	3.43	143.92s	4.86	1047.59s	DeepACO	1.89	16.86s	3.03	119.58s	4.44	652.46s
GFACS	1.44	13.75s	2.46	150.49s	3.99	1141.24s	GFACS	1.80	17.36s	1.54	136.14s	2.57	731.17s
NeuFACO	**1.39**	**0.22s**	**2.06**	**0.48s**	**2.98**	**1.03s**	NeuFACO	**1.66**	**0.28s**	**1.50**	**0.74s**	**2.19**	**1.98s**