

Detailed results on Datasets A and D

In Tables EC.1–EC.5, we report detailed results for LNS-ATCI–25k and CCG on Datasets A and D. For LNS-ATCI–25k, we perform 10 runs on the instances of Dataset D, but only one run on those of Dataset A because the latter are easy to solve. We report the best objective function value UB_{init} obtained in the specified number of runs and the total time t_{heu} to perform all runs. Additionally, we report the time t_{clu} that we spend to generate the routes Φ and clusters $\hat{\Omega}$ in Step 2 of CCG. We calculate percentage gaps Δ_x of lower bound x to the best upper bound obtained, i.e., the minimum of UB_{final} and UB_{init} . Optimal solutions are marked in bold, and timeouts in italics. Finally, we indicate all cases of insufficient memory with OOM.

Table EC.1 Detailed results on small instances of Dataset A

Inst	LNS-ATCI		CCG													t_{tot}
	UB_{init}	t_{heu}	$ \Phi $	$ \hat{\Omega}' $	t_{clu}	$z(\text{LP}_1)$	$\Delta_{z(\text{LP}_1)}$	$z(\text{LP}_2)$	$\Delta_{z(\text{LP}_2)}$	$ \hat{\Omega}'' $	$z(\overline{\text{SP}})$	$\Delta_{z(\overline{\text{SP}})}$	$ \overline{\Omega} $	UB_{final}	t_{noUB}	
1_10	142.03	5.1	305	744	0.1	142.03	100.0	142.03	100.0	5	142.03	100.0	2	142.03	0.1	5.2
2_10	121.07	2.5	760	951	0.1	118.15	97.6	121.07	100.0	9	121.07	100.0	2	121.07	0.1	2.6
3_10	149.41	2.6	1221	774	0.1	149.41	100.0	149.41	100.0	10	149.41	100.0	2	149.41	0.1	2.7
4_10	150.89	2.4	753	801	0.1	150.89	100.0	150.89	100.0	9	150.89	100.0	2	150.89	0.1	2.5
5_10	132.31	3.4	718	810	0.1	126.90	95.9	130.77	98.8	14	132.31	100.0	4	132.31	0.2	3.6
1_12	171.02	3.2	852	2150	0.1	169.14	98.9	170.93	99.9	19	171.02	100.0	2	171.02	0.1	3.3
2_12	111.54	3.0	657	3743	0.1	110.96	99.5	110.96	99.5	11	111.54	100.0	2	111.54	0.1	3.2
3_12	145.69	2.8	1573	3666	0.1	145.32	99.8	145.32	99.8	10	145.69	100.0	4	145.69	0.2	3.0
4_12	166.37	3.4	928	2317	0.1	161.49	97.1	164.01	98.6	47	166.37	100.0	13	166.37	0.5	3.9
5_12	140.42	3.1	1188	3412	0.1	138.36	98.5	139.75	99.5	11	140.42	100.0	5	140.42	0.2	3.3
Avg		3.2	896	1937	0.1		98.7		99.6	15		100.0	4		0.2	3.3

Table EC.2 Detailed results on new instances of Dataset D with 20 customers and route duration

Inst	LNS-ATCI			CCG												UB _{final}	t _{noUB}	t _{tot}
	UB _{init}	t _{heu}	$ \Phi $	$ \hat{\Omega}' $	t _{clu}	z(LP ₁)	$\Delta_{z(LP_1)}$	z(LP ₂)	$\Delta_{z(LP_2)}$	$ \hat{\Omega}'' $	z($\overline{SP}$)	$\Delta_{z(\overline{SP})}$	$ \overline{\Omega} $					
6_19_0.5_0.4	1247.04	92.0	3948	357 551	0.2	1224.64	98.2	1228.09	98.5	89	1247.04	100.0	14	1247.04	0.8	92.8		
6_19_0.5_0.6	1228.12	81.5	3948	357 551	0.2	1224.64	99.7	1228.09	100.0	13	1228.12	100.0	2	1228.12	0.4	81.9		
6_19_0.5_0.8	1228.12	68.4	3948	357 551	0.2	1224.64	99.7	1228.09	100.0	13	1228.12	100.0	2	1228.12	0.4	68.8		
6_19_0.5_1.0	1228.12	49.7	3948	357 551	0.2	1224.64	99.7	1228.09	100.0	13	1228.12	100.0	2	1228.12	0.4	50.0		
6_19_0.7_0.4	1992.41	158.7	33 136	79 766	0.2	1950.73	97.9	1952.14	98.0	529	1992.41	100.0	24	1992.41	4.5	163.2		
6_19_0.7_0.6	1982.33	93.5	33 136	79 766	0.2	1950.73	98.4	1952.14	98.5	267	1982.33	100.0	7	1982.33	1.2	94.7		
6_19_0.7_0.8	1974.50	80.3	33 136	79 766	0.2	1950.73	98.8	1952.14	98.9	167	1974.5	100.0	4	1974.50	0.5	80.8		
6_19_0.7_1.0	1971.66	63.6	33 136	79 766	0.2	1950.73	98.9	1952.14	99.0	118	1971.66	100.0	3	1971.66	0.4	64.0		
6_19_0.9_0.4	2159.29	186.0	113 561	51 606	0.3	2149.89	99.6	2149.89	99.6	27	2159.29	100.0	9	2159.29	1.7	187.7		
6_19_0.9_0.6	2156.01	170.4	113 561	51 606	0.2	2146.46	99.6	2149.03	99.7	23	2156.01	100.0	6	2156.01	0.9	171.2		
6_19_0.9_0.8	2154.30	112.6	113 561	51 606	0.3	2132.27	99.0	2149.89	99.8	23	2154.3	100.0	5	2154.30	0.8	113.3		
6_19_0.9_1.0	2149.91	70.5	113 561	51 606	0.3	2149.04	100.0	2149.04	100.0	11	2149.91	100.0	3	2149.91	0.3	70.8		
7_20_0.5_0.4	1395.44	81.8	1456	88 035	0.1	1375.47	98.6	1375.47	98.6	74	1395.44	100.0	28	1395.44	0.9	82.8		
7_20_0.5_0.6	1378.31	69.0	1456	88 035	0.2	1375.47	99.8	1375.47	99.8	29	1378.31	100.0	6	1378.31	0.3	69.3		
7_20_0.5_0.8	1377.14	47.5	1456	88 035	0.2	1375.47	99.9	1375.47	99.9	37	1377.14	100.0	6	1377.14	0.3	47.8		
7_20_0.5_1.0	1375.50	34.4	1456	88 035	0.2	1375.47	100.0	1375.47	100.0	18	1375.5	100.0	3	1375.50	0.2	34.6		
7_20_0.7_0.4	2117.73	114.3	13 883	13 247	0.1	2015.68	95.2	2030.08	95.9	1124	2117.73	100.0	41	2117.73	11.7	126.0		
7_20_0.7_0.6	2030.11	87.3	13 883	13 247	0.1	2030.08	100.0	2030.08	100.0	9	2030.11	100.0	3	2030.11	0.2	87.4		
7_20_0.7_0.8	2030.11	69.2	13 883	13 247	0.1	2030.08	100.0	2030.08	100.0	9	2030.11	100.0	3	2030.11	0.2	69.3		
7_20_0.7_1.0	2030.11	56.9	13 883	13 247	0.1	2030.08	100.0	2030.08	100.0	9	2030.11	100.0	3	2030.11	0.1	57.1		
7_20_0.9_0.4	2339.56	122.3	24 364	10 175	0.1	2329.8	99.6	2329.8	99.6	10	2339.56	100.0	5	2339.56	0.4	122.7		
7_20_0.9_0.6	2334.67	91.8	24 364	10 175	0.1	2329.8	99.8	2329.8	99.8	11	2334.67	100.0	4	2334.67	0.3	92.0		
7_20_0.9_0.8	2334.44	80.9	24 364	10 175	0.1	2314.73	99.2	2327.25	99.7	24	2334.44	100.0	4	2334.44	0.3	81.2		
7_20_0.9_1.0	2329.84	63.5	24 364	10 175	0.1	2329.8	100.0	2329.8	100.0	7	2329.84	100.0	4	2329.84	0.2	63.7		
8_20_0.5_0.4	1391.32	101.4	6089	672 447	0.4	1349.13	97.0	1356.94	97.5	231	1391.32	100.0	57	1391.32	18.1	119.5		
8_20_0.5_0.6	1370.20	117.7	6089	672 447	0.3	1349.32	98.5	1356.94	99.0	32	1370.2	100.0	17	1370.20	1.4	119.1		
8_20_0.5_0.8	1356.96	100.3	6089	672 447	0.4	1356.94	100.0	1356.94	100.0	6	1356.96	100.0	2	1356.96	0.6	100.8		
8_20_0.5_1.0	1356.96	47.4	6089	672 447	0.4	1356.94	100.0	1356.94	100.0	6	1356.96	100.0	2	1356.96	0.5	47.9		
8_20_0.7_0.4	2001.81	137.2	44 334	245 517	0.3	1911.73	95.5	1911.73	95.5	236	2001.81	100.0	57	2001.81	123.1	260.3		
8_20_0.7_0.6	1929.03	122.1	44 334	245 517	0.3	1911.73	99.1	1911.73	99.1	27	1929.03	100.0	3	1929.03	1.3	123.4		
8_20_0.7_0.8	1917.23	105.1	44 334	245 517	0.3	1911.73	99.7	1911.73	99.7	21	1917.23	100.0	3	1917.23	0.6	105.7		
8_20_0.7_1.0	1911.73	64.8	44 334	245 517	0.3	1911.73	100.0	1911.73	100.0	6	1911.73	100.0	2	1911.73	0.5	65.3		
8_20_0.9_0.4	2338.99	257.6	219 512	132 131	0.5	2256.59	96.5	2273.16	97.2	1088	2338.83	100.0	36	2338.83	63.8	321.4		
8_20_0.9_0.6	2274.02	112.7	219 512	132 131	0.4	2274.02	100.0	2274.02	100.0	9	2274.02	100.0	3	2274.02	0.5	113.2		
8_20_0.9_0.8	2274.02	105.4	219 512	132 131	0.4	2274.02	100.0	2274.02	100.0	9	2274.02	100.0	3	2274.02	0.6	105.9		
8_20_0.9_1.0	2274.02	80.7	219 512	132 131	0.5	2274.02	100.0	2274.02	100.0	9	2274.02	100.0	3	2274.02	0.6	81.3		
Avg.		97.2	51 143	183 386	0.2		99.1		99.3	120		100.0	11		6.6	103.8		

Table EC.3 Detailed results on new instances of Dataset D with 20 customers and without route duration

Inst	LNS-ATCI			CCG												UB _{final}	t _{noUB}	t _{tot}
	UB _{init}	t _{heu}	Φ	Ω'	t _{clu}	z(LP ₁)	Δ _{z(LP₁)}	z(LP ₂)	Δ _{z(LP₂)}	Ω''	z(SP̄)	Δ _{z(SP̄)}	Ω					
6_19_0.5_0.4	1247.04	92.9	4310	453 087	0.2	1214.53	97.4	1214.53	97.4	535	1247.04	100.0	25	1247.04	14.8	107.6		
6_19_0.5_0.6	1221.59	88.9	4310	453 087	0.2	1214.53	99.4	1214.53	99.4	11	1221.59	100.0	2	1221.59	0.6	89.5		
6_19_0.5_0.8	1216.89	85.1	4310	453 087	0.2	1214.53	99.8	1214.53	99.8	14	1216.89	100.0	2	1216.89	0.5	85.6		
6_19_0.5_1.0	1214.56	53.6	4310	453 087	0.2	1214.53	100.0	1214.53	100.0	14	1214.56	100.0	2	1214.56	0.4	54.0		
6_19_0.7_0.4	1914.25	194.8	78 895	332 602	0.3	1861.8	97.3	1866.31	97.5	601	1914.25	100.0	37	1914.25	307.6	502.4		
6_19_0.7_0.6	1874.14	175.1	78 895	332 602	0.3	1866.31	99.6	1866.31	99.6	18	1874.14	100.0	4	1874.14	1.1	176.2		
6_19_0.7_0.8	1874.14	151.4	78 895	332 602	0.3	1866.31	99.6	1866.31	99.6	18	1874.14	100.0	4	1874.14	1.3	152.7		
6_19_0.7_1.0	1866.33	81.5	78 895	332 602	0.3	1866.31	100.0	1866.31	100.0	8	1866.33	100.0	2	1866.33	0.5	82.0		
6_19_0.9_0.4	2151.30	200.2	372 185	262 770	0.7	2058.06	95.7	2066.55	96.1	3832	2087.16	97.0	4	2151.30	7201.0	7401.1		
6_19_0.9_0.6	2116.19	175.0	372 185	262 770	0.7	2058.06	97.3	2066.55	97.7	530	2116.19	100.0	10	2116.19	1328.4	1503.5		
6_19_0.9_0.8	2096.99	149.4	372 185	262 770	0.8	2058.06	98.2	2066.55	98.6	200	2096.62	100.0	4	2096.62	48.4	197.8		
6_19_0.9_1.0	2066.58	73.7	372 185	262 770	0.8	2066.55	100.0	2066.55	100.0	11	2066.58	100.0	2	2066.58	0.9	74.6		
7_20_0.5_0.4	1383.02	89.1	5453	596 939	0.3	1322.03	95.6	1322.03	95.6	2521	1383.02	100.0	244	1383.02	139.4	228.5		
7_20_0.5_0.6	1355.65	81.4	5453	596 939	0.3	1322.03	97.5	1322.03	97.5	228	1355.65	100.0	42	1355.65	3.5	84.9		
7_20_0.5_0.8	1332.60	88.3	5453	596 939	0.3	1322.03	99.2	1322.03	99.2	29	1332.6	100.0	8	1332.60	0.7	89.0		
7_20_0.5_1.0	1322.04	45.4	5453	596 939	0.3	1322.03	100.0	1322.03	100.0	14	1322.04	100.0	2	1322.04	0.5	45.8		
7_20_0.7_0.4	2023.34	119.6	77 850	159 129	0.2	1969.14	97.3	1969.14	97.3	448	2023.34	100.0	52	2023.34	14.2	133.8		
7_20_0.7_0.6	1980.89	89.8	77 850	159 129	0.2	1969.14	99.4	1969.14	99.4	24	1980.89	100.0	6	1980.89	0.7	90.5		
7_20_0.7_0.8	1969.17	86.4	77 850	159 129	0.2	1969.14	100.0	1969.14	100.0	11	1969.17	100.0	3	1969.17	0.3	86.7		
7_20_0.7_1.0	1969.17	56.9	77 850	159 129	0.2	1969.14	100.0	1969.14	100.0	11	1969.17	100.0	3	1969.17	0.3	57.2		
7_20_0.9_0.4	2230.16	145.6	182 168	116 396	0.4	2223.26	99.7	2223.26	99.7	13	2230.16	100.0	3	2230.16	0.6	146.2		
7_20_0.9_0.6	2228.29	111.9	182 168	116 396	0.3	2223.26	99.8	2223.26	99.8	9	2228.29	100.0	3	2228.29	0.5	112.4		
7_20_0.9_0.8	2228.06	99.7	182 168	116 396	0.3	2223.26	99.8	2223.26	99.8	11	2228.06	100.0	3	2228.06	0.5	100.1		
7_20_0.9_1.0	2223.26	68.8	182 168	116 396	0.3	2223.26	100.0	2223.26	100.0	6	2223.26	100.0	3	2223.26	0.4	69.2		
8_20_0.5_0.4	1378.12	127.7	8955	1 048 575	0.4	1258.1	91.3	1258.1	91.3	331 833	1285.84	93.3	3	1378.12	7200.4	7328.1		
8_20_0.5_0.6	1308.13	124.1	8955	1 048 575	0.4	1258.1	96.2	1258.1	96.2	43	1308.13	100.0	15	1308.13	2817.0	2941.2		
8_20_0.5_0.8	1292.97	109.0	8955	1 048 575	0.4	1258.1	97.3	1258.1	97.3	11	1292.97	100.0	3	1292.97	410.9	519.9		
8_20_0.5_1.0	1258.10	70.2	8955	1 048 575	0.4	1258.1	100.0	1258.1	100.0	4	1258.1	100.0	1	1258.10	1.4	71.5		
8_20_0.7_0.4	1946.20	168.6	100 329	1 048 017	0.7	1818.77	93.5	1825.08	93.8	10 649	1825.08	93.8	2	1946.20	7200.2	7368.8		
8_20_0.7_0.6	1846.00	234.8	100 329	1 048 017	0.7	1825.08	98.9	1825.08	98.9	32	1846	100.0	4	1846.00	206.6	441.4		
8_20_0.7_0.8	1835.84	208.6	100 329	1 048 017	0.7	1825.08	99.4	1825.08	99.4	32	1835.84	100.0	2	1835.84	63.5	272.1		
8_20_0.7_1.0	1825.09	102.7	100 329	1 048 017	0.6	1825.08	100.0	1825.08	100.0	15	1825.09	100.0	2	1825.09	54.4	157.0		
8_20_0.9_0.4	2267.22	281.3	1 076 210	1 035 699	2.4	2144.42	94.6	2172.15	95.8	7591	2172.15	95.8	2	2267.22	7199.6	7481.0		
8_20_0.9_0.6	2181.90	255.4	1 076 210	1 035 699	2.4	2172.15	99.6	2172.15	99.6	7	2181.9	100.0	4	2181.90	6.3	261.7		
8_20_0.9_0.8	2181.90	242.6	1 076 210	1 035 699	2.4	2172.15	99.6	2172.15	99.6	7	2181.9	100.0	4	2181.90	6.6	249.2		
8_20_0.9_1.0	2172.15	122.4	1 076 210	1 035 699	2.4	2172.15	100.0	2172.15	100.0	9	2172.15	100.0	2	2172.15	3.3	125.7		
Avg.		129.2	211 817	561 468	0.6		98.4		98.5	9982		99.4	14		951.0	1080.2		

Table EC.4 Detailed results on new instances of Dataset D with 30 customers and with route duration

Inst	LNS-ATCI			CCG													
	UB _{init}	t_{heu}	$ \Phi $	$ \hat{\Omega}' $	t_{clu}	$z(\text{LP}_1)$	$\Delta_{z(\text{LP}_1)}$	$z(\text{LP}_2)$	$\Delta_{z(\text{LP}_2)}$	$ \hat{\Omega}'' $	$z(\overline{\text{SP}})$	$\Delta_{z(\overline{\text{SP}})}$	$ \overline{\Omega} $	UB _{final}	t_{noUB}	t_{tot}	
6_29_0.5_0.4	1835.77	136.6	45910	28967792	46.8	1830.85	99.7	1831.19	99.8	17	1835.77	100.0	8	1835.77	60.6	197.1	
6_29_0.5_0.6	1835.63	155.2	45910	28967792	46.9	1830.85	99.7	1831.19	99.8	15	1835.63	100.0	11	1835.63	61.6	216.8	
6_29_0.5_0.8	1835.02	141.7	45910	28967792	46.8	1830.77	99.8	1831.19	99.8	24	1835.02	100.0	8	1835.02	61.4	203.1	
6_29_0.5_1.0	1831.25	95.6	45910	28967792	47.0	1831.19	100.0	1831.19	100.0	16	1831.25	100.0	3	1831.25	60.3	155.9	
6_29_0.7_0.4	2575.00	258.4	352396	2512344	14.8	2516.63	97.7	2516.63	97.7	311	2575.00	100.0	29	2575.00	71.2	329.6	
6_29_0.7_0.6	2524.04	199.8	352396	2512344	14.7	2516.63	99.7	2516.63	99.7	10	2524.04	100.0	3	2524.04	15.7	215.5	
6_29_0.7_0.8	2521.56	172.7	352396	2512344	14.7	2516.63	99.8	2516.63	99.8	12	2521.56	100.0	3	2521.56	15.4	188.2	
6_29_0.7_1.0	2516.67	124.7	352396	2512344	14.7	2516.63	100.0	2516.63	100.0	7	2516.67	100.0	3	2516.67	15.3	140.0	
6_29_0.9_0.4	3008.48	313.5	1736175	764444	23.8	2893.42	96.2	2904.11	96.5	11302	3008.48	100.0	37	3008.48	267.9	581.4	
6_29_0.9_0.6	2962.44	273.5	1736175	764444	23.7	2893.42	97.7	2904.11	98.0	1146	2962.44	100.0	6	2962.44	27.1	300.6	
6_29_0.9_0.8	2958.34	204.7	1736175	764444	23.7	2893.42	97.8	2904.11	98.2	790	2958.34	100.0	6	2958.34	26.4	231.1	
6_29_0.9_1.0	2954.36	130.5	1736175	764444	23.8	2893.42	97.9	2904.11	98.3	677	2954.36	100.0	4	2954.36	25.5	155.9	
7_30_0.5_0.4	2106.96	148.7	8602	2084316	12.5	2055.42	97.6	2075.81	98.5	1162	2106.96	100.0	56	2106.96	28.4	177.2	
7_30_0.5_0.6	2084.88	151.9	8602	2084316	12.5	2074.9	99.5	2075.81	99.6	43	2084.88	100.0	12	2084.88	13.4	165.3	
7_30_0.5_0.8	2077.73	128.5	8602	2084316	12.5	2075.8	99.9	2075.8	99.9	24	2077.73	100.0	6	2077.73	13.0	141.4	
7_30_0.5_1.0	2076.22	87.1	8602	2084316	12.5	2076.18	100.0	2076.18	100.0	6	2076.22	100.0	4	2076.22	12.9	100.1	
7_30_0.7_0.4	2986.74	218.1	108313	108933	8.2	2871.66	96.1	2919.77	97.8	7433	2986.74	100.0	42	2986.74	128.6	346.7	
7_30_0.7_0.6	2945.62	181.7	108313	108933	8.1	2874.05	97.6	2919.77	99.1	528	2945.62	100.0	8	2945.62	16.6	198.3	
7_30_0.7_0.8	2944.57	152.8	108313	108933	8.2	2874.05	97.6	2919.77	99.2	446	2944.57	100.0	5	2944.57	13.3	166.1	
7_30_0.7_1.0	2944.57	119.7	108313	108933	8.2	2874.05	97.6	2919.77	99.2	446	2944.57	100.0	5	2944.57	14.3	134.0	
7_30_0.9_0.4	3257.22	207.0	164734	77960	20.0	3218.71	98.8	3235.59	99.3	34	3257.22	100.0	5	3257.22	20.9	227.9	
7_30_0.9_0.6	3255.35	183.4	164734	77960	19.9	3235.59	99.4	3235.59	99.4	22	3255.35	100.0	5	3255.35	20.6	204.1	
7_30_0.9_0.8	3254.27	166.3	164734	77960	20.2	3247.74	99.8	3247.74	99.8	12	3254.27	100.0	5	3254.27	20.9	187.1	
7_30_0.9_1.0	3247.81	131.8	164734	77960	19.3	3247.74	100.0	3247.74	100.0	12	3247.81	100.0	5	3247.81	19.6	151.4	
8_30_0.5_0.4	1994.22	219.5	75635	111325308	171.3	1953.18	97.9	1953.18	97.9	348	1994.22	100.0	61	1994.22	299.6	519.0	
8_30_0.5_0.6	1953.60	221.0	75635	111325308	172.3	1953.18	100.0	1953.18	100.0	13	1953.60	100.0	3	1953.60	222.1	443.0	
8_30_0.5_0.8	1953.18	234.1	75635	111325308	171.7	1953.18	100.0	1953.18	100.0	9	1953.18	100.0	3	1953.18	216.0	450.0	
8_30_0.5_1.0	1953.18	135.0	75635	111325308	171.7	1953.18	100.0	1953.18	100.0	9	1953.18	100.0	3	1953.18	216.0	350.9	
8_30_0.7_0.4	2704.92	402.0	1097114	7694121	59.5	2673.06	98.8	2673.06	98.8	172	2704.92	100.0	23	2704.92	69.7	471.6	
8_30_0.7_0.6	2673.06	367.8	1097114	7694121	59.2	2673.06	100.0	2673.06	100.0	8	2673.06	100.0	3	2673.06	62.0	429.8	
8_30_0.7_0.8	2673.06	334.9	1097114	7694121	58.9	2673.06	100.0	2673.06	100.0	8	2673.06	100.0	3	2673.06	61.8	396.7	
8_30_0.7_1.0	2673.06	191.3	1097114	7694121	59.1	2673.06	100.0	2673.06	100.0	8	2673.06	100.0	3	2673.06	61.9	253.2	
8_30_0.9_0.4		3183.11	381.1	4243573	3022173	56.4	3031.64	95.2	3031.64	95.2	29396	3067.43	96.4	12	3183.11	7199.0	7580.1
8_30_0.9_0.6	3040.10	385.1	4243573	3022173	56.2	3031.64	99.7	3031.64	99.7	14	3040.10	100.0	3	3040.10	57.9	443.0	
8_30_0.9_0.8	3031.64	373.6	4243573	3022173	55.6	3031.64	100.0	3031.64	100.0	10	3031.64	100.0	3	3031.64	56.9	430.5	
8_30_0.9_1.0	3031.64	189.1	4243573	3022173	55.6	3031.64	100.0	3031.64	100.0	10	3031.64	100.0	3	3031.64	56.8	245.9	
Avg.		208.8	870272	17395265	45.9		98.9		99.2	1514		99.9	11		267.0	475.8	

Table EC.5 Detailed results on new instances of Dataset D with 30 customers and without route duration

Inst	LNS-ATCI		CCG													
	UB _{init}	t _{heu}	\Phi	\hat{\Omega}'	t _{clu}	z(LP ₁)	\Delta _{z(LP₁)}	z(LP ₂)	\Delta _{z(LP₂)}	\hat{\Omega}''	z(\overline{SP})	\Delta _{z(\overline{SP})}	\overline{\Omega}	UB _{final}	t _{noUB}	t _{tot}
6_29_0.5_0.4	1808.47	136.6	107422	266052583	126.3	1777.59	98.3	1777.59	98.3	891	1808.47	100.0	47	1808.47	282.1	418.7
6_29_0.5_0.6	1797.64	155.2	107422	266052583	125.5	1777.59	98.9	1777.59	98.9	51	1797.64	100.0	24	1797.64	277.5	432.7
6_29_0.5_0.8	1786.60	141.7	107422	266052583	125.2	1777.59	99.5	1777.59	99.5	34	1786.6	100.0	7	1786.60	253.8	395.5
6_29_0.5_1.0	1777.63	95.6	107422	266052583	131.0	1777.59	100.0	1777.59	100.0	12	1777.63	100.0	2	1777.63	263.2	358.9
6_29_0.7_0.4	2521.96	258.4	4372042	120585951	90.2	2485.79	98.7	2494.71	99.1	615	2518.52	100.0	11	2518.52	108.1	366.5
6_29_0.7_0.6	2504.13	199.8	4372042	120585951	90.4	2494.71	99.6	2494.71	99.6	22	2504.13	100.0	3	2504.13	99.5	299.4
6_29_0.7_0.8	2498.45	172.7	4372042	120585951	90.3	2494.71	99.9	2494.71	99.9	9	2498.45	100.0	3	2498.45	98.9	271.7
6_29_0.7_1.0	2494.75	124.7	4372042	120585951	90.3	2494.71	100.0	2494.71	100.0	12	2494.75	100.0	3	2494.75	99.6	224.3
6_29_0.9_0.4	2917.67	313.5	43645944	50553707	209.8	2824.76	96.8	2833.25	97.1	8799	2848.88	97.6	3	2917.67	7199.4	7512.9
6_29_0.9_0.6	2862.65	273.5	43645944	50553707	291.5	2824.76	98.8	2833.25	99.1	193	2858.7	100.0	14	2858.70	341.1	614.7
6_29_0.9_0.8	2835.91	204.7	43645944	50553707	295.6	2833.25	99.9	2833.25	99.9	13	2835.91	100.0	4	2835.91	299.7	504.4
6_29_0.9_1.0	2833.28	130.5	43645944	50553707	295.1	2833.25	100.0	2833.25	100.0	9	2833.28	100.0	3	2833.28	299.8	430.2
7_30_0.5_0.4	1998.04	148.7	79883	145846224	73.8	1922.96	96.2	1922.96	96.2	15212	1989.62	99.6	265	1998.04	7253.7	7402.4
7_30_0.5_0.6	1958.23	151.9	79883	145846224	71.1	1922.96	98.2	1922.96	98.2	253	1958.23	100.0	44	1958.23	128.1	280.0
7_30_0.5_0.8	1923.01	128.5	79883	145846224	71.1	1922.96	100.0	1922.96	100.0	9	1923.01	100.0	3	1923.01	80.6	209.0
7_30_0.5_1.0	1923.01	87.1	79883	145846224	71.3	1922.96	100.0	1922.96	100.0	9	1923.01	100.0	3	1923.01	80.7	167.8
7_30_0.7_0.4	2887.70	218.1	2240806	7831629	22.6	2807.24	97.2	2824.32	97.8	9432	2887.7	100.0	137	2887.70	596.1	814.2
7_30_0.7_0.6	2824.32	181.7	2240806	7831629	23.0	2824.32	100.0	2824.32	100.0	15	2824.32	100.0	4	2824.32	23.8	205.5
7_30_0.7_0.8	2824.32	152.8	2240806	7831629	22.4	2824.32	100.0	2824.32	100.0	15	2824.32	100.0	4	2824.32	23.2	176.0
7_30_0.7_1.0	2824.32	119.7	2240806	7831629	22.7	2824.32	100.0	2824.32	100.0	15	2824.32	100.0	4	2824.32	23.4	143.1
7_30_0.9_0.4	3147.24	207.0	5226739	3925527	48.1	3118.09	99.1	3126.92	99.4	102	3145.37	100.0	6	3145.37	50.4	257.4
7_30_0.9_0.6	3145.29	183.4	5226739	3925527	48.5	3119.53	99.2	3126.92	99.4	68	3145.29	100.0	6	3145.29	50.1	233.5
7_30_0.9_0.8	3131.55	166.3	5226739	3925527	48.3	3126.92	99.9	3126.92	99.9	17	3131.55	100.0	5	3131.55	48.9	215.1
7_30_0.9_1.0	3126.95	131.8	5226739	3925527	48.2	3126.92	100.0	3126.92	100.0	13	3126.95	100.0	5	3126.95	48.6	180.4
8_30_0.5_0.4	1956.30	219.5						OOM								219.5
8_30_0.5_0.6	1905.55	221.0						OOM								221.0
8_30_0.5_0.8	1905.55	234.1						OOM								234.1
8_30_0.5_1.0	1874.87	135.0						OOM								135.0
8_30_0.7_0.4	2616.57	402.0	20799154	821136477	756.6	2540.33	97.1	2549.22	97.4	9200	2549.22	97.4	2	2616.57	7200.6	7602.6
8_30_0.7_0.6	2574.86	367.8	20799154	821136477	741.5	2549.22	99.0	2549.22	99.0	129	2574.86	100.0	12	2574.86	1353.4	1721.2
8_30_0.7_0.8	2552.02	334.9	20799154	821136477	729.1	2549.22	99.9	2549.22	99.9	16	2552.02	100.0	2	2552.02	1155.2	1490.1
8_30_0.7_1.0	2549.24	191.3	20799154	821136477	732.5	2549.22	100.0	2549.22	100.0	11	2549.24	100.0	2	2549.24	1146.3	1337.6
8_30_0.9_0.4	3087.07	381.1						OOM								381.1
8_30_0.9_0.6	2967.49	385.1						OOM								385.1
8_30_0.9_0.8	2961.19	373.6						OOM								373.6
8_30_0.9_1.0	2947.71	189.1						OOM								189.1
Avg.		208.8	10924570	202276014	196.1		99.1		99.2	1613		99.8	22		1031.6	1011.2

Results of CCG on ConVRP-SST and ConVRP-SSTW

In Tables EC.6–EC.7, we report the results of CCG on Dataset D when interpreting the instances as ConVRP-SST and ConVRP-SSTW instances, respectively. Optimal solutions are marked in bold, and timeouts in italics. Finally, we indicate all cases of insufficient memory with OOM.

Table EC.6 Detailed results on the ConVRP-SST and ConVRP-SSTW instances from Dataset D with 20 customers

Inst	with route duration								without route duration							
	ConVRP-SST				ConVRP-SSTW				ConVRP-SST				ConVRP-SSTW			
	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(LP_0)$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $
6_19_0.5_0.4	1228.12	1228.12	0.5	2	1228.12	1228.12	0.4	2	1216.89	1216.89	0.9	2	1216.89	1216.89	1.1	2
6_19_0.5_0.6	1228.12	1228.12	0.4	2	1228.12	1228.12	0.4	2	1214.56	1214.56	0.4	2	1214.56	1214.56	0.5	2
6_19_0.5_0.8	1228.12	1228.12	0.4	2	1228.12	1228.12	0.4	2	1214.56	1214.56	0.4	2	1214.56	1214.56	0.5	2
6_19_0.5_1.0	1228.12	1228.12	0.4	2	1228.12	1228.12	0.4	2	1214.56	1214.56	0.4	2	1214.56	1214.56	0.4	2
6_19_0.7_0.4	1979.28	1979.28	1.7	6	1979.28	1979.28	2.8	6	1882.17	1882.17	11.2	8	1877.09	1877.09	3.4	6
6_19_0.7_0.6	1971.66	1971.66	0.6	3	1971.66	1971.66	0.5	3	1871.93	1871.93	1.1	4	1871.93	1871.93	1.3	4
6_19_0.7_0.8	1971.66	1971.66	0.5	3	1971.66	1971.66	0.4	3	1870.70	1870.70	0.8	4	1870.70	1870.70	1.1	4
6_19_0.7_1.0	1971.66	1971.66	0.4	3	1971.66	1971.66	0.4	3	1866.33	1866.33	0.5	2	1866.33	1866.33	0.6	2
6_19_0.9_0.4	2156.01	2156.01	1.2	5	2156.01	2156.01	1.2	5	2096.99	2096.99	413.0	4	2095.42	2095.42	64.5	4
6_19_0.9_0.6	2149.91	2149.91	0.4	3	2149.91	2149.91	0.4	3	2066.58	2066.58	1.2	2	2066.58	2066.58	1.4	2
6_19_0.9_0.8	2149.91	2149.91	0.4	3	2149.91	2149.91	0.4	3	2066.58	2066.58	0.9	2	2066.58	2066.58	1.1	2
6_19_0.9_1.0	2149.91	2149.91	0.3	3	2149.91	2149.91	0.4	3	2066.58	2066.58	0.8	2	2066.58	2066.58	1.0	2
7_20_0.5_0.4	1377.14	1377.14	0.3	6	1377.14	1377.14	0.3	6	1329.10	1329.10	2.8	6	1328.78	1328.78	2.7	6
7_20_0.5_0.6	1377.14	1377.14	0.3	6	1377.14	1377.14	0.3	6	1322.04	1322.04	0.5	2	1322.04	1322.04	0.7	2
7_20_0.5_0.8	1377.14	1377.14	0.3	6	1377.14	1377.14	0.3	6	1322.04	1322.04	0.5	2	1322.04	1322.04	0.6	2
7_20_0.5_1.0	1375.50	1375.50	0.2	3	1375.50	1375.50	0.2	3	1322.04	1322.04	0.5	2	1322.04	1322.04	0.5	2
7_20_0.7_0.4	2030.11	2030.11	1.0	3	2030.11	2030.11	1.0	3	1969.17	1969.17	0.5	3	1969.17	1969.17	0.6	3
7_20_0.7_0.6	2030.11	2030.11	0.2	3	2030.11	2030.11	0.2	3	1969.17	1969.17	0.3	3	1969.17	1969.17	0.4	3
7_20_0.7_0.8	2030.11	2030.11	0.2	3	2030.11	2030.11	0.2	3	1969.17	1969.17	0.3	3	1969.17	1969.17	0.4	3
7_20_0.7_1.0	2030.11	2030.11	0.2	3	2030.11	2030.11	0.2	3	1969.17	1969.17	0.3	3	1969.17	1969.17	0.4	3
7_20_0.9_0.4	2334.67	2334.67	0.4	4	2334.67	2334.67	0.4	4	2228.29	2228.29	0.7	3	2228.29	2228.29	0.8	3
7_20_0.9_0.6	2334.44	2334.44	0.3	4	2334.44	2334.44	0.4	4	2228.06	2228.06	0.6	3	2228.06	2228.06	0.8	3
7_20_0.9_0.8	2334.44	2334.44	0.3	4	2334.44	2334.44	0.4	4	2223.46	2223.46	0.5	3	2223.46	2223.46	0.6	3
7_20_0.9_1.0	2329.84	2329.84	0.2	4	2329.84	2329.84	0.3	4	2223.26	2223.26	0.4	3	2223.26	2223.26	0.5	3
8_20_0.5_0.4	1356.96	1356.96	0.8	2	1356.96	1356.96	0.8	2	1378.12	1258.10	7199.1	1	1378.12	1258.10	7200.5	1
8_20_0.5_0.6	1356.96	1356.96	0.5	2	1356.96	1356.96	0.6	2	1288.92	1288.92	275.5	3	1280.18	1280.18	101.3	1
8_20_0.5_0.8	1356.96	1356.96	0.6	2	1356.96	1356.96	0.6	2	1274.95	1274.95	19.1	1	1274.95	1274.95	87.8	1
8_20_0.5_1.0	1356.96	1356.96	0.6	2	1356.96	1356.96	0.6	2	1258.10	1258.10	1.4	1	1258.10	1258.10	1.5	1
8_20_0.7_0.4	1918.35	1918.35	1.5	3	1918.35	1918.35	1.6	3	1843.30	1843.30	3516.9	4	1841.98	1841.98	352.5	5
8_20_0.7_0.6	1917.23	1917.23	0.9	3	1917.23	1917.23	1.2	3	1835.84	1835.84	119.8	2	1835.84	1835.84	155.1	2
8_20_0.7_0.8	1917.23	1917.23	0.7	3	1917.23	1917.23	0.8	3	1835.84	1835.84	73.5	2	1835.84	1835.84	73.5	2
8_20_0.7_1.0	1911.73	1911.73	0.5	2	1911.73	1911.73	0.5	2	1825.09	1825.09	63.1	2	1825.09	1825.09	63.2	2
8_20_0.9_0.4	2274.02	2274.02	1.2	3	2274.02	2274.02	1.2	3	2181.90	2181.90	1376.6	4	2181.90	2181.90	25.0	4
8_20_0.9_0.6	2274.02	2274.02	0.5	3	2274.02	2274.02	0.6	3	2172.68	2172.68	4.2	2	2172.68	2172.68	4.9	2
8_20_0.9_0.8	2274.02	2274.02	0.6	3	2274.02	2274.02	0.6	3	2172.15	2172.15	3.6	2	2172.15	2172.15	3.9	2
8_20_0.9_1.0	2274.02	2274.02	0.6	3	2274.02	2274.02	0.6	3	2172.15	2172.15	3.7	2	2172.15	2172.15	3.7	2
Avg.			0.6	3			0.6	3			363.8	3			226.6	3

Table EC.7 Detailed results on the ConVRP-SST and ConVRP-SSTW instances from Dataset D with 30 customers

Inst	with route duration								without route duration							
	ConVRP-SST				ConVRP-SSTW				ConVRP-SST				ConVRP-SSTW			
	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $	UB _{final}	$z(\overline{SP})$	t_{noUB}	$ \overline{\Omega} $
6_29_0.5_0.4	1835.77	1835.77	61.0	8	1835.77	1835.77	60.7	8	1797.20	1797.20	276.5	19	1797.20	1797.20	433.2	19
6_29_0.5_0.6	1835.63	1835.63	61.1	11	1835.63	1835.63	60.9	11	1781.86	1781.86	261.9	6	1781.86	1781.86	260.0	6
6_29_0.5_0.8	1834.89	1834.89	61.1	8	1834.89	1834.89	61.1	8	1777.63	1777.63	248.1	2	1777.63	1777.63	250.8	2
6_29_0.5_1.0	1831.25	1831.25	59.8	3	1831.25	1831.25	59.9	3	1777.63	1777.63	253.1	2	1777.63	1777.63	256.2	2
6_29_0.7_0.4	2523.11	2523.11	16.3	3	2523.11	2523.11	17.3	3	2501.65	2501.65	99.2	3	2501.65	2501.65	99.6	3
6_29_0.7_0.6	2521.56	2521.56	15.7	3	2521.56	2521.56	15.7	3	2498.45	2498.45	96.5	3	2498.45	2498.45	105.4	3
6_29_0.7_0.8	2521.56	2521.56	15.5	3	2521.56	2521.56	16.0	3	2494.75	2494.75	96.2	3	2494.75	2494.75	96.7	3
6_29_0.7_1.0	2516.67	2516.67	15.4	3	2516.67	2516.67	15.4	3	2494.75	2494.75	96.6	3	2494.75	2494.75	106.0	3
6_29_0.9_0.4	2959.11	2959.11	71.2	6	2959.11	2959.11	77.1	6	2844.92	2844.92	294.5	5	2844.92	2844.92	241.3	5
6_29_0.9_0.6	2958.34	2958.34	27.7	6	2958.34	2958.34	28.2	6	2835.91	2835.91	203.8	4	2835.91	2835.91	206.3	4
6_29_0.9_0.8	2958.34	2958.34	27.0	6	2958.34	2958.34	27.1	6	2833.28	2833.28	203.5	3	2833.28	2833.28	205.1	3
6_29_0.9_1.0	2954.36	2954.36	25.8	4	2954.36	2954.36	25.6	4	2833.28	2833.28	204.1	3	2833.28	2833.28	205.1	3
7_30_0.5_0.4	2081.81	2081.81	16.5	11	2081.81	2081.81	16.6	11	1954.49	1954.49	137.0	32	1949.89	1949.89	103.4	23
7_30_0.5_0.6	2077.73	2077.73	12.9	6	2077.73	2077.73	13.0	6	1923.01	1923.01	68.5	3	1923.01	1923.01	68.8	3
7_30_0.5_0.8	2076.50	2076.50	12.8	6	2076.50	2076.50	12.9	6	1923.01	1923.01	68.1	3	1923.01	1923.01	68.7	3
7_30_0.5_1.0	2076.22	2076.22	12.7	4	2076.22	2076.22	12.7	4	1923.01	1923.01	68.5	3	1923.01	1923.01	68.5	3
7_30_0.7_0.4	2947.36	2947.36	63.0	11	2947.36	2947.36	58.8	11	2824.32	2824.32	33.1	4	2824.32	2824.32	33.6	4
7_30_0.7_0.6	2945.60	2945.60	16.3	8	2945.60	2945.60	15.6	8	2824.32	2824.32	18.5	4	2824.32	2824.32	19.0	4
7_30_0.7_0.8	2944.57	2944.57	14.4	5	2944.57	2944.57	14.5	5	2824.32	2824.32	18.6	4	2824.32	2824.32	19.2	4
7_30_0.7_1.0	2944.57	2944.57	14.6	5	2944.57	2944.57	14.2	5	2824.32	2824.32	18.4	4	2824.32	2824.32	18.9	4
7_30_0.9_0.4	3255.35	3255.35	21.7	5	3255.35	3255.35	21.2	5	3131.78	3131.78	38.6	5	3131.78	3131.78	39.7	5
7_30_0.9_0.6	3254.27	3254.27	21.5	5	3254.27	3254.27	21.0	5	3131.55	3131.55	38.4	5	3131.55	3131.55	39.7	5
7_30_0.9_0.8	3254.09	3254.09	21.7	5	3254.09	3254.09	21.0	5	3126.95	3126.95	38.3	5	3126.95	3126.95	39.3	5
7_30_0.9_1.0	3247.81	3247.81	21.7	5	3247.81	3247.81	20.8	5	3126.95	3126.95	38.1	5	3126.95	3126.95	39.0	5
8_30_0.5_0.4	1970.11	1970.11	361.0	11	1970.11	1970.11	387.9	11	1956.40	1874.85	9396.0	1	1956.40	1874.85	8957.8	1
8_30_0.5_0.6	1953.18	1953.18	222.6	3	1953.18	1953.18	222.0	3	1887.31	1887.31	5666.0	10	1887.31	1887.31	5583.3	10
8_30_0.5_0.8	1953.18	1953.18	219.3	3	1953.18	1953.18	217.4	3	1880.08	1880.08	5542.1	4	1880.08	1880.08	5512.7	4
8_30_0.5_1.0	1953.18	1953.18	222.8	3	1953.18	1953.18	217.1	3	1874.87	1874.87	5387.6	2	1874.87	1874.87	5257.7	2
8_30_0.7_0.4	2673.06	2673.06	67.6	3	2673.06	2673.06	64.0	3	2552.02	2552.02	1168.6	2	2552.02	2552.02	1158.7	2
8_30_0.7_0.6	2673.06	2673.06	63.9	3	2673.06	2673.06	63.9	3	2549.24	2549.24	1193.6	2	2549.24	2549.24	1190.6	2
8_30_0.7_0.8	2673.06	2673.06	63.4	3	2673.06	2673.06	64.2	3	2549.24	2549.24	1147.7	2	2549.24	2549.24	1136.1	2
8_30_0.7_1.0	2673.06	2673.06	63.4	3	2673.06	2673.06	63.8	3	2549.24	2549.24	1126.9	2	2549.24	2549.24	1123.7	2
8_30_0.9_0.4	3031.64	3031.64	70.0	3	3031.64	3031.64	71.6	3		OOM				OOM		
8_30_0.9_0.6	3031.64	3031.64	58.6	3	3031.64	3031.64	60.5	3		OOM				OOM		
8_30_0.9_0.8	3031.64	3031.64	59.3	3	3031.64	3031.64	60.6	3		OOM				OOM		
8_30_0.9_1.0	3031.64	3031.64	62.0	3	3031.64	3031.64	60.5	3		OOM				OOM		
Avg.			62.3	5			62.8	5			1048.3	5			1029.5	5