

Online Supplement of the Paper “Optimizing Inspection Routes and Schedules for Infrastructure Systems under Stochastic Decision-dependent Failures”

1 Algorithms

Algorithm 1 Random coloring algorithm (Yu et al., 2022)

Network $G = (N, E)$, color coding ϕ , iteration budget maxIter, number of solutions to early stop nSol, evaluated solution set S , dual optimal solution π .

Initialization $T = \emptyset$ as candidate solution set, $k = 0$

while $k < \text{maxIter}$ or $|T| < \text{nSol}$ **do**

- Generate a random coloring function $\phi_k : N \rightarrow \{1, \dots, Q\}$
- Initialize $\Lambda_{\text{depot}} \leftarrow \{0, \dots, 0\}$
- for** $i \in N$ **do**

 - $\Lambda_i \leftarrow \emptyset$
 - end for**
 - $B = \{\text{depot}\}$
 - while** $B \neq \emptyset$ **do**

 - Sample $i \in B$
 - if** $i = \text{depot}$ **then**

 - Add corresponding routes from Λ_{depot} with negative cost to T

 - else**

 - for** $j : (i, j) \in E$ **do**

 - for** $\lambda_i = (R_i, C_i) \in \Lambda_i$, with $R_i = (n_i, N_i^1, \dots, N_i^Q)$ **do**

 - if** $N_i^{\phi(j)} = 0$ **then**

 - Extend λ_i to obtain λ_j
 - if** $\lambda_j \notin S$ **then**

 - if** λ_j is not dominated by any path in Λ_j **then**

 - Add λ_j to Λ_j and $B = B \cup \{j\}$
 - Remove any path in Λ_j that is dominated by λ_j

 - end if**

 - end if**

 - end if**

 - end for**

 - end if**
 - Remove i from B

 - end while**
 - Add routes with negative cost to T
 - $k = k + 1$

end while

Return T

2 Additional Computational Results

2.1 Computational Strengthening

Based on insights from the sensitivity analysis, we propose initializing the restricted master problem with strategically generated routes that prioritize early visits to critical nodes. These routes are constructed using heuristic or local search techniques and are included in the initial pool \bar{P} .

Table 1 compares the runtime of the scenario decomposition algorithm with and without this initialization. Although not universally dominant, initializing with critical node-prioritized routes consistently reduces runtime in most configurations without adding significant overhead. We observe a benefit in initializing the set of columns as we observe a reduction in total time in most instances to find an optimal solution, and thus this procedure strengthens the initial set of candidate routes.

Table 1: Impact of column initialization on runtime in G-20-75.

Crit. (%)	$ K $	Q	Baseline (s)	Initialized (s)
5	4	8	213	110
		9	266	243
		10	301	225
	5	6	156	94
		7	198	189
		8	178	180
	7	5	113	89
		6	129	119
		7	304	261
	20	8	171	159
		9	289	232
		10	332	336
	20	6	150	105
		7	151	146
		8	170	180
	40	5	136	140
		6	144	152
		7	150	140
	40	8	684	572
		9	753	732
		10	893	867
	40	6	170	191
		7	201	213
		8	256	246
	40	5	150	90
		6	150	160
		7	279	298

We conduct all experiments under a serial implementation. To further enhance scalability, we implement two levels of parallelization: (i) between scenario subproblems in the scenario decomposition algorithm, and (ii) between iterations of the random coloring acceleration within the column

generation algorithm. Figure 1 shows the speedup factors using 12 CPU cores as a function of instance size and number of scenarios.

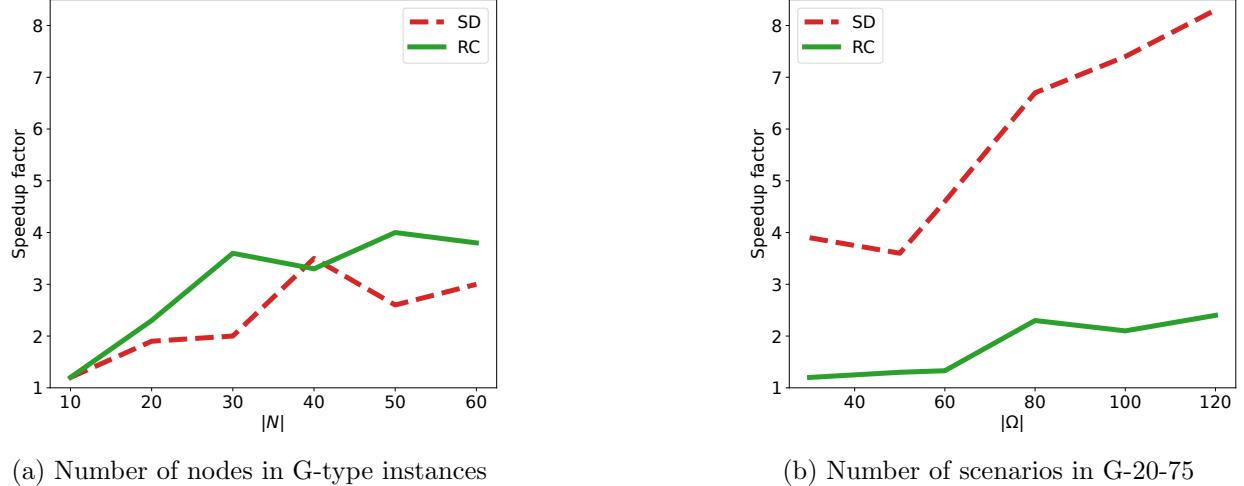


Figure 1: Speedup from parallelizing scenario decomposition (SD) and random coloring (RC) in the computation of randomly generated instances. SD benefits more from increasing scenario count.

In Figure 1, we observe that the scenario-level parallelization offers the highest speedup as $|\Omega|$ grows. For smaller instances, the parallelization of random coloring provides meaningful gains. Coordination between workers is handled through a barrier synchronization step after solving each scenario, ensuring consistent pool updates and avoiding redundant evaluations (see, e.g., Deng et al., 2018).

2.2 Runtime Analysis

Table 2: Runtime and optimality gap comparison across solution approaches for G-type instances

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Gurobi		Scenario Decomposition		Stochastic ALNS	
				Time (s)	Gap (%)	Time (s)	Gap (%)	Time (s)	Gap (%)
G-10-30	S-S	1	1.0	13.2	—	16.2	0.03	4.1	1.27
	L-S	1	1.0	15.2	—	19.4	0.08	5.1	1.82
	L-L	1	1.0	17.8	—	22.7	0.13	6.2	2.39
	S-S	1	1.5	14.6	—	16.7	0.09	4.3	1.61
	L-S	1	1.5	16.8	—	20.0	0.14	5.4	2.04
	L-L	1	1.5	19.7	—	23.4	0.19	6.5	2.63
	S-S	2	1.0	31.2	—	28.3	0.02	7.4	1.94
	L-S	2	1.0	35.9	—	34.0	0.07	9.3	2.36
	L-L	2	1.0	42.1	—	39.6	0.12	11.1	2.91
	S-S	2	1.5	42.8	—	30.4	0.11	8.1	1.83
	L-S	2	1.5	49.2	—	36.5	0.17	10.1	2.29
	L-L	2	1.5	57.8	—	42.6	0.22	12.2	2.88
	S-S	3	1.0	71.7	—	38.2	0.10	10.4	2.07
	L-S	3	1.0	82.5	—	45.8	0.16	13.0	2.58
	L-L	3	1.0	96.8	—	53.5	0.21	15.6	3.11
G-20-75	S-S	3	1.5	86.2	—	56.2	0.04	15.7	2.39
	L-S	3	1.5	99.1	—	67.4	0.10	19.6	2.97
	L-L	3	1.5	116.4	—	78.7	0.16	23.6	3.54
	S-S	3	1.0	140.2	—	123.1	0.04	38.5	1.93
	L-S	3	1.0	161.2	—	147.7	0.09	48.1	2.41
	L-L	3	1.0	189.3	—	172.3	0.15	57.8	2.96
	S-S	3	1.5	141.1	—	170.2	0.03	52.1	2.31
	L-S	3	1.5	162.3	—	204.2	0.08	65.1	2.79
	L-L	3	1.5	190.5	—	238.3	0.14	78.2	3.33
	S-S	5	1.0	320.2	—	164.2	0.07	49.6	2.12
	L-S	5	1.0	368.2	—	197.0	0.13	62.0	2.63
	L-L	5	1.0	432.3	—	230.0	0.18	74.4	3.14
	S-S	5	1.5	372.5	—	241.5	0.16	76.8	2.74
	L-S	5	1.5	428.4	—	289.8	0.22	96.0	3.27
	L-L	5	1.5	503.9	—	338.1	0.28	115.2	3.81
	S-S	7	1.0	763.2	—	231.2	0.03	73.3	2.49
	L-S	7	1.0	877.7	—	277.4	0.09	91.6	3.02
	L-L	7	1.0	1030.3	—	323.7	0.15	110.0	3.55
	S-S	7	1.5	989.5	—	249.6	0.07	79.2	2.97
	L-S	7	1.5	1137.9	—	299.5	0.13	99.0	3.48
	L-L	7	1.5	1335.8	—	349.4	0.18	118.8	4.02

Table 3: Runtime and optimality gap comparison across solution approaches for IEEE instances

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Gurobi		Scenario Decomposition		Stochastic ALNS	
				Time (s)	Gap (%)	Time (s)	Gap (%)	Time (s)	Gap (%)
S-S	3	1.0	204.3	—	182.3	0.12	88.1	4.37	
	L-S	3	1.0	234.9	—	218.8	0.18	110.1	4.92
	L-L	3	1.0	275.8	—	255.2	0.23	132.1	5.41
	S-S	3	1.5	264.6	—	234.5	0.03	117.2	4.89
	L-S	3	1.5	304.3	—	281.4	0.09	146.5	5.36
	L-L	3	1.5	357.2	—	328.3	0.14	175.8	5.97
	S-S	5	1.0	523.1	—	243.2	0.01	121.6	5.23
	L-S	5	1.0	601.6	—	291.8	0.07	152.0	5.81
	L-L	5	1.0	706.2	—	340.5	0.12	182.4	6.28
	S-S	5	1.5	750.6	—	269.7	0.11	135.1	5.76
	L-S	5	1.5	863.2	—	323.6	0.17	168.9	6.34
	L-L	5	1.5	1013.3	—	377.6	0.22	202.7	6.91
	S-S	7	1.0	1829.1	—	310.3	0.10	161.4	6.21
	L-S	7	1.0	2103.5	—	372.4	0.16	201.8	6.73
IEEE-33-136	L-L	7	1.0	2469.3	—	434.4	0.21	242.1	7.19
	S-S	7	1.5	1968.1	—	359.8	0.12	190.7	6.87
	L-S	7	1.5	2263.3	—	431.8	0.18	238.4	7.43
	L-L	7	1.5	2656.9	—	503.7	0.23	286.1	7.96
IEEE-123-556	S-S	3	1.0	540.9	—	420.3	1.96	210.2	6.53
	L-S	3	1.0	622.0	—	504.4	2.02	262.7	7.08
	L-L	3	1.0	730.2	—	588.4	2.08	315.3	7.62
	S-S	3	1.5	640.9	—	422.8	0.89	215.0	7.02
	L-S	3	1.5	737.0	—	507.4	0.95	268.8	7.63
	L-L	3	1.5	865.2	—	591.9	1.01	322.5	8.11
	S-S	5	1.0	1203.2	—	502.8	0.75	256.4	7.58
	L-S	5	1.0	1383.7	—	603.4	0.81	320.5	8.17
	L-L	5	1.0	1624.3	—	703.9	0.86	384.6	8.69
	S-S	5	1.5	1255.2	—	596.6	2.49	314.2	8.32
	L-S	5	1.5	1443.5	—	715.9	2.55	392.8	8.91
	L-L	5	1.5	1694.5	—	835.2	2.61	471.3	9.37
	S-S	7	1.0	4302.9	—	720.4	0.37	388.9	9.18
	L-S	7	1.0	4948.3	—	864.5	0.43	486.1	9.71
L-L	7	1.0	5808.9	—	1008.6	0.48	583.3	10.23	
	S-S	7	1.5	4756.6	—	738.2	0.72	399.5	9.81
	L-S	7	1.5	5470.1	—	885.8	0.78	499.4	10.36
	L-L	7	1.5	6421.4	—	1033.5	0.83	599.2	10.87

Table 4: Runtime and optimality gap comparison across solution approaches for EPANET instances

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Gurobi		Scenario Decomposition		Stochastic ALNS	
				Time (s)	Gap (%)	Time (s)	Gap (%)	Time (s)	Gap (%)
EPANET-36-275	S-S	3	1.0	600.5	—	310.4	0.93	140.3	9.84
	L-S	3	1.0	690.6	—	372.5	0.99	175.4	10.37
	L-L	3	1.0	810.7	—	434.6	1.06	210.5	10.91
	S-S	3	1.5	720.8	—	365.2	1.21	165.7	10.48
	L-S	3	1.5	828.9	—	438.2	1.27	207.1	11.02
	L-L	3	1.5	973.1	—	511.3	1.33	248.5	11.57
	S-S	5	1.0	1420.7	—	512.9	1.42	210.4	11.28
	L-S	5	1.0	1633.8	—	615.5	1.49	263.0	11.83
	L-L	5	1.0	1917.9	—	718.1	1.55	315.6	12.36
	S-S	5	1.5	1685.9	—	648.3	1.83	262.7	12.15
	L-S	5	1.5	1938.8	—	778.0	1.89	328.4	12.67
	L-L	5	1.5	2276.0	—	907.6	1.95	394.0	13.19
	S-S	7	1.0	2890.3	—	835.6	2.04	328.9	13.08
	L-S	7	1.0	3323.8	—	1002.7	2.11	411.1	13.59
EPANET-97-2013	L-L	7	1.0	3901.9	—	1169.8	2.18	493.3	14.12
	S-S	7	1.5	3156.4	—	972.1	2.35	379.2	14.19
	L-S	7	1.5	3629.9	—	1166.5	2.42	474.0	14.67
	L-L	7	1.5	4261.1	—	1361.0	2.48	568.8	15.21
	S-S	3	1.0	1805.2	—	910.5	1.63	260.8	12.76
	L-S	3	1.0	2076.0	—	1092.6	1.69	326.0	13.31
	L-L	3	1.0	2437.0	—	1274.7	1.75	391.2	13.88
	S-S	3	1.5	2150.7	—	1048.9	2.03	305.3	13.72
	L-S	3	1.5	2473.3	—	1258.7	2.09	381.6	14.26
	L-L	3	1.5	2903.4	—	1468.5	2.15	457.9	14.79
	S-S	5	1.0	4525.9	—	1432.7	2.33	402.6	14.93
	L-S	5	1.0	5204.8	—	1719.2	2.39	503.2	15.48
	L-L	5	1.0	6110.0	—	2005.8	2.45	603.9	15.97
	S-S	5	1.5	5210.4	—	1765.8	2.71	485.1	15.84
	L-S	5	1.5	5992.0	—	2119.0	2.78	606.4	16.37
	L-L	5	1.5	7034.0	—	2472.1	2.84	727.7	16.92
	S-S	7	1.0	8923.6	—	2289.3	2.93	590.4	16.55
	L-S	7	1.0	10262.1	—	2747.2	3.01	738.0	17.06
	L-L	7	1.0	12046.9	—	3205.0	3.07	885.6	17.61
	S-S	7	1.5	9635.8	—	2620.7	3.22	672.9	17.39
	L-S	7	1.5	11081.2	—	3144.8	3.28	841.1	17.94
	L-L	7	1.5	13008.3	—	3669.0	3.34	1009.3	18.41

2.3 Solution Performance

Table 5: Solution quality and fleet utilization for SD and stochastic ALNS on G-type instances ($|\Omega| = 50$) under different coverage ratios.

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Scenario Decomposition (SD)				Stochastic ALNS					
				Obj.	Util.	Avg. len	Std. len	Fail. (%)	Obj.	Util.	Avg. len	Std. len	Fail. (%)
G-10-30	S-S	3	1.0	3141	0.79	4.3	0.8	6.4	3239	0.81	4.6	1.1	7.5
G-10-30	S-S	3	1.5	2986	0.57	5.2	1.0	4.5	3098	0.59	5.4	1.2	5.7
G-10-30	L-L	3	1.0	3199	0.76	5.0	1.2	6.7	3317	0.78	5.3	1.3	8.1
G-10-30	L-L	3	1.5	3046	0.54	6.1	1.3	4.8	3179	0.56	6.4	1.4	6.2
G-10-30	L-S	3	1.0	3083	0.97	4.5	1.0	5.8	3181	0.95	4.7	1.1	6.7
G-10-30	L-S	3	1.5	2952	0.89	4.9	1.1	4.1	3057	0.87	5.1	1.3	5.1
G-10-30	S-S	5	1.0	3067	0.73	3.3	0.9	5.9	3158	0.75	3.4	0.9	6.9
G-10-30	S-S	5	1.5	2921	0.52	4.4	1.1	4.2	3033	0.54	4.6	1.2	5.4
G-10-30	L-L	5	1.0	3121	0.71	4.1	1.0	6.1	3249	0.73	4.3	1.2	7.7
G-10-30	L-L	5	1.5	2983	0.49	5.1	1.3	4.6	3105	0.51	5.3	1.3	5.8
G-10-30	L-S	5	1.0	3022	0.95	3.6	0.9	5.3	3119	0.93	3.8	1.0	6.4
G-10-30	L-S	5	1.5	2891	0.87	4.1	1.1	4.0	3004	0.85	4.3	1.1	5.2
G-20-75	S-S	3	1.0	6264	0.79	6.0	1.1	9.4	6422	0.81	6.3	1.2	10.2
G-20-75	S-S	3	1.5	5951	0.55	7.9	1.5	6.8	6185	0.57	8.3	1.6	8.3
G-20-75	L-L	3	1.0	6396	0.75	7.7	1.4	9.7	6613	0.77	8.1	1.6	11.0
G-20-75	L-L	3	1.5	6085	0.51	9.9	1.9	7.3	6342	0.53	10.2	2.0	9.0
G-20-75	L-S	3	1.0	6151	0.97	6.8	1.2	8.8	6353	0.95	7.0	1.4	9.9
G-20-75	L-S	3	1.5	5874	0.88	8.3	1.6	6.4	6102	0.86	8.6	1.7	7.8
G-20-75	S-S	5	1.0	6098	0.81	4.8	0.9	8.9	6253	0.83	5.0	1.1	9.8
G-20-75	S-S	5	1.5	5824	0.53	6.6	1.3	6.5	6066	0.55	6.9	1.5	7.9
G-20-75	L-L	5	1.0	6207	0.77	6.3	1.2	9.2	6445	0.79	6.5	1.4	10.5
G-20-75	L-L	5	1.5	5921	0.49	8.4	1.7	7.0	6189	0.51	8.7	1.8	8.7
G-20-75	L-S	5	1.0	5993	0.99	5.4	1.0	8.4	6179	0.97	5.6	1.2	9.3
G-20-75	L-S	5	1.5	5751	0.89	7.0	1.4	6.1	5975	0.87	7.3	1.6	7.5

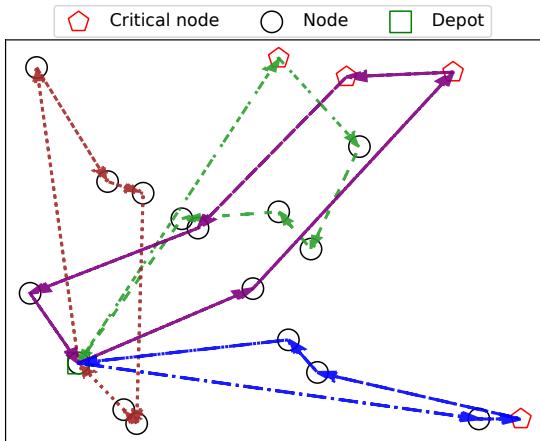
Table 6: Solution quality and fleet utilization for SD and stochastic ALNS on IEEE instances ($|\Omega| = 50$) under different coverage ratios.

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Scenario Decomposition (SD)				Stochastic ALNS					
				Obj.	Util.	Avg. len	Std. len	Fail. (%)	Obj.	Util.	Avg. len	Std. len	Fail. (%)
IEEE-33-136	S-S	3	1.0	10234	0.83	9.37	2.11	9.7	10621	0.80	9.91	2.34	12.5
IEEE-33-136	S-S	3	1.5	9738	0.59	12.84	2.63	7.1	10192	0.61	13.32	2.88	9.8
IEEE-33-136	L-L	3	1.0	10489	0.79	10.42	2.27	10.3	10873	0.77	10.96	2.55	13.2
IEEE-33-136	L-L	3	1.5	9924	0.56	14.23	2.81	7.6	10318	0.57	14.79	3.07	10.4
IEEE-33-136	L-S	3	1.0	10087	0.95	9.82	2.05	9.2	10473	0.92	10.29	2.28	12.0
IEEE-33-136	L-S	3	1.5	9629	0.88	13.21	2.54	6.8	10083	0.86	13.67	2.81	9.3
IEEE-33-136	S-S	5	1.0	9941	0.84	7.61	1.93	9.3	10312	0.82	8.07	2.15	12.1
IEEE-33-136	S-S	5	1.5	9527	0.61	10.94	2.39	6.9	9998	0.63	11.37	2.63	9.5
IEEE-33-136	L-L	5	1.0	10136	0.80	8.44	2.06	9.9	10584	0.78	8.93	2.29	12.8
IEEE-33-136	L-L	5	1.5	9703	0.58	11.89	2.55	7.3	10162	0.59	12.35	2.82	10.2
IEEE-33-136	L-S	5	1.0	9857	0.96	8.02	1.88	8.9	10291	0.94	8.49	2.10	11.7
IEEE-33-136	L-S	5	1.5	9446	0.89	11.37	2.32	6.5	9879	0.87	11.82	2.58	9.1
IEEE-123-556	S-S	3	1.0	21473	0.81	14.87	3.92	12.9	22416	0.78	15.41	4.23	16.4
IEEE-123-556	S-S	3	1.5	20368	0.57	20.16	4.51	9.5	21437	0.59	20.79	4.86	13.2
IEEE-123-556	L-L	3	1.0	21992	0.77	16.93	4.21	13.6	23081	0.74	17.48	4.56	17.1
IEEE-123-556	L-L	3	1.5	20789	0.55	22.34	4.83	10.1	21976	0.56	22.97	5.17	14.0
IEEE-123-556	L-S	3	1.0	21106	0.95	15.42	4.03	12.3	22097	0.92	15.96	4.32	15.8
IEEE-123-556	L-S	3	1.5	20087	0.88	21.01	4.59	9.1	21164	0.86	21.58	4.95	12.7
IEEE-123-556	S-S	5	1.0	20931	0.82	12.76	3.61	12.4	21879	0.80	13.29	3.94	16.0
IEEE-123-556	S-S	5	1.5	19924	0.60	17.38	4.18	9.2	20983	0.62	17.94	4.52	12.9
IEEE-123-556	L-L	5	1.0	21362	0.78	14.49	3.84	13.1	22397	0.76	15.01	4.13	16.7
IEEE-123-556	L-L	5	1.5	20311	0.57	19.62	4.39	9.8	21364	0.58	20.17	4.74	13.6
IEEE-123-556	L-S	5	1.0	20724	0.96	13.68	3.69	11.9	21703	0.94	14.17	3.99	15.4
IEEE-123-556	L-S	5	1.5	19782	0.89	18.41	4.24	8.8	20816	0.87	18.93	4.59	12.3

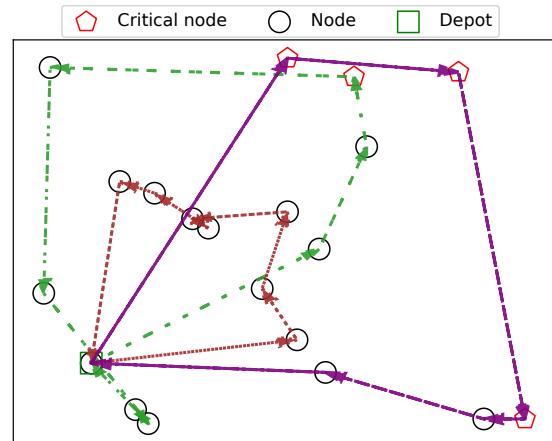
Table 7: Solution quality and fleet utilization for SD and stochastic ALNS on EPANET instances ($|\Omega| = 50$) under different coverage ratios.

Instance	Fleet	$ K $	$\frac{Q K }{ N }$	Scenario Decomposition (SD)					Stochastic ALNS				
				Obj.	Util.	Avg. len	Std. len	Fail. (%)	Obj.	Util.	Avg. len	Std. len	Fail. (%)
EPANET-36-275	S-S	3	1.0	12941	0.76	11.82	2.81	13.9	13784	0.72	12.51	3.19	16.8
EPANET-36-275	S-S	3	1.5	12296	0.54	15.89	3.26	10.6	13147	0.56	16.41	3.61	13.9
EPANET-36-275	L-L	3	1.0	13354	0.71	14.12	3.23	14.6	14293	0.69	14.83	3.57	18.1
EPANET-36-275	L-L	3	1.5	12637	0.50	18.39	3.67	11.4	13582	0.51	19.02	4.01	15.4
EPANET-36-275	L-S	3	1.0	12741	0.94	12.63	2.95	13.3	13596	0.91	13.18	3.23	16.4
EPANET-36-275	L-S	3	1.5	12047	0.86	16.58	3.35	10.1	12872	0.84	17.21	3.70	13.5
EPANET-36-275	S-S	5	1.0	12643	0.78	9.97	2.44	13.5	13418	0.75	10.62	2.78	16.6
EPANET-36-275	S-S	5	1.5	11978	0.57	13.92	2.94	10.3	12843	0.59	14.51	3.27	13.5
EPANET-36-275	L-L	5	1.0	12983	0.73	12.21	2.86	14.1	13876	0.70	12.79	3.17	17.5
EPANET-36-275	L-L	5	1.5	12264	0.52	16.85	3.51	11.1	13207	0.53	17.43	3.88	15.0
EPANET-36-275	L-S	5	1.0	12431	0.96	11.21	2.61	12.9	13264	0.94	11.77	2.93	16.0
EPANET-36-275	L-S	5	1.5	11732	0.88	15.12	3.17	9.7	12591	0.86	15.63	3.53	13.1
EPANET-97-2013	S-S	3	1.0	29281	0.80	20.13	4.53	16.1	31097	0.77	20.91	4.97	19.9
EPANET-97-2013	S-S	3	1.5	27643	0.57	27.04	5.46	12.5	29536	0.59	27.83	5.93	16.4
EPANET-97-2013	L-L	3	1.0	29974	0.75	23.72	5.07	16.9	31941	0.72	24.43	5.55	20.8
EPANET-97-2013	L-L	3	1.5	28324	0.54	31.67	6.03	13.5	30382	0.55	32.48	6.44	18.1
EPANET-97-2013	L-S	3	1.0	28641	0.96	21.78	4.87	15.6	30422	0.93	22.39	5.21	19.3
EPANET-97-2013	L-S	3	1.5	27234	0.88	28.76	5.66	12.0	29141	0.86	29.51	6.11	15.8
EPANET-97-2013	S-S	5	1.0	28391	0.82	17.09	4.19	15.7	30162	0.79	17.81	4.63	19.3
EPANET-97-2013	S-S	5	1.5	27046	0.60	23.31	4.99	12.2	28897	0.62	24.09	5.42	16.2
EPANET-97-2013	L-L	5	1.0	29071	0.77	20.51	4.71	16.3	31022	0.74	21.16	5.09	20.2
EPANET-97-2013	L-L	5	1.5	27839	0.56	27.86	5.66	13.1	29827	0.57	28.47	6.12	17.6
EPANET-97-2013	L-S	5	1.0	28053	0.97	18.89	4.39	15.1	29814	0.95	19.47	4.81	18.7
EPANET-97-2013	L-S	5	1.5	26741	0.89	24.26	5.22	11.7	28596	0.87	24.98	5.69	15.3

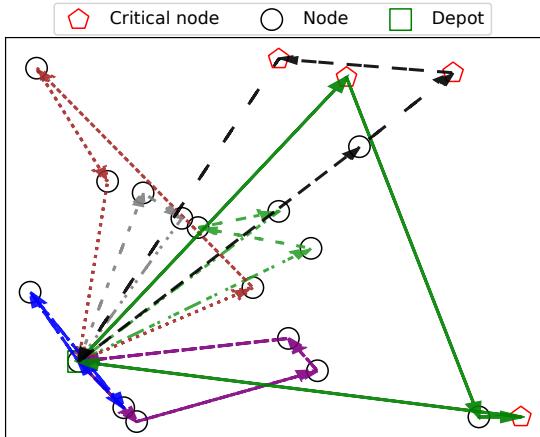
2.4 Solution Visualization Across Number of Critical Nodes in Network



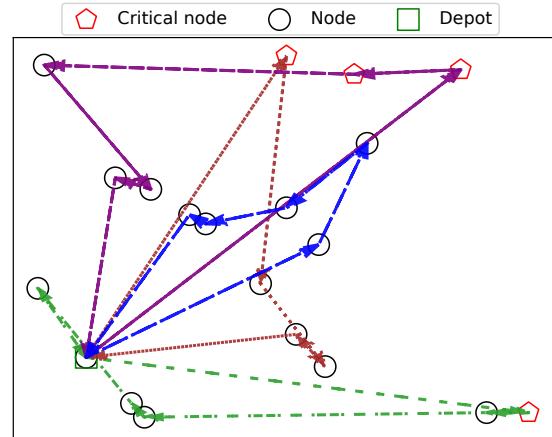
(a) $|K| = 4, Q = 5$



(b) $|K| = 4, Q = 7$



(c) $|K| = 7, Q = 3$



(d) $|K| = 7, Q = 5$

Figure 2: Routing solutions under varying fleet characteristics in G-20-75 with 20% of critical nodes

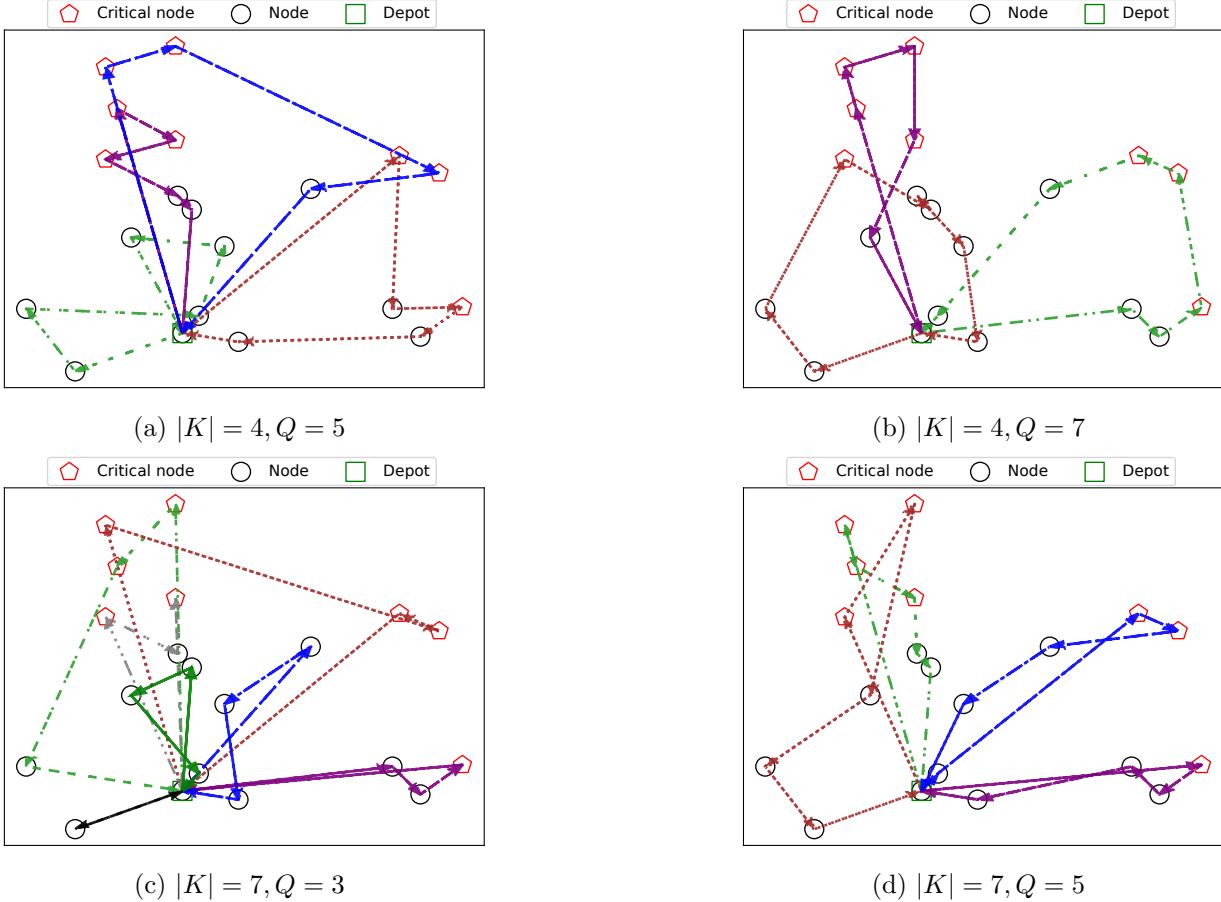


Figure 3: Routing solutions under varying fleet characteristics in G-20-75 with 40% of critical nodes

References

- Deng, Y., Ahmed, S., and Shen, S. (2018). Parallel scenario decomposition of risk-averse 0-1 stochastic programs. *INFORMS Journal on Computing*, 30(1):90–105.
- Yu, M., Nagarajan, V., and Shen, S. (2022). Improving column generation for vehicle routing problems via random coloring and parallelization. *INFORMS Journal on Computing*, 34(2):953–973.