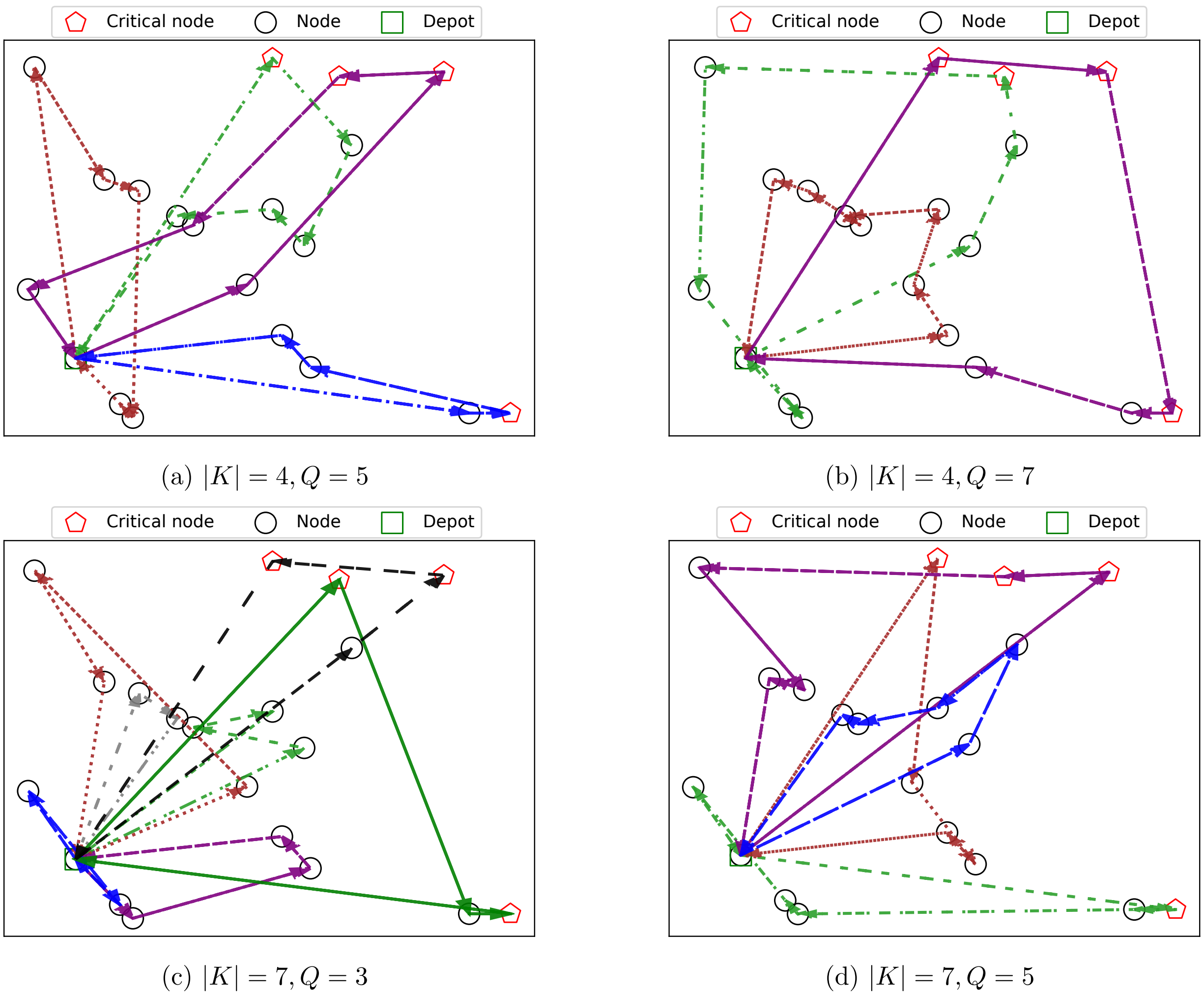
Online Supplement of the Paper "Optimizing Inspection Routes and Schedules for Infrastructure Systems under Stochastic Decision-dependent Failures"

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 $k <$ maxIter or $|T| <$ nSol **do**
  Generate a random coloring function $\phi_k : N \to \{1, \ldots, Q\}$
  Initialize $\Lambda_{\text{depot}} \leftarrow \{0 \ldots, 0\}$
  for $i \in N$ **do**
    $\Lambda_i \leftarrow \emptyset$
  end for
  $B = \{\text{depot}\}$
  while $B \neq \emptyset$ **do**
    Sample $i \in B$
    if $i =$ 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 $R_i = (n_i, N_i^1, \ldots, N_i^Q)$ **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 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



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

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

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

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

Figure 1: Optimal routes for 20% of critical nodes

References

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.