

EURO meets NeurIPS 2022 Vehicle Routing Competition

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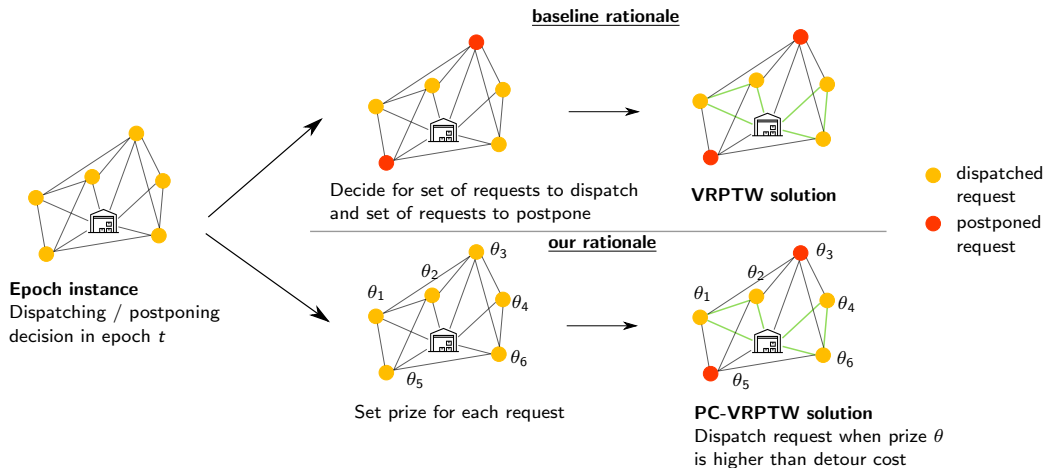
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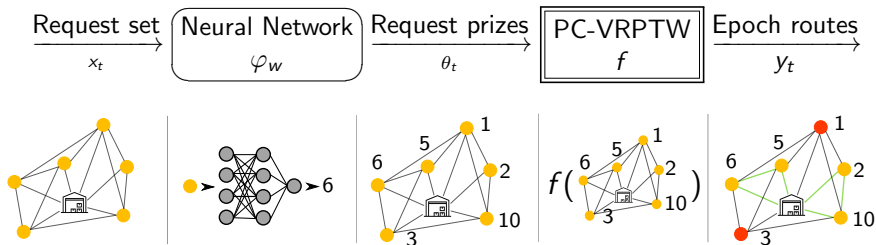
Dynamic VRPTW as Prize-Collecting VRPTW

- We learn to represent the dynamic VRPTW with a Prize-Collecting VRPTW

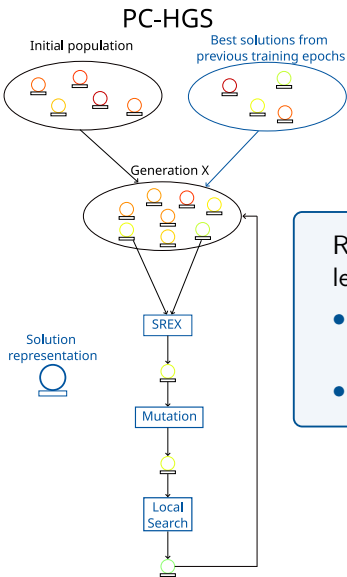
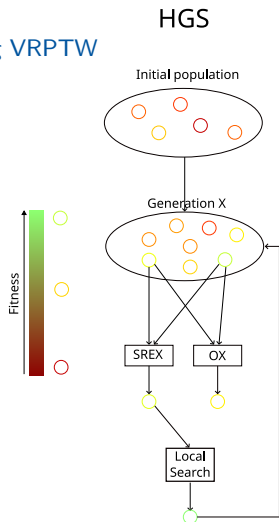


The Idea

- Implementing this approach requires a novel structured-learning pipeline



Prize Collecting VRPTW

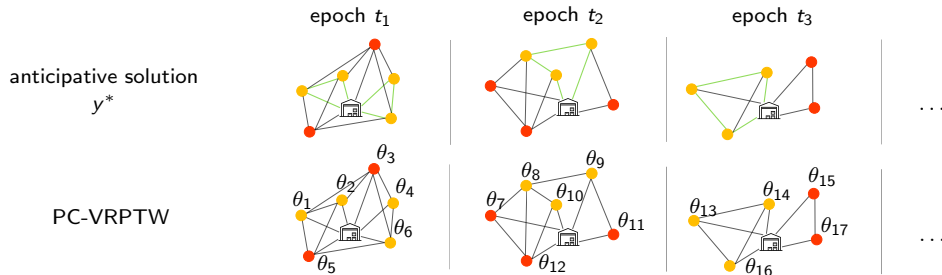


Requirements of usage in learning environment:

- Robust w.r.t. objective value
- Quick convergence

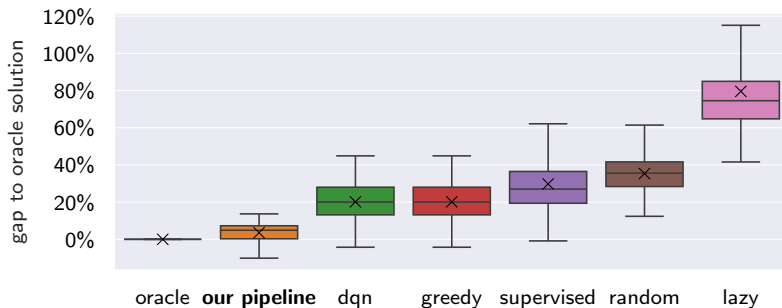
Learning the Neural Network (Prizes)

- We learn to imitate the anticipative (oracle) strategy



$$L(\theta, y^*) = \underbrace{\mathbb{E} \left[\max_{y \in \mathcal{Y}(x_i)} (\theta + Z)^\top y - d(y) \right]}_{\text{non-optimality of } y \text{ as anticipative solution}} - (\theta^\top y^* - d(y^*))$$

Results



- ... gap of our pipeline to the oracle: **3.55%**
- ... gap of second best solution (dqn, greedy) to oracle: **20.15%**

General consensus in literature on stochastic problems indicates that imitating an anticipative strategy does not generalize well.
Yet, our approach yields near optimal solutions.