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Frameworks for Nonclairvoyant Network Design with Deadlines or Delay

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Abstract: Clairvoyant network design with deadlines or delay has been studied extensively, culminating in an $O(\log n)$-competitive general framework, where n is the number of possible request types (Azar and Touitou, FOCS 2020). In the nonclairvoyant setting, the problem becomes much harder, as $\Omega(\sqrt{n})$ lower bounds are known for certain problems (Azar et al., STOC 2017). However, no frameworks are known for the nonclairvoyant setting, and previous work focuses only on specific problems, e.g., multilevel aggregation (Le et al., SODA 2023).

In this paper, we present the first nonclairvoyant frameworks for network design with deadlines or delay. These frameworks are nearly optimal: their competitive ratio is $\tilde{O}(\sqrt{n})$, which matches known lower bounds up to logarithmic factors.

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