Scenario-based path travel time aggregation with Gaussian copula estimated through Lasso

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In this paper, we highlight the characteristics of floating car data, and extend our research on single link to paths.

To carry out the minimum risk routing decision, we need to estimate the distribution especially the tails of the path travel time. By the law of total probability, we then propose to approximate the total path travel time distribution by the probability-weighted sum of a series of scenario-specific conditional path travel time distributions. Each of them is characterized by the sequence of entering time to the links of the path and the sequence is expressed as its corresponding (entering-time) positioning vector and window width vector. Any of such conditional distribution is the sum distribution of a sequence of link travel time distribution with specific dependence structure. The dependent structure is modeled by a lagged Gaussian copula while the marginal distributions are estimated by kernel method. The L1-constrain-minimization (Lasso) method is utilized to obtain an invertible covariance matrix of the Gaussian copula even for limited data.

Compare to the iterative type procedure, this approach is efficient when the number of scenarios to visit is limited and it resolves the "conditional distribution puzzle" in the iterative formulas.