## Wasserstein distance and the distributionally robust TSP

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June 7, 2016

## Abstract

Recent research on the robust and stochastic travelling salesman problem and the vehicle routing problem has seen many different approaches for describing the region of uncertainty, such as taking convex combinations of observed demand vectors or imposing constraints on the moments of the spatial demand distribution. One approach that has been used outside the transportation sector is the use of statistical metrics that describe a distance function between two probability distributions. In this paper, we consider a distributionally robust version of the Euclidean travelling salesman problem in which we compute the worst-case spatial distribution of demand against all distributions whose *Wasserstein distance* to an observed demand distribution is bounded from above. This constraint allows us to circumvent common overestimation that arises when other procedures are used, such as fixing the center of mass and the covariance matrix of the distribution.

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