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Solving Quadratic Optimization Problems using the Cauchy-Schwarz Inequality

Quadratic Programming (QP) is an example of a non-linear programming problem, where the goal is to optimize a quadratic function on n variables, subject to linear constraints on those variables. In this talk, we provide an alternative way of solving one special type of QP problem, via the Cauchy-Schwarz Inequality.

We apply the technique to determine the optimal fare prices for any transportation network that charges its commuters by total travel distance, where the goal is to maximize fare revenue given a fixed ridership. Our “fare price formula” is applied to a well-known 47-station transportation network in British Columbia with 400,000 daily commuters.

This research will inform the work of Metro Vancouver’s transportation authority, an organization that is in the process of conducting a comprehensive review of transit fare policy for the first time in its history.