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## A Charging Network for Electric Vehicles

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### Abstract

Electric vehicles (EVs) have gained worldwide attention as a solution due to their environmentally friendly characteristics. The need to expand and/or increase the capacity of the existing electric vehicle charging station infrastructure with an appropriate investment plan is on the rise, in parallel with the increasing demand. In this study, considering the existing charging stations, a mixed-integer linear programming model is proposed for the suggested multi-objective optimization problem to determine capacity enhancements in existing charging stations and to identify the locations and capacities of newly to be established ones. The model is used to solve considered design problem to meet EV demands considering closest possible location, while minimizing the investment cost. We consider several factors, such as various EV brands and models, EV and charger power and battery capacities, and different charging service requirements from drivers to solve the problem in a realistic manner. According to the computational analysis, the effectiveness of the model is shown on randomly generated test problems. A set of potential solutions (Pareto front) is obtained by a multi objective approach instead of a unique solution as in single objective cases. Hence, decision makers can choose a result based on their preferences and then implement the selected solution (charging network design).

**Keywords:** Electric vehicle, Charging station network, Location, Multi objective, Pareto