Abstract

In this thesis, we study some uncertain optimization model where the data are not known accurately. These uncertainties can occur due to various reasons such as measurement error, lack of knowledge of model parameters, product demand, or price for future time periods. A tractable formulation of an optimization problem is often associated with an uncertain optimization problem that restricts the nature of uncertainty. To deal with uncertain optimization problems, two major approaches available, namely stochastic optimization and robust optimization. Stochastic optimization techniques refer to a collection of methods when the parameters of the problem are characterized by random variables, where as robust optimization addresses uncertain optimization problem where data can vary in an uncertainty set around their nominal values.

The present thesis highlights the methodology to obtain the computationally tractable formulation of the multi-objective solid transportation problem where the right-hand side parameters of the following Gamma or Erlang distribution. In a stochastic optimization model, if the parameter of the coefficient matrix follows a probability distribution other than the normal distribution, then the decision-maker needs to define the joint probability distribution function. However, it becomes intricate to define joint probability distribution functions for big data. In a stochastic transportation problem, to avoid this situation when the coefficient parameters of the objective function follow other than the normal distribution, we develop a transformation technique with the help of chance constraint programming based on Essen inequality to reduce the complexity and obtain an equivalent computationally tractable formulation. Further, we generalized the uncertain linear optimization model that incorporates the products of two uncertain parameters in some terms and obtain computationally tractable formulation by considering the data are either an ellipsoidal uncertainty set or polyhedral uncertainty set. Further, we apply the generalized uncertain optimization model to real-life decision-making problems. Finally, some numerical examples are presented to illustrate the proposed model and methodology.

Keywords: Liner programming, Non-linear programming, Multi objective programming, Stochastic optimization, Chance constraint programming, Robust optimization.