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Title: Probability constraints: analytical properties and a discussion of dedicated algorithms

Abstract: In decision making problems wherein decisions are taken prior to observing uncertainty, probability constraints are a convenient way to express safety. Indeed, frequently one encounters an inequality system involving both the decision and random vector that needs to hold as much as desired/possible. Since the decision is fixed prior to observing the result of this inequality system, it is clear that requesting it to hold almost surely is likely excessive. Requiring a high enough probability is intuitive, but yields a non-trivial optimization problem: the properties of which need to be analyzed. Understanding the analytical properties of the resulting problem or probability functions is not only of mathematical but also of practical interest. In this talk we will discuss differentiability properties of probability functions and convexity of probability constrained feasible sets. We will also discuss some recent dedicated algorithms for handling optimization problems with probability constraints.