PEDRO PÉREZ-AROS, Universidad de Chile

Subdifferential characterization of probability functions under Gaussian distribution

This work provides formulae for the subdifferential of the probability function

$$\varphi(x) = \mathbb{P}(g(x, \xi) \leq 0),$$

where $(\Omega, \Sigma, \mathbb{P})$ is a probability space, ξ is an m-dimensional gaussian random vector, $g : X \times \mathbb{R}^m \to \mathbb{R}$ is locally Lipschitz and convex in the second variable and X is a separable reflexive Banach space. Applications for this class of functions can be found in water management, telecommunications, electricity network expansion, mineral blending, chemical engineering, etc, where the constraint $\mathbb{P}(g(x, \xi) \leq 0) \geq p$ expresses that a decision vector x is feasible if and only if the random inequality $g(x, \xi) \leq 0$ is satisfied with probability at least p. The aim of this work is to extend the previous results (see [1, 2]) to infinite dimensional spaces X, using a weaker growth condition and assuming local Lipschitz continuity of g only, even when the probabilistic function φ could be non-Lipschitz.

References

[1] W. van Ackooij and R. Henrion . Gradient formulae for nonlinear probabilistic constraints with Gaussian and Gaussian-like distributions. *SIAM J. Optim.*, 24 (2014), no. 4, 1864-1889.

[2] W. van Ackooij and R. Henrion . (Sub-) gradient formulae for probability functions of random inequality systems under Gaussian distribution. *SIAM/ASA J. Uncertain. Quantif.*, 5 (2017), no. 1, 63-87.