

Optimality Conditions and Stability Analysis for Uncertain Optimization Problems

Vo Duc Think

Department of Mathematics Teacher Education, Dong Thap University, Vietnam.

Email: vdthink@dthu.edu.vn

ABSTRACT

In this work, we study an uncertain inequality system, where the input data are uncertain and belong to prescribed uncertainty sets. Using deterministic approach in robust optimization, we treat this uncertain system by examining the so-called robust system. This approach enables us to compute the second order tangent sets for solution set of the robust system and thus, to obtain the second order epi-subderivative for the indicator function of its solution set. In this way, we are able to calculate the graphical derivative for normal cone mapping of solution set of the robust system under certain qualification conditions. As applications, we establish second order necessary and sufficient optimality conditions, and derive necessary and sufficient conditions for stability properties such as the isolated calmness of optimization problems involving uncertain constraints under weak qualification constraints.

Key words. Graphical derivative, normal cone mapping, generalized equation, robust optimization, second order epi-subderivative, second order tangent set.

REFERENCES

- [1] A. Ben-Tal, L. El Ghaoui, and A. Nemirovski, *Robust Optimization*, Princeton Series in Applied Mathematics, Princeton University Press, 2009.
- [2] D. Bertsimas, D. B. Brown, and C. Caramanis, Theory and applications of robust optimization, *SIAM Review*, 53 (2011), pp. 464–501.
- [3] T. D. Chuong, Robust optimality and duality in multiobjective optimization problems under data uncertainty, *SIAM Journal on Optimization*, 30 (2020), pp. 1501–1526.
- [4] T. D. Chuong and V. Jeyakumar, Robust global error bounds for uncertain linear inequality systems with applications, *Linear Algebra and its Application*, 493 (2016), pp. 183–205.