Title: Error Bounds and their Stability Analysis and Applications

Abstract: Error bounds and related topics, such as metric subregularity, weak sharp minima, calmness and exact penalization, have been extensively studied in last three decades. Error bounds have important applications in the design of optimal algorithms and the study of their convergence analysis in solving nonlinear optimization problems, as convergence rates of some iterative algorithms rely on the error bound property and the accuracy of the approximate solution obtained by the algorithms depends on the magnitude of the local error bound modulus. As in the practical optimization applications, data in the models are often not estimated accurately, stability analysis can guarantee that the solutions or properties of the original system can be reserved under certain kinds of perturbations. However the study on the computable local error bound moduli and their stability analysis is relatively new and immature. Therefore there is a need to carry out an in-depth study for local error bound moduli and their stability analysis and applications.

In this project we will establish computable lower and upper estimates of the local error bound modulus for a proper and lower semicontinuous function without regularity assumptions and obtain a computable global error bound modulus for a positively homogeneous function by virtue of variational analysis tools. We will provide formulae for the uniform local error bound modulus and the restricted uniform local error bound modulus respectively for a proper and lower semicontinuous function. We will exam sufficient conditions for uniform local error bound and the restricted uniform local error bound properties that allow us to explore stability analysis of the relevant error bound. We will apply the obtained results to the study of the convergence analysis of the sequence produced by approximate problems of a difference-of-convex optimization problem to a Bouligand-stationary point and investigate the local error bound property of the supremum function of a linear portfolio selection optimization problem with a sparsity constraint.