

Sujet de recherche Master MSIAM 2019-2020

Titre: Interval approach for solving constraints in DFO context

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Subject description:

Derivative-free Optimization (DFO) have been widely developed in the last decade with successfully results.

Some of them considers all components of the objective function as black-boxes. The current work will address the case where derivatives are available for some of these components (but not all). This problem has been recently addressed in Mono and Mult Objective context. In the context of single objective directional direct search, derivatives have already been used to prune the sets of directions explored at the poll step of the algorithms. Also, the knowledge of derivatives allows the computation of accurate quadratic polynomial models, based in Taylor expansions.

Other strategies will be considered when the constraints are analytically defined. We want to explore new combination using branch and bound methods and interval algebra.

Some work have been developed in G-SSCOP Lab (interval, BB algorithm and ProDESIGN for analytical models and also in Montreal and Lisboa for DFO software (NOMAD, DMS)

Skills required: Nonlinear optimization; high level language for programming (C++,Java,Python,Julia)

Internship place: the internship will take place part in Grenoble and part in foreign country (Montreal or Lisboa)

Références:

- M. A. Abramson, C. Audet and J. E. Dennis Jr., Generalized pattern searches with derivative information, *Mathematical Programming*, 100 (2004), 3 – 25
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- A. L. Custódio, J. F. A. Madeira, A. I. F. Vaz and L. N. Vicente , Direct Multisearch for Multiobjective Optimization, *SIAM Journal on Optimization*, 21 (2011), 1109 – 1140
- J. Thomann and G. Eichfelder, A trust-region algorithm for heterogeneous multiobjective optimization, *SIAM Journal on Optimization*, 29 (2019), 1017-1047
- Laura Picheral, Khaled Hadj-Hamou, and Jean Bigeon. Robust optimization based on the Propagation of Variance method for analytic design models. *International Journal of Production Research*, 52(24):7324–7338, January 2014.
- Issam Mazhoud, Khaled Hadj-Hamou, Jean Bigeon, and Ghislain Remy. Interval-based global optimization in engineering using model reformulation and constraint propagation. *Engineering Applications of Artificial Intelligence*, 25(2):404–417, 2012b. doi: 10.1016/j.engappai.2011.10.010.