



## ***A tutorial for Deterministic Global Optimisation Algorithms.***

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### resumen:

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Global Optimization (GO) is a challenging area where we want to find the best optimum in continuous space in situations where more than one optimum may exist. In engineering applications we observe use of heuristic methods based on (pseudo)random generated numbers. The best generated trial point is then used as an approximation of the solution. There is no guarantee it is close to the optimum.

Interesting alternatives are Deterministic Global Optimisation algorithms. Also here heuristics exist to deal with costly evaluations in a careful way. However, there are also deterministic methods that give a guarantee that in the end we are close to the global optimum. Of course a free lunch does not exist. Such methods require information on the structure of the problem and nobody says that any problem can be solved within a humans lifetime.

In the presentation we sketch material and exercises made to introduce students into the ideas of deterministic GO algorithms. After introducing the idea of finite sampling, structures of concavity, DC, Lipschitz continuity, Quadratic, Bilinear, Fractional Programming and Interval arithmetic are discussed with small numerical examples without being exhaustive in all its properties. After that we devote some cases to give a feeling for the construction of GO Branch-and-Bound algorithms. These algorithms lead to the guarantee that we obtain the global optimum. How can structures be recognised and be used to derive bounds? How can bounds be used in an algorithmic context to construct algorithms leading to a guaranteed optimum?

### sobre E.M.T.Hendrix:

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Eligius M.Th. Hendrix is a researcher in optimisation methods. In his teaching experience of 25 years he supervised about 100 Msc theses and 10 PhD theses. The investigation results can be found in 35 articles in international journals and contributions to several books and national papers. His work started at Tilburg University where he graduated, but most contributions can be found in agricultural and environmental applications due to his relationship with Wageningen University; among others in agro-logistics, design of experiments, risk, water management, fodder industry etc. Most fundamental research questions deal with Global Optimisation, Robustness and Location problems, where he also organises workshops.