Interval-based Global Optimization (GO) techniques [8] provide guaranteed global optima to complex nonlinear programming problems, including Mixed-Integer Nonlinear Programming problems (MINLPs) [1]. Thanks to recent developments [2,7,3,6] interval-based GO is competitive (in terms of computing time) with respect to other (non-guaranteed) techniques, at least for some classes of problems.

This property is particularly interesting when considering the problem of parameter estimation from noisy measurements for systems described by ODE- or PDE-based mathematical models that involve functions which are nonlinear in their parameters [10]. For such systems, the parameters may not necessarily be globally identifiable. Due to the lack of identifiability, the cost function to be optimized may have a globally optimal value attained by distinct parameter vectors. One way for detecting such situations involves finding all globally optimal parameter vectors [5,4,9]. Computational experience shows that the computing times needed to obtain all global optima may be several orders of magnitude larger than with conventional (non-guaranteed) optimization techniques, even for very simple nonlinear models with two or three parameters [10]. One of the reasons for this overhead is due to difficulty to bound efficiently the range of the cost function over some box in the parameter space. The aim of this post-doctoral fellowship will be to determine the causes for interval-based GO techniques inefficiencies in the context of parameter estimation, and to propose tools, e.g., based on constraint propagation or on sensitivity analysis to improve their efficiency.

If interested, the applicant may also consider applications in communication and networking, such as elaborating routing strategies for multicasting multimedia contents with guarantee on the quality of service. Such problems may be cast into the framework of MINLP: routes for packets have to be determined, which corresponds to the integer part of the problems, and delay and distortion constraints have to be satis?ed at the receivers, which correspond to the continuous part of the problem. The applicants should have a good background in numerical methods for global optimization. No background in estimation nor in communication and networking is required.

This one-year fellowship is funded by Digiteo, a very large research cluster devoted to research in Science and Technology of Information located close to Paris (see http://www.digiteo.fr/ for more details). The net monthly salary is 2000EUR (French-style, which means there may be some taxes to pay --- averaging 1500EUR --- at the end of the fiscal year). The postdoctoral fellow will benefit from the close links established between all participants to this cluster both in terms of the theoretical and applied aspects of his or her scientific

research and in terms of opportunities for his or her future career.

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