

**AN ADAPTIVE FEASIBILITY APPROACH FOR CONSTRAINED BAYESIAN OPTIMIZATION WITH
APPLICATION IN AIRCRAFT DESIGN.**

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Abstract: The multidisciplinary optimization of new aircraft configurations involves numerous design variables and constraints. In this context, ONERA (the french aerospace Lab) developed a new constrained bayesian optimizer, named Super Efficient Global Optimization (SEGO) based on Mixture of experts (MOE). The latter employs gaussian processes to set surrogate models for the objective function and the constraints taking into account both exploration (sampling from areas of high uncertainty) as well as exploitation (sampling areas likely to offer improvement over the current best observation). Concerning the constraints, only the prediction of these models is taken into account during the optimization process. Thus, due to the error made by the surrogate model, the estimated feasible domain can be not well approximated and hence leading to poor optimization results in some cases. This issue is amplified once large-scale constrained optimization problems are regarded. In this work, we propose different criteria for constraint handling based on feasibility probabilities (estimated using gaussian processes). In fact, instead of using only constraints predictors the new criteria allow the optimizer to explore unfeasible areas in terms of the constraints predictors. An adaptive mechanism is also included to manage the minimum feasibility acceptance of possible enrichment points. The obtained optimization strategy based on the use of the feasibility probabilities explores better the feasible domain. Numerical experiments are carried out on a set of known test problems as well as an industrial optimization problem.