

## DESIGNING SAFE SYSTEMS UNDER SEVERE UNCERTAINTIES.

One year post-doctoral position  
LABEX (MS2T)

**Supervisor: Sébastien Destercke and Mohamed Sallak**

### CONTEXT

In various situations, i.e., uncommon working conditions, use of new components, early phases of designs, presence of human factors, etc. It often happens that the behaviour of systems or of systems-of-systems is ill-known or difficult to precisely characterise, in particular regarding their reliability.

In such settings, the design task has to face several new difficulties: either one settle for a very cautious design given current knowledge, running the risk of designing an overly reliable but sub-optimal system in other aspects (weight, cost, etc.), or one try to search which designs are promising, possibly retaining multiple ones that may all satisfy safety requirements. In this latter case, two important issues arise: determining efficiently a set of promising systems, and trying to collect more information in order to discard, among those retained systems, the ones that are actually not optimal.

### TOPIC

The offered post-doctorate position will deal with those two issues, in particular we expect the applicant to work on those two issues:

- How to efficiently select undominated designs when the working probabilities of components are ill-known, both in the binary and multiple state (i.e., where components can work in degraded conditions) settings. Such research involves, for example, working on finding solutions to peculiar equations such as polynomial or multi-linear ones, problems that are computationally challenging in their most general expressions. The candidate will be able to develop efficient heuristics for general cases, or exact methods for specific cases of interest (n-out-of-k systems, consecutive n-out-of-k, etc.)
- Once a set of possible designs has been determined by the previous methods, what kind of information should be collected in order to reduce the most this set of possible candidate designs. Such information may come from the result of expert elicitation procedures, or of complementary experiments

performed on the components. An interesting line of research that could be pursued is to use a notion of optimal elicitation procedure, understood as the information that would provide some guarantees about the rate at which some designs would be discarded.

#### ENVIRONMENT

- Place of research: Heudiasyc laboratory, Compiègne University of Technology (40 minutes by train from Paris)
- Salary: according to applicant experience
- Duration: 1 year
- Starting date: September/October 2017

The applicant will benefit from past works performed by the two supervisors and some of their students on similar topics, as well as from the general advantages offered by LABEX MS2T in terms of visibility, possibility to fund travels, etc. This post-doctoral position is linked to the ORUs (Optimisation, Reliability, Uncertainties) labex challenge team, whose members are part of the ASER (Automatic, Robotic, On-board systems) and DI (Image and Decision) teams of Heudiasyc.

#### APPLICANT PROFILE AND APPLICATION REQUIREMENTS

The candidate should hold a PhD Thesis in computer science, reliability analysis, optimisation or related fields. In particular, we are searching for excellent skills in at least one of the following fields:

- Reliability analysis
- System design
- Reliability analysis
- Computer science

Applications and questions can be sent to <sebastien.destercke@hds.utc.fr>. Applications **must** include the following items:

- a letter of motivation detailing explicitly what are the interest of the applicant in the proposed topic;
- a curriculum vitae clearly showing how the candidate profile matches the above requirements;
- contact information of at least one reference (two or more would be appreciated).

Any application not containing these three items, or not tailored to this proposal, will not be considered further. In addition, the following optional items may be included:

- existing scientific papers;

- any link to significant realisations (e.g., software, ...)