Résumé du projet de recherche (Langue 1)

In the past 50 years, there has been an increasing demand for a principled approach to the maintenance of industrial equipment. However, maintenance processes are typically triggered by either malfunctioning, or by a simple time-based maintenance schedule. The development of techniques designed to help determine the condition of in-service equipment in order to predict when maintenance should be performed, is a recent effort that goes under the name of predictive maintenance.

In the context of this PhD Thesis, we will explore novel approaches to design, analyse and validate interpretable machine learning models, that not only output predictions (e.g. whether a system is in a normal, functioning state or not) but also which are the rules that determine such predictions.

In particular, we will work on Boolean function approximation, in that their structure readily accommodates expressing rules in normal forms, such a disjunctive normal forms. The main challenges we will address are related to: 1) the discrete nature of the modelling space, which calls for optimisation heuristics or relaxation techniques for loss minimisation; 2) algorithmic scalability in face of very large training sets; 3) automatic support in decision making, through the use of the reinforcement learning paradigm.

This Thesis is supported by SAP, which will provide its operational data, and will provide a safe “sand box environment” to evaluate the contributions of this work.