Topic : Fault Detection Algorithm and effect in a Process Control
Project for : Ecole Polytechnique de Montréal, Montreal, Quebec, Canada
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Context

In the intricate landscape of complex systems, particularly in fields like industrial operations, the occurrence of catastrophic failures can have devastating consequences. These failures often trigger what can be described as "alarm floods" — torrents of alarms and notifications, a relentless deluge of system alerts that, if not managed effectively, can pose a grave threat to operations and even lead to potentially catastrophic accidents. This alarming scenario has been a pressing concern for many industries.

Recent advances in research have brought about a significant transformation in how we address this problem. These breakthroughs have introduced diagnostic tools designed explicitly to tackle the challenge of alarm floods. These advanced algorithms not only excel at identifying the root causes of these alarm floods but also provide real-time diagnoses to the operators who are responsible for managing these complex systems. Such diagnostic tools have become pivotal in helping operators navigate the turbulent sea of alarms and make informed decisions, thereby averting potential disasters.

However, our project takes a distinctive and somewhat unconventional angle in this realm of research. Rather than assessing the accuracy of diagnoses provided by these tools — whether they are correct, incorrect, or nonexistent — we delve deeper into a critical aspect that is often overlooked: the impact of these diagnostic tools on the decision-making processes of the operators themselves. In essence, we seek to understand how operators' decision-making is influenced when they are confronted with correct, incorrect, or absent diagnoses from these tools.

Moreover, our project goes beyond the realm of diagnostics. We are equally committed to enhancing the operator interface. We aim to refine and optimize the way operators interact with these diagnostic tools. This includes improvements that enhance attention, usability, and focus, all critical factors in ensuring that operators can effectively manage complex systems. This dual focus, on both the effect of diagnostic tools on decision-making and the enhancement of the user interface, underscores the multidimensional approach we adopt in our research.

Furthermore, it is essential to highlight that throughout the course of our project, we have harnessed the capabilities of various laboratory facilities. These resources have empowered us to conduct in-depth studies, carry out comprehensive experiments, and gather valuable insights that contribute to our research endeavors. This multi-pronged approach, combining technology with a focus on human decision-making, reflects our commitment to advancing the field and improving the safety and efficiency of complex systems.