Validating Condition-Based Maintenance Algorithms through Simulation

Authors : Marcel Chevalier, Léo Dupont, Sylvain Marié, Frédérique Roffet, Elena Stolyarova, William Templier, Costin Vasile **Abstract :** Industrial end-users are currently facing an increasing need to reduce the risk of unexpected failures and optimize their maintenance. This calls for both short-term analysis and long-term ageing anticipation. At Schneider Electric, we tackle those two issues using both machine learning and first principles models. Machine learning models are incrementally trained from normal data to predict expected values and detect statistically significant short-term deviations. Ageing models are constructed by breaking down physical systems into sub-assemblies, then determining relevant degradation modes and associating each one to the right kinetic law. Validating such anomaly detection and maintenance models is challenging, both because actual incident and ageing data are rare and distorted by human interventions, and incremental learning depends on human feedback. To overcome these difficulties, we propose to simulate physics, systems, and humans -including asset maintenance operations- in order to validate the overall approaches in accelerated time and possibly choose between algorithmic alternatives.

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