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Candidat	M JAZA Rabii
Fonction	Doctorant
Laboratoire INSA	LAMCOS
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Résumé

This thesis work is a proof of concept. It is the first part of a much larger work where we try to answer the question whether it is possible to set a link between the morphological aspects of the third body particles and the rheological parameters of the contact where they were created. The rheological measurements are almost impossible to obtain without opening the contact itself. Therefore, such a link could be a game changer especially in machine monitoring and failure prediction, which is the long-term goal of this project. In this effort, we evaluate the efficiency of supervised machine learning algorithms in linking back the third body particles with the tests from which they originate. In addition, we assess the ability of the algorithms in predicting the rheological properties of the contact from the morphological descriptors of the wear debris it produced. We held our own tribological tests using a classical pin-disk tribometer. To ensure the production of diverse third body particles, we conduct nine tests organized in three sets. One experimental condition was varied between the tests of a give set. The rheological parameters in this project were calculated directly from the in situ signals recorded during the tribotests. They are are not the usual measures but they are mechanical measurement that describe the flow of the wear debris. Regarding the morphological dataset, we chose five different descriptors to characterize the particles post mortem after the tribological tests were terminated. Those descriptors are calculated through image analysis algorithms of SEM images. Machine learning algorithms had a 40% success rate at learning from in which test each particle was created using only the shape descriptors. However, the results of predicting the rheological parameters from the morphological database were not as promising however they were essential for the future work.