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A Comprehensive Degradation Modelling: From Statistical to Artificial Intelligence Models

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In the real world, a product or a system usually loses its function gradually with a degradation process rather than fails abruptly. To meet the demand of safety, productivity, and economy, it is essential to monitor the actual degradation process and predict imminent degradation trends. A degradation process can be affected by many different factors.

Degradation modelling typically involves the use of mathematical models to describe the degradation processes that occur in materials or systems over time. These models can be based on empirical data, physical principles, or a combination of both, and can be used to make predictions about the future performance of the material or system.

This work is attempted to review previous degradation models, and present some new deep learning based approaches for degradation modelling. First, it deals with statistical models, like general path and stochastic models. Then, because of some cumbersomeness of statistical models; like incompleteness modelling, it moves to make comforts by some AI models.

The main advantage of AI models is capturing possible nonlinearity in the observed degradation data, but they often suffer from limitations of available dataset.

To overcome limitations of statistical and machine learning models, some mixed models considering both simultaneously have been presented.

This work is aimed at explaining briefly all models and then making a huge comparison between them for some irregular real degradation data. The mentioned data is related to the wear of some chains producing glass wool.

Keywords

Degradation Modelling, Statistical and Machine Learning Models, Artificial Intelligence Models

Classification

Both methodology and application

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