

Foundation Models for Process Monitoring in Vibration-Assisted Drilling

Background

In the aerospace industry, holes in multi-layer material stacks are generally produced using industrial robots. During vibration-assisted drilling (VAD), multi-channel sensor signals and quality data are recorded. Large, pre-trained models for time-series and tabular data could also be used for tool-wear estimation with only a small amount of process-specific data.

Task

The work includes:

- Literature review and overview of suitable open-source models
- Evaluation of data formats and applicability to process data
- Benchmarking against classical machine-learning models
- Investigation of fine-tuning strategies and their influence on accuracy and robustness

Requirements

- Programming skills, ideally in Python and PyTorch
- Interest in machine learning and process monitoring
- Basic knowledge of time-series data is advantageous, but not required
- Initiative, a structured approach to work, reliability, and commitment

Goal

The goal of this work is to systematically investigate the suitability of such foundation models for process monitoring in VAD and compare them with small, classical machine-learning models.

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