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## **Statistical Monitoring for Failure Detection of Royal Netherlands Navy Vessels**

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Within the PrimaVera (Predictive maintenance for Very effective asset management) project, we carried out a case study on monitoring procedures for failure detection of bearing in diesel engines of ocean-going patrol vessels. Monitoring is based on bearing temperature, since the two most important failure modes (abrasive wear and cavitation) cause an increase in these temperatures.

A regression model to correct the bearing temperatures for external factors was fitted using LASSO variable selection. Monitoring procedures have been developed based on predictive and recursive residuals. A hybrid method consisting of EWMA charts based on a combination of recursive and predictive residuals proved to be effective when applied to historical data, and has the additional feature of being self-starting.

Another effective method that proved to be useful is based on regression adjusted variables. This method is designed to detect when a bearing shows deviant behaviour from what is expected given the other bearings.

### **Keywords**

monitoring, regression control charts, contextual anomaly detection

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