Anomaly Detection

Producers must be increasingly competitive to protect their market share. Strong competition means machinery must operate at peak performance for as long as possible - and without interruption. In order for companies to ensure that maintenance occurs at exactly the right time, they must know about impending issues far enough in advance in order to take action.

Manufacturing plants are a complex array of components and automated systems finely tuned to work together. Critical parts are monitored for proper functioning, with sensors providing data at regular intervals. Based on readings taken while parts are functioning correctly, a model is trained to detect anomalous data, thereby predicting impending breakdowns. This data is read into a KNIME workflow which is automatically executed daily on KNIME Server. The model is applied and the deployment workflow calls PMML models which, in the case of an anomaly, assess whether a first or second level alert should be activated.

In this case, the first level alert is generated by applying the prelearned PMML models. In a second step, those first level alerts are combined and analyzed to report the second level alert. In the case of a first level alert the REST service enables the action - an email to be sent or even a siren to start. If a critical anomaly is detected in the form of a second level alert, a system shutdown can be invoked.
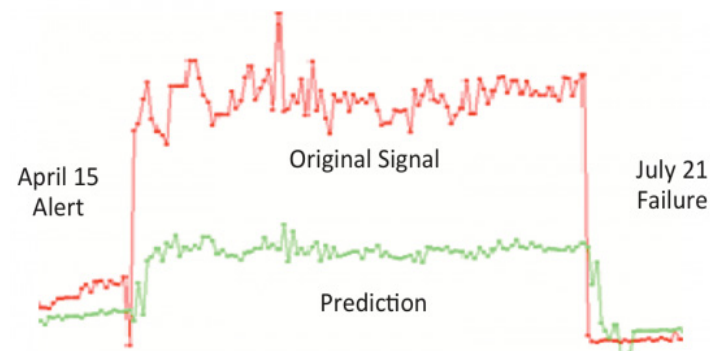

Fig. 1: The workflow was able to predict and issue an alert months before the failure.

Results:
With this Analytical Service, Production Managers can more efficiently manage their manufacturing plant due to:
· Accurately predicted breakdowns - in this case up to ten weeks in advance
· Escalation of maintenance actions e.g. from email to system shutdown
· Creation of an accurate, customized preventive maintenance program
· Gradations in alert severity which are recognized and acted upon, based on how critical they are

Fig 2. High-level KNIME workflow

A KNIME workflow deployed on KNIME Server as a Guided Analytics Application (hosted in the cloud), makes vast computational resources available to deploy predictive analytics on sensor data, predicting breakdowns up to ten weeks in advance and setting off alerts to Production Managers.

Try it out for yourself!
This workflow is available on the KNIME Hub:
tinyurl.com/knime-anomaly-detection