ARROWHEAD TOOLS

A KNOWLEDGE AND LEARNING ENGINEERING ENVIRONMENT FOR PREDICTIVE MAINTENANCE AND AUTOMATED DECISION MAKING

GOAL

To enable industrial companies to build and run smart AI applications for both reactive and predictive diagnosis and maintenance, by combining domain and expert knowledge with the power of machine learning & data science.

Challenge

In the industry there is a strong and fast growing need for smart maintenance solutions, which are well-suited for both reactive and predictive diagnosis and maintenance of any kind of complex machinery, equipment and processes with an utmost degree of automation and automated decision making.

This is achieved by a hybrid AI approach which combines the strengths and advantages of knowledge based AI technologies with the power of machine/deep learning and data science. Hybrid AI systems are programs that not only have learnt (and still learn) from data but take also advantage from explicit domain and expert knowledge. Combining these technologies means to combine the best of both worlds.

This approach makes AI programs more powerful, comprehensible and auditable.

Semantis has done substantial research and is going to embed a whole bunch of new advanced AI technologies for predictive maintenance in its software product line 'Raptor Suite for Smart Maintenance'. This will significantly extend the capabilities of problem solving and process controlling. It also extends the applicability to a wider range of equipment and processes and for a wider clientele. The new Raptor Technology comes along with a lot of new features for automatic decision making or for decision support on expert level, resp.

▶ **A model contains explicit knowledge about**

· *Potential Failures & Problems*
· *Relevant Cases*
· *Fuzzy Knowledge*
· *Structure of a System*
· *Functional Behaviour of a System*

▶ **and about inference strategies as**

· *Failure Reasoning*
· *Case Based Reasoning*
· *Fuzzy Reasoning*
· *Model Oriented Reasoning*
· *Statistical Reasoning*

Domain Level

Hybrid Knowledge Base

Data / Pattern Level

▶ **and combines it with the power & capabilities of**

· *Machine & Deep Learning*
· *Pattern Recognition &*
· *Data Science*

ARTEMIS
Industry Association

Engineering Phases

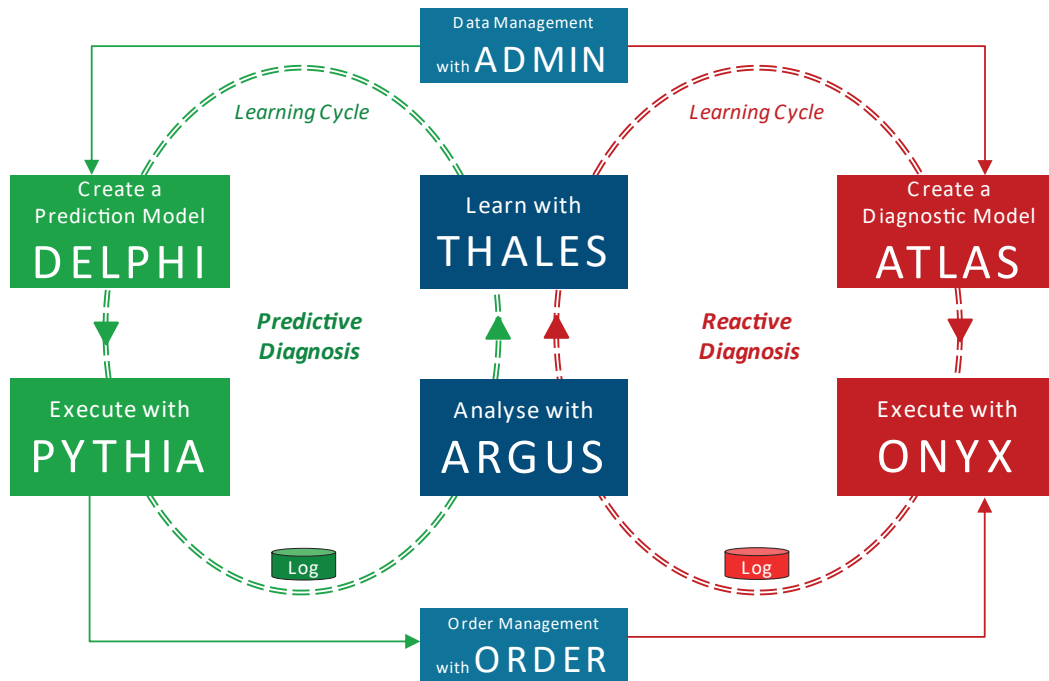| Requirements	Functional Design	Procurement Engineering	Deployment & Commissioning	Operation & Management	Maintenance	Evolution	Training & Education

Results

The *Raptor Technology for Smart Maintenance* provides a comprehensive development and runtime environment to easily build and run models to diagnose, predict and maintain complex engineered systems and processes with a high degree of automation and automatic decision making. This technology marks a leading position in the field of intelligent and smart diagnosis and maintenance.

It is designed for a broad and easy usage in production floors and plants as well as in after sales markets for most effective service of complex products, e.g. vehicles, aeroplanes or laser systems. With the extensions for prediction and automation the Raptor Technology is pushing the limits of *smart fab* and *smart services*, resp. It enables companies to be one step ahead in the sprint to success in a competitive world.

Data Management with **ADMIN**

Learning Cycle   *Learning Cycle*

Create a Prediction Model **DELPHI**

Learn with **THALES**

Create a Diagnostic Model **ATLAS**

Predictive Diagnosis   *Reactive Diagnosis*

Execute with **PYTHIA**

Analyse with **ARGUS**

Execute with **ONYX**

Log   Log

Order Management with **ORDER**

Partner Data

Semantis Information Builders GmbH is an IT company that is strongly focussed on cutting-edge technologies as AI, Knowledge Representation and Processing, Machine/Deep Learning, Data Science and Digitisation and Automation. Semantis is especially specialised on the development of decision support systems, systems for automated decision making and automation itself. In the context of Industry 4.0 we concentrate on the entirety of all activities with regard to smart maintenance, i.e. diagnosis and maintenance, predictive analytics and automation.
Our mission is to act as an enabler. With our work we want to enable our customers to stay at the forefront of their industries in terms of technology, innovation and leadership.

Semantis Information Builders GmbH

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