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Decentralised architectures for optimised operations via virtualised processes and manufacturing ecosystem collaboration

Deliverable D4.3

Predictive Analytics Toolkit – Report

Workpackage:	WP4 – CPS, IoT and analytics
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DISRUPT Project Profile

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Executive Summary

This deliverable summarizes work performed in Task 4.3 of the DISRUPT. As inputs from other tasks, it considers mostly the DISRUPT architecture (Task 4.1) to deliver a state-of-the-art solution base for predictive analytics which is the major output from this work. In addition, the predictive analytics toolkit complements and extends functionality as proposed by the data analytics toolkit (Task 4.2) in order to deliver a solution that not only considers the present, but uses historic information to predict future incidents or errors. In combination with streaming analytics – as it has been developed within the data analytics toolkit – a very powerful solution is hereby provided that allows monitoring of continuous data streams in real-time coming from multiple inputs like sensors (IoT, CPS) and other information sources (e.g., data base systems, historic events) while running the prediction models that allow forecasts on upcoming situations.

The predictive analytics toolkit also contributes to one of the DISRUPT objectives by materializing machine learning on ICT-enabled innovations through the use of data collection, processing and machine learning technology. This is to a large extent achieved by realizing a tight integration with the data analytics toolkit but also with the CPS Optimal Control (Task 4.4) using messaging via MQTT.

In supporting the DISRUPT pilots, three distinct use cases have been identified and investigated within this task, which are:

i) the Colour Painting and Defect Monitoring scenario of car bodies within the automotive use case of CRF,
ii) the PCB Analytics and Failure Detection from ARCELIK, and
iii) the Manufacturing KPI Prediction scenario which is applied in both pilots.

The resulting predictive analytics toolkit is a collection of different modules which presents a holistic solution. Each of the modules implements specialized and distinct algorithms using pre-trained models in order to support the envisioned use cases. This fulfils the DISRUPT objective of a modular, decentralized production topology accessible through services, integrated through messaging and the support of monitoring and intelligent autonomous agents.

Further contributions of this task are the technical solutions in the area of machine learning, event messaging and data collection used to implement the artificial intelligence component of this toolkit that allow the deployment of data and in particular predictive analytics at lower level (e.g., the PCB- and car body monitoring) but also on upper levels as the scenario of manufacturing KPI aggregation proofs which is another business objective of DISRUPT.