

Big Data Analytics in Smart Manufacturing

Course objective

In the 20th century, manufacturing companies are striving to be more competitive and be more relevant to the industry to ensure sustainability of business while staying ahead of their peers. At the moment, manufacturing philosophy such as lean manufacturing is adopted quite extensively to ensure sustainability, however, there is still a need to further improve the current climate of the industry. This initiative sparks the revolutionary idea of Industry 4.0.

The main concept of the Industry 4.0 is to allow technologies and machines to communicate with human and business by exchanging data to make educated decision. Coupling the data from machines, subject-matter-experts (SME) and technologies, companies could leverage them to solve business problems and achieve business objectives more effectively and ergonomically in a data-driven environment.

Technologies allow machines, devices, sensors and people to be interconnected and this results in enormous amount of data generated and exchanged. Such reform necessitates the systematic analytics on data to transform them into information that enables business to make “informed” decisions. Therefore, organisations must be able to adapt to big data phenomenon to meet the expectations of Smart Manufacturing. However, big data analytics is a relatively new phenomenon and its potential applications on manufacturing activities are wide-reaching and diverse.

In this 2-days course, we will walk you through multiple big data analytics use cases in the manufacturing industry, via hands-on exercises incorporating state-of-the-art analytics techniques.

We understand that just having vast quantities of data at hand doesn't mean one can extract the needed insights. Therefore, the key deliverables of this course – the analytical methodologies to turn big data into useful information, is, in turn, the key to sustainable innovation in a smart manufacturing environment.

What will you learn?

Address production challenges:

- Improve Overall Resource Efficiency
- Increase Machine Availability

Address analytical challenges:

- Equipment and process complexity
- Process dynamics
- Data quality

After the training, students will have the ability to:

- Perform all common data preparations
- Build sophisticated predictive models
- Evaluate model quality with respect to different criteria
- Deploy analytical predictive models

Pre-requisite

Basic knowledge of computer programs and mathematics.

Training methodology

Hands-on exercise, lecture, group discussion, and case study.

Course Outline:

1. Overview

- The relevance and importance of Industry 4.0
- How Big Data Analytics play in the role to achieve Industry 4.0 and Smart Manufacturing?
- What could be done with Big Data Analytics to solve business problem?

2. Basic usage

- Introduction to User interface
- Creating and handling RapidMiner repositories
- Starting a new RapidMiner project
- Operators and processes
- Loading data
- Storing data, processes, and results

3. Data Cleansing and Preparation

- Normalization and standardization
- Basic transformations of value types
- Handling missing values
- Sampling
- Filtering examples and attributes
- Handling attribute roles
- Joining Data from different Sources

4. EDA: Exploratory Data Analysis

- Data Types
- Quick Summary Statistics
- Visualizing Data
- Charting

5. Building better processes

- Organizing
- Renaming
- Relative Path
- Flow Control
- Subprocesses
- Breakpoints

6. Predictive models

- K – Nearest Neighbour
- Naive Bayes
- Linear Regression
- Decision Trees
- Optimization
- Importance of attributes – Feature Selections

7. Model evaluation

- Applying models
- Splitting data
- Evaluation methods
- Performance criteria

8. Model Application

- Scoring on new set of data

9. Sharing and collaboration

- RapidMiner Server
- Automation