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# Introduction to Industrial Data Science

## 1.1 the definition of Data Science and Data Mining

Data Science is the extraction of information and knowledge from data.

* Data Science is closely related to other concepts, such as Big Data, machine learning, data mining, data-driven decision making, etc.
* There is a wide and progressive spread of Data Science in a wide variety of fields.
* Data Science unites Computer Science, Statistics and Domain Knowledge

Data mining is defined as the process of finding patterns in data. This process runs automatically. Data mining involves the process of identifying statistically valid, potentially useful, and understandable but previously unknown patterns in datasets.

* Data mining involves the process of identifying statistically valid, potentially useful, and understandable but previously unknown patterns in datasets
* Data mining is the actual analysis step of the Knowledge Discovery in Databases process (KDD)
* An increasingly large amount of production-related data is available
* Evaluation of data for, among other things: Quality assurance, Design, Process planning

## 1.2 the cross-sectional areas of Industrial Data Science

Industrial Data Science is Extraction of process- and product-specific knowledge from data in an industrial context.

## 1.3 the origin and the historical development of Data Science

The roots of data science can be traced back to the 1960s and 1970s when computer science and statistics began to intersect. During this time, statisticians were among the first to realize the potential of computers for data analysis. The emergence of tools and software for data processing and analysis was a crucial step in the evolution of data science. Here are some key developments from the past: Statistics and Computation, The Birth of Databases, Machine Learning Roots, Data Warehousing.

## 1.4 the benefits of Data Science and name fields of action

* Improved Decision-Making
* Increased Efficiency
* Enhanced Customer Experience
* Competitive Advantage
* Predictive Analytics
* Personalized Marketing and Customer Segmentation
* Better Healthcare Outcomes
* Efficient Resource Allocation
* Continuous Improvement
* Innovation and New Opportunities

## 1.5 the individual phases of the product life cycle and outline themEin Bild, das Text, Diagramm, Reihe enthält. Automatisch generierte Beschreibung

## 1.6 the characteristics of Big Data and explain them

5 V's of Big Data:

* Volume: enormous size of data.
* Veracity: Veracity means how much the data is reliable. It has many ways to filter or translate the data. Veracity is the process of being able to handle and manage data efficiently.
* Variety: Big Data can be structured, unstructured, and semi-structured that are being collected from different sources.
* Value: It is not the data that we process or store. It is valuable and reliable data that we store, process, and also analyze.
* Velocity: Velocity creates the speed by which the data is created in real-time. It contains the linking of incoming data sets speeds, rate of change, and activity bursts.

## 1.7 the CRISP-DM model and its phases in detail

Domain knowledge is essential at every level of the CRISP-DM

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Automatisch generierte Beschreibung

Ein Bild, das Text, Diagramm, Screenshot, Schrift enthält.

Automatisch generierte Beschreibung

# 2. Data in industrial Contexts

## 2.1 Digital Factory and the associated development steps

The Digital Factory is the generic term for a comprehensive network of digital models, methods, and tools - including simulation and 3D / VR visualization - which are integrated through end-to-end data management.

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## 2.2 different types of data, the different levels of data acquisition and connectivity

## 2.3 the potentials and goals of Industrial Data Science

## 2.4 the process classes of Data Science

## 2.5 determine the data maturity of a given Use Case

## 2.6 distinguish between supervised and unsupervised learning methods