AI vs. Machine Learning vs. Data Science for Industry

Key Definitions, Differences, and How They Work Together

Over the past few years, the popularity of Artificial Intelligence (AI), Machine Learning, and Data Science have risen to such an extent that most manufacturing companies have now engaged in their digital transformation journey toward a fully connected factory or Industry 4.0.

High uncertainty and limited growth have forced manufacturers to squeeze every asset for maximum value and made them move toward the next growth opportunity from AI, Data Science, and **Machine Learning**. However, as with most digital innovations, new technology warrants confusion. While these concepts are all closely interconnected, each has a distinct purpose and functionality, especially within industry.

To leverage and get the most value from these solutions, below we've unpacked these concepts in a straightforward and simple way. For each of those buzz words, you'll learn how they are interconnected, where they are unique, and some **key use cases in manufacturing**.

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Let's start at the beginning: Definitions

Artificial Intelligence	Data Science	Machine Learning

Artificial intelligence: Well, well, well… this one is tricky as it is so widely used in different industries and with different meanings. Put most simply: the core purpose of Artificial Intelligence is to bring human intellect to machines.

AI focuses explicitly on making smart devices think and act like humans. In this respect, an AI-driven machine carries out tasks by mimicking human intelligence. For example, machines that can identify products with a defect.

Within manufacturing, AI can be seen as the ability for machines to understand/interpret data, learn from data, and make 'intelligent' decisions based on insights and patterns drawn from data. Often one can say that AI goes beyond what is humanly possible in terms of calculation capacities.

In manufacturing, AI is mostly used for:

- Preventive maintenance

- Predictive forecasting

- Prescriptive insights

- Real-time monitoring and settings

- Pattern recognition for defects

Data Science: as the name suggests, Data Science centers on uncovering information from data. In fact, everything connected with data collection, preparation, and analysis of data that you generate for various insights relates to data science.

The central aspect of Data Science is getting new results from data: find meaning, reveal problems you never knew existed, and solve complex issues. Data Science is based strictly on analytical evidence, works with structured and unstructured data, and brings a cultural change in companies toward data-driven decisions.

Today, the availability of huge volumes of data implies more revenues gleaned from Data Science. Because of this opportunity to find savings, reduce risk, and empower humans through data, Braincube offers a combination of Edge and Cloud solutions with ready-to-use applications in a fully integrated and interoperable IIoT Platform. This way, anyone can become a citizen data scientist and make sense of contextualized data clusters to reach best-in-class production standards thanks to real-time monitoring and insights; and Big Data analytics.

Data Science in manufacturing involves the processes of:

- Data extraction

- Data cleansing

- Visualization

- Analysis

- And actionable insights generation... thanks to AI!

So why do so many Data Science applications sound similar or even identical to AI applications? Essentially, this exists because Data Science overlaps the field of AI in many areas. However, remember that the end goal of Data Science is to produce insights from data and this may or may not include incorporating some form of AI for advanced analysis, such as Machine Learning for example.

Machine Learning: is the science of getting computers to learn and act like humans do while improving their learning over time in an autonomous way. It is a subset of AI... often used by data science. Machine Learning draws aspects from statistics and algorithms to work on the data generated and extracted from multiple sources.

Instead of writing code, you feed data to a generic algorithm, and Machine Learning then builds its logic based on that information. In simple words, with Machine Learning, computers learn to program themselves.

As seen in our Data Science definitions, data gets generated in massive volumes by industry and it becomes tedious for a data scientist, process engineer, or executive team to work with it. That is when Machine Learning comes into play. Machine Learning is the ability given to a system to learn and process data sets autonomously without human intervention. The Machine Learning model goes into production mode only after it has been tested enough for reliability and accuracy.

The importance of Machine Learning is growing in manufacturing, and serves as an opportunity to prevent, predict, and prescribe settings to gain in productivity, quality, energy consumption, and cost reduction. Essentially, Machine Learning is the implementation or a current application of AI.

It's time to summarize how these concepts are connected, the real differences between ML and AI and when and how data science comes into play.

AI vs. Machine Learning vs. Data Science: How they Work Together

Data Sciences uses AI (and its Machine Learning subset) to interpret historical data, recognize patterns, and make predictions. In this case, AI and Machine Learning help data scientists to gather data in the form of insights.

As mentioned, Machine Learning is a branch of AI, pushing Data Science into the next automation level. There are plenty of relationships between Data Science and Machine Learning.

Machine Learning and statistics are parts of data science. The Machine Learning algorithms train on data delivered by data science to become smarter and more informed when giving back predictions. Therefore, Machine Learning algorithms depend on the data as they won't learn without using it as a training set.

Key Differences in AI, Machine Learning, and Data Science

Artificial Intelligence means that the computer, in one way or another, imitates human behavior. Machine Learning is a subset of AI, meaning that it exists alongside others AI subsets. Machine Learning consists of methods that allow computers to draw conclusions from data and provide these conclusions to AI applications.

Data Science is applicable to more than Machine Learning and AI. In Data Science, information can come from a machine, a mechanical process, an IT system, etc. It may have nothing to do with learning: it can be about simple data visualization.

Also, AI can be used by Data Science as a tool for data insights, the main difference lies in the that Data Science covers the whole spectrum of data collection, preparation, and lysis. It's not limited to the algorithmic or statistical aspects. So while Machine Learning and AI experts are busy with building algorithms throughout the project lifecycle, data scientists have to be more flexible switching between different data roles according to the needs of the project.

Data Science involves analysis, visualization, and prediction. It uses different statistical techniques, while AI and Machine Learning implements models to predict future events and makes use of algorithms.

A Simple Use Case

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Scenario:

Let's imagine your factory produces chocolate cake. Each day, your machines follow the provided recipe, but some days, the cake doesn't come out as good. To solve this quality issue, you will need all three concepts: Data Science, Machine Learning, and Artificial Intelligence.

Data Science

Your company begins to receive complaints about a change in taste of your famous chocolate cake. When alerted to this change, you begin to hypothesize what the issue could be—did we over cook a batch? Was the flour the culprit? Did our unexpected downtime last week cause the batter to sit too long? Data Science enables your team to pull the data models to begin to uncover which factors might have impacted this change in product quality.

Machine Learning

From there, your Data Scientist sets up a supervised Machine Learning model containing the perfect recipe and production process. The model learns over time similar variables that yield the right results, and variables that result in changes to the cake. Through Machine Learning, your company identifies that changes in the flour caused the product disruption. To remedy unavoidable raw material variability, Machine Learning was able to prescribe the exact duration to sift the flour to ensure the right consistency for the tastiest cake.

Artificial Intelligence

A week later, you receive another shipment of flour containing the wrong consistency. Not to worry though—because Machine Learning helped to identify this change and the parameters to operate at, your mixer automatically spots the variance in texture and continues to mix the batter to the perfect consistency. Through AI, your cake comes out perfectly!

In Summary

The core purpose of **Artificial Intelligence** is to bring human intellect to machines.

Machine Learning is a subset of AI trying to make computers learn and act like humans do while improving their learning over time in an autonomous way.

The central aspect of **Data Science** is getting new results from data: finding meaning, revealing problems you never knew existed, and solving complex issues. To achieve these outcomes, you can think of it as a process of data collection, preparation, analysis, and refinement. AI and Machine Learning, are tools used by Data Science to implement actual and

applicable insights and are now more and more being leveraged by tools that enable **citizen a scientists to achieve new insights from data**.

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To conclude, as you can see in all of these examples, it is important to notice that AI, Data Science, and **Machine Learning** are designed to help augment humans to drive new progress and do not have the intention of replacing humans in their analytical, tactical, or strategic roles. Instead, it can be seen as a tool to offer new insights, increased motivation, and better company success.

The Importance of Legitimizing AI

Production teams use AI-enabled analytical tools in an IIoT platform to gain access to the data that can answer their questions or offer them prescriptions at the right time. But how legitimate are these AI solutions? How can industrials ensure the suggested parameter modifications that AI

4 Ways to Use Machine Learning in Manufacturing

Continuing to find new ways to improve operations requires increased creativity, capacity, and access to critical data. Industrials use Machine Learning to identify opportunities to improve OEE at any phase of the manufacturing process. Learn how to use Machine Learning to solve some of the biggest

How Could AI be Leveraged During COVID-19?

No one could have predicted the path 2020 would take. With a global pandemic still ongoing, the uncertainty surrounding supply, demand, staffing, and more continues to impact industrials. For many, the answer lives within your data, but the power to analyze it quickly and effectively requires AI. Learn