

Apr. 13, 2023

Data Science vs. Artificial Intelligence & Machine Learning: What's the Difference?

Though data science, artificial intelligence, and machine learning are all connected, there are key differences. Learn more about the distinctions from Rice.



Particularly in this new generative AI revolution driven by tech breakthroughs like OpenAI's ChatGPT, you may often hear the terms data science, machine learning, and artificial intelligence (AI) used interchangeably. While these are all connected, there are meaningful differences. Machine learning is the science of designing self-running software that can learn autonomously or in concert with other machines or humans. Machine learning helps make artificial intelligence —

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the science of making machines capable of human-like decision-making — possible.
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Data science is the process of developing systems that gather and analyze disparate information to uncover solutions to various business challenges and solve real-world problems. Machine learning is used in data science to help discover patterns and automate the process of data analysis. Data science contributes to the growth of both AI and machine learning. This article will help you better understand the differences between AI, machine learning, and data science as they relate to careers, skills, education, and more.

What is Artificial Intelligence, and How Does it Connect to Data Science?

While there is debate about the definitions of data science vs. artificial intelligence, AI is a sub-discipline of computer science focused on building computers with flexible intelligence capable of solving complex problems using data, learning from those solutions, and making replicable decisions at scale.

AI-equipped machines are designed to gather and process big data, adjust to new inputs and autonomously act on the insights from that analysis. AI is widely used in everyday applications people interact with, from personalized recommendations of products or services served up on social media and online shopping sites to AI-powered safety functions in cars, the analysis of genetic code to detect medical conditions, and more.

Data scientists contribute to the growth and development of AI. They create algorithms designed to learn patterns and correlations from data, which AI can use to create predictive models that generate insight from data. Data scientists also use AI as a tool to understand data and inform business decision-making.

What is Machine Learning, and How Does it Connect to Data Science?

Machine learning is a subfield of artificial intelligence that makes AI possible by enabling computers to learn how to act like humans and perform human-like tasks using data.

The difference between data science vs. machine learning is that Data scientists create the algorithms that make machine learning happen -- in other words, that allow machines to learn from sources of data autonomously, without programs written by software engineers or developers. Data scientists also use machine learning as an "amplifier", or tool to extract meaning from data at greater scale.

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Machine learning is ubiquitous in modern life. It's what makes it possible for Netflix to recommend videos and movies, smart home systems to automatically adjust indoor temperatures, and health systems to monitor and predict epidemics. **Break into Machine Learning with Rice's online master's in data science degree program.** [Learn More](#)

What Is the Difference Between Machine Learning and AI?

In short, machine learning is a sub-set of artificial intelligence (AI). Artificial intelligence is interested in enabling machines to mimic humans' cognitive processes in order to solve complex problems and make decisions at scale, in a replicable and repeatable manner.

Machine learning, or "applied AI", is one of the paths to realizing AI and focuses on how humans can train machines to learn from multiple data sources to solve complex problems on our behalf. In other words, machine learning is where a machine can learn from data on its own without being explicitly programmed by a software engineer, developer or computer scientist. Machine learning helps to automate and scale human intelligence, but it must also be "explainable" (documented in a way that can be explained transparently to a regular or non-computer scientist) and monitored heavily to ensure it learns accurate data in the right way; otherwise society could face massive dilemmas of unethical AI.

How Data Science, AI, and Machine Learning Work Together

It's important to consider how data science, machine learning and AI intersect. Fundamentally, machines can't hope to mimic humans' cognitive processes without information -- and Data scientists are tasked with "feeding" machines accurate, empirical data and statistical models that enable machines to learn autonomously. By constantly improving machine learning, society comes closer to realizing true artificial intelligence (AI).

Machine learning and other subsets of AI (for example, deep learning) also help make predictive analytics possible, so Data scientists are equipped with better, deeper insights and can forecast behaviors, trends and outcomes. Working in concert, machine learning algorithms and Data scientists can help retailers and manufacturing organizations better serve customers through enhanced inventory control and delivery systems. They also make conversational chatbot technology possible, ever improving customer service and healthcare support and making voice recognition technology that controls smart TVs possible.

Machine learning enables personalized product recommendations, financial advice, and medical care. The combination of data science, machine learning, and AI also underpins best-in-class cybersecurity and fraud detection. New developments like ChatGPT and other generative AI breakthroughs are being made every day.

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Comparing Data Science, Artificial Intelligence, and Machine Learning

The common denominator between data science, AI, and machine learning is data. Data science focuses on managing, processing, and interpreting big data to effectively inform decision-making. Machine learning leverages algorithms to analyze data, learn from it, and forecast trends. AI requires a continuous feed of data to learn and improve decision-making.

Here's how they compare:

Data Science vs. AI vs. ML

	Data Science	AI	Machine Learning
Focus	Extract meaning from structured and unstructured data to inform decision-making and planning.	Enable computers to perform complex intellectual tasks like humans, including decision making, problem-solving, perception and understanding human communication.	Provide a way for systems to synthesize data, learn from it and use the insights to improve over time.
Application	Business and problem-solving using descriptive, predictive, and prescriptive analytics applications. Examples: Customer trends, Financial analysis, Process improvement.	Perform tasks like humans by learning, reasoning, and self-correction. Examples: Chatbots, Voice assistants, Online gaming, Robots.	Extract knowledge from structured and semi-structured data to learn from that data and make predictions. Examples: Automated recommendations, Search algorithms, Health monitoring.

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	Data Science	AI	Machine Learning
Skills Required	<ul style="list-style-type: none"> • Advanced Math • Statistics • Analytics & Modeling • Database Management • Data Visualization • Machine Learning Methods • Communication & Collaboration • Programming for Data Science (especially Python) 	<ul style="list-style-type: none"> • Advanced Math • Probability & Statistics • Programming (especially Python, R, Java and C++) • Spark and other Big Data Technologies 	<ul style="list-style-type: none"> • Applied Mathematics • Neural Network Architectures • Physics • Data Modeling & Evaluation • Advanced Signal Processing Techniques • Natural Language Processing • Audio & Video Processing • Reinforcement Learning

Differences in Job Titles & Salaries in Data Science, AI, and ML

Data scientists work to extract valuable insights from big data. They use computer programs to collect, clean, structure, analyze and visualize big data. They may also program algorithms to query data for different purposes. Machine learning engineers work with data scientists to develop and maintain scalable machine learning software models. AI engineers work closely with data scientists to build deployable versions of the machine learning models.

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DATA SCIENTIST JOB TITLES	APPROX. SALARIES*
Bioinformatics Scientist	\$106,517
Sr. Bioinformatics Analyst	\$92,155
*Source: U.S. Bureau of Labor Statistics, Glassdoor, ZipRecruiter	

Differences in Skills Needed for Data Science, AI, and ML

In the data science vs. machine learning vs. artificial intelligence area, career choices abound. The three practices are interdisciplinary and require many overlapping foundational computer science skills. But the processes, techniques, and use cases differ.

Data Science

Data scientists focus on collecting, processing, analyzing, visualizing, and making predictions based on data. In data science, the focus remains on building models that can extract insights from data. Skills required include programming, data visualization, statistics, and coding. Data scientists are instrumental in every industry, using their skills to identify medical conditions, optimize logistics, inform city planning, fight fraud, improve shopping experiences, and more.

Machine Learning

Data scientists who work in machine learning make it possible for machines to learn from data and generate accurate results. In machine learning, the focus is on enabling machines to easily analyze large sets of data and make correct decisions with minimal human intervention. Skills required include statistics, probability, data modeling, mathematics, and natural language processing. Machine learning specialists develop applications based on algorithms that can detect defects in parts, improve manufacturing processes, streamline inventory and supply chain management, prevent crime, and more.

Artificial Intelligence

Data scientists who specialize in artificial intelligence build models that can emulate human intelligence. AI involves the process of learning, reasoning, and self-correction. Skills required include programming, statistics, signal processing

techniques and model evaluation. AI specialists are behind our favorite AI-powered personal assistants and entertainment and social apps, make autonomous vehicles possible and ensure payment technologies are safe to use.

Breakthrough and Leadership with Robo-AI specialists are behind our favorite program

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Differences in Degrees Needed to Pursue a Career in Data Science, AI, and ML

Some data scientists begin their careers with a bachelor's degree. However, those with aspirations for executive-level positions can meet employer requirements and achieve their career goals with a [Master of Data Science degree from Rice University](#). The MDS@Rice degree program offers the opportunity to learn from industry experts and supportive faculty members. The robust curriculum provides exposure to current applications and hands-on experience. No matter if your interest lies in data science vs. machine learning vs. artificial intelligence, the Master of Data Science at Rice University is a great way to position yourself for a rewarding and long-term career.

Learn More About How to Become a Data Scientist

The Master of Data Science at Rice University is a great way to enhance your engineering skills and prepare you for a professional data science career in machine learning or AI. Learn more about the [data science career](#) and how the [MDS@Rice curriculum](#) will prepare you to meet the demands of employers.

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