

Laying the Foundation for Artificial Intelligence and Machine Learning: A Gartner Trend Insight Report

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Now more than ever, technical professionals must focus on developing the foundational components needed to support artificial intelligence and machine learning in the enterprise. This special report gathers a range of research that will help accomplish that goal.

Opportunities and Challenges

- Artificial intelligence (AI) and machine learning (ML) are at the peak of hype in organizations today. Although these technologies are still emerging, they are delivering practical benefits to help solve real-world problems.
- To take advantage of these benefits, technical professionals must prepare the right foundational steps, such as developing an AI strategy, devising data management and data quality processes, and leveraging AI vendor offerings to jump-start AI/ML efforts in the enterprise. They will also need to operationalize AI and ML components.
- Technical professionals face the challenge of preparing their organizations with the functional components needed to make AI and ML benefits a successful reality.
- How you use, manage and combine various datasets to extract a better understanding of systems can determine your level of success and competitive advantage with AI/ML.

What You Need to Know

- Data continues to be rocket fuel for AI/ML, and thus, the right data management strategy will significantly increase your probability of success.
- Most organizations are eager to capture the potential of AI, but stall at the overwhelming set of potential applications and confusion around which use cases are realistic.
- The key priorities for IT organizations are to establish the foundational components needed to support AI and ML and to bring practical benefits to the enterprise.

- Technical professionals should leverage data within existing analytical platforms to provide quick wins — and also look for a technology fit that can create a strategic differentiation against competitors.

Insight From the Analyst

AI and ML May Seem Futuristic, but the Time to Prepare Is Now



[Carlton Sapp](#), Research Director

Do you think AI and ML are too futuristic to worry about? Many technical professionals question whether AI and ML are mature enough to offer practical benefits.

The reality is that AI and ML are actually delivering practical benefits for a range of organizations. For example, AI and ML can power enterprise search, drive DevOps for solution delivery and empower digital customer experiences, to name just a few examples.

To take advantage of these benefits, technical professionals must prepare the right foundational steps, such as developing an AI strategy, devising data management and data quality processes, and leveraging AI vendor offerings to jump-start AI efforts within the enterprise.

Technical professionals responsible for advanced analytics must cut through the hype to understand how AI and ML technology can solve real-world problems. They must also understand how to integrate AI and ML into their solutions. But in attempting to do so, technical professionals face key challenges.

First, they face a data issue, and second, they face a process issue: How do you maintain these systems given that the data will continuously change over time?

Those are the biggest problems that technical professionals are struggling with in trying to get to the practical use of AI. Understanding how to control and digest the massive amounts of data coming in, and then how to manage and operationalize that process over time, are among the key challenges.

The answers to tackling these and other challenges can be found in a range of Gartner for Technical Professionals (GTP) research published over the past year. The research featured in this special report was gathered with the goal of providing the wisdom you'll need to gain the technical foundation for AI and ML. AI and ML aren't as futuristic as you may think — and the time to prepare is now.

Kind regards,

Carlton Sapp

Executive Overview

Definition

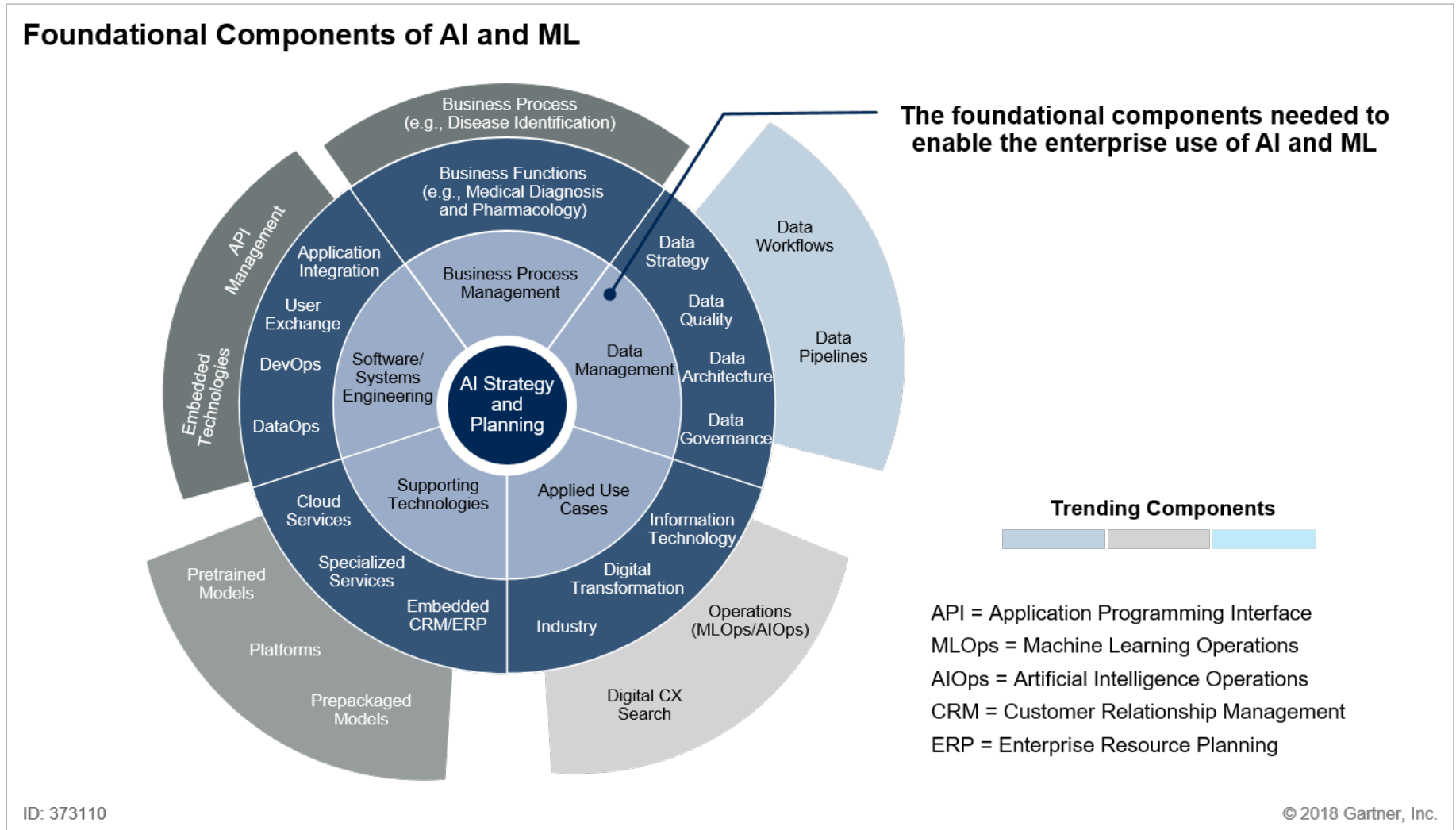
AI and ML are at the peak of hype in organizations today. Although these technologies are still emerging, they are delivering practical solutions to real-world problems. AI and ML demand attention, but identifying what's real and what's too futuristic is still a major challenge for organizations.

AI is a technology or system that can emulate human performance — for example, by learning, coming to conclusions or engaging in dialogues with people. Machine learning is a category of AI that aims to extract knowledge or patterns from a series of observations.

Technical professionals face the challenge of preparing their organizations with the foundational technical components needed to make AI and ML benefits a reality. If IT doesn't take the initiative to prepare for AI and ML, the business will push technical professionals to make AI and ML benefits a reality. The problem for technical professionals is that many know little about the foundational components needed to be successful at enabling and empowering the use of AI/ML.

GTP research offers a variety of guidance for technical professionals — who will be on the front lines of preparing the organization with the technical foundations for AI and ML. Technical professionals must take the initiative to discover and deliver the foundational components needed to enable and empower the use of AI/ML. These components include AI strategy, data management, applied AI/ML and the use of supporting technologies and solutions (see Figure 1).

Figure 1. Foundational Components of AI and ML



Source: Gartner (September 2018)

This special report brings together a range of GTP research that provides knowledge and guidance on important priorities for AI and ML, including how to:

- Develop your strategy and plans for AI and ML
- Prepare your data initiatives for AI and ML
- Exploit AI functionality in vendor offerings
- Explore practical applications of AI and ML in the enterprise

Research Highlights

Develop Your Strategy and Plans for AI and ML

Most organizations are eager to capture the potential of AI, but stall at the overwhelming set of potential applications and confusion around which use cases are realistic. Recent surveys indicate that three of the top five reasons why organizations haven't adopted AI are related to an inability to articulate a roadmap. Most enterprises will see the greatest benefit from an AI strategy that builds on existing expertise in analytics and incorporates emerging AI technologies. This can help establish foundational efforts that pave a path to the introduction of transformational technologies like AI, thereby enhancing business processes.

Technical professionals should use a combination of either of two recommended approaches — data-centric and technology-centric — to drive AI-based implementations that provide immediate value to the business. Technical professionals should leverage data within existing analytical platforms to provide quick wins — and look for a technology fit that can create a strategic differentiation against competitors in a given domain.

Much of what technical professionals do with their systems involves data. They strive to gain insight from that data to gain knowledge or a better understanding of those systems and their behavior. This allows them to make informed decisions. However, how you use data and extract a better understanding of systems can determine your level of success and competitive advantage. The capability to transform data into actionable insight is the key to that competitive advantage. The ability to autonomously learn and evolve as new data is introduced — without explicitly programming to do so — is the holy grail of business intelligence. That's what AI and machine learning offers: a capability that accelerates data-driven insights and knowledge acquisition.

The GTP reports featured in this report will help technical professionals understand how best to:

- Develop a strategy and plan for AI
- Control bias
- Architect for machine learning

Related Research

- “Driving an Effective AI Strategy”: Many organizations struggle to define a strategy for leveraging AI. This research helps technical professionals focus the scope of consideration to clarify potential AI use cases while also helping them optimize around existing data, skills and pretrained systems to deliver quick wins.
- “Control Bias and Eliminate Blind Spots in Machine Learning and Artificial Intelligence”: Machine bias is unavoidable, but it is manageable. By opening up the black boxes at the center of AI solutions, technical professionals can improve the quality and capability of their applications while also reducing risks to the enterprise.
- “Preparing and Architecting for Machine Learning, 2018 Update”: Machine learning continues to gain traction in digital businesses, and technical professionals must embrace it as a tool for creating operational efficiencies. This updated primer discusses the new benefits and pitfalls of machine learning, updates to architectures, and the new roles and responsibilities required.

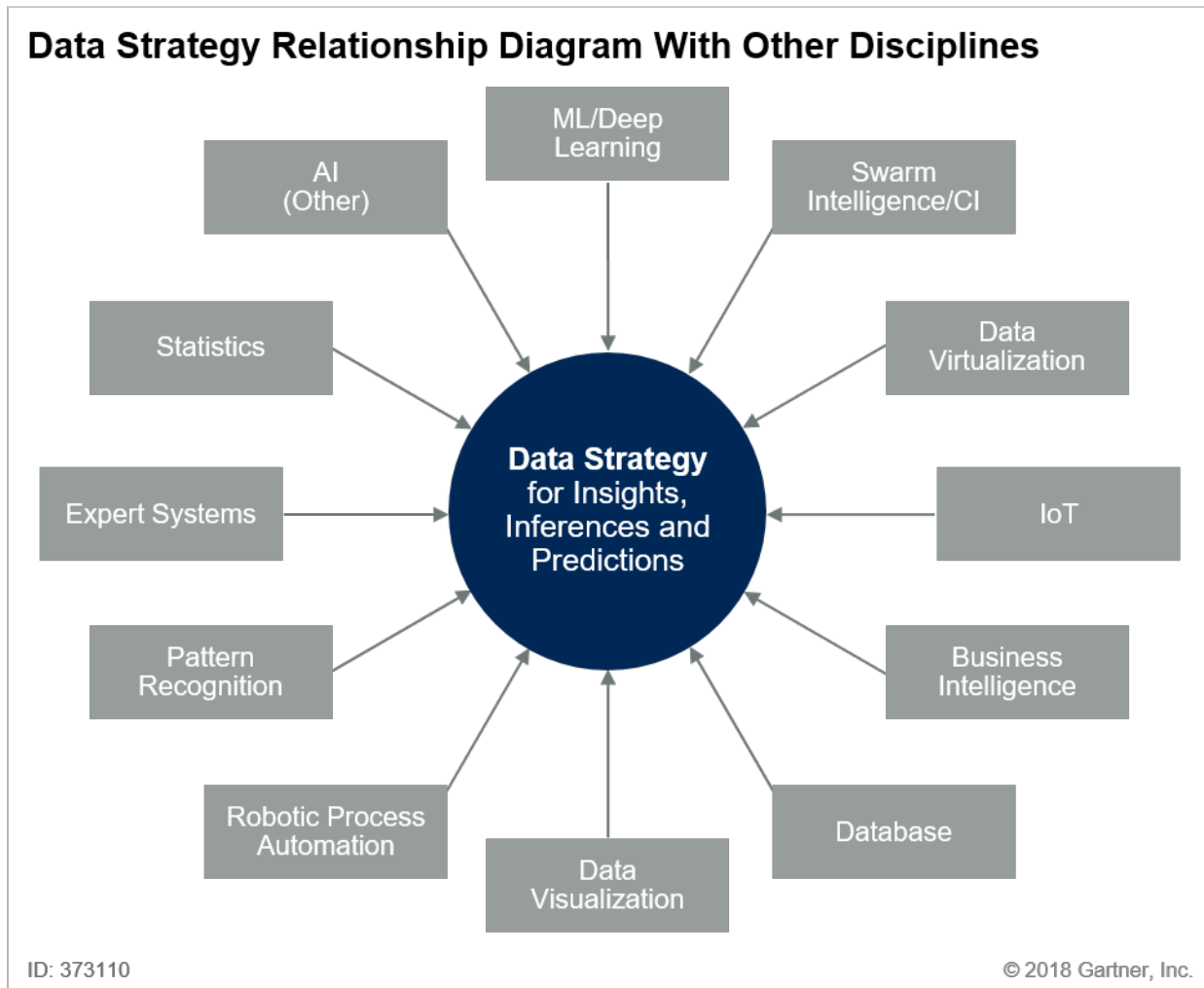
Prepare Your Data Initiatives for AI and ML

Data is the foundation of AI and ML. Hence, planning for the data-related aspects is a critical focus for technical professionals who support AI and ML. Key priorities for data include:

- Creating a data strategy for ML-powered AI to deal with the complexity of real-world data.
- Improving data quality because poor-quality data will reduce the effectiveness of ML processes and deployed AI models. Technical professionals must enhance data quality pipelines to support ML and AI systems.
- Creating an architecture to support a data and analytics strategy for AI and ML.

A data strategy for AI and ML entails many different complex relationships and disciplines for the purpose of insights, inferences and predictions, as shown in Figure 2. The different disciplines may require independent data pipelines within the data strategy. Developing strategies for different disciplines does not mean you should abandon your enterprise data strategy. Understanding the different disciplines that are impacted (as outlined in Figure 2) and the complications that may be presented from each discipline enables a more integrated and comprehensive approach to dealing with different kinds of data.

Figure 2. Data Strategy Relationship Diagram With Other Disciplines



Source: Gartner (September 2018)

To improve data quality in order to enhance ML processes and AI initiatives, technical professionals should analyze data quality workflows to capture and correct variances in the datasets that data scientists use during development, training and testing. They should also implement metrics to identify data drift and minimize its impact on deployed AI solutions, and they should leverage existing data quality systems to perform ML preprocessing functions like cleansing and normalization. And if they are using machine learning when architecting Internet of Things (IoT) solutions, they must also consider building IoT data pipelines.

Finally, technical professionals should build a holistic data management architecture to support current and future business intelligence, advanced analytics and machine learning. Gartner recommends that organizations adopt a “build for change” mindset to establish a highly modular data architecture that delivers and interoperates with complementary analytic solutions.

Related Research

- “How to Create a Data Strategy for Machine-Learning-Powered Artificial Intelligence”: Machine-learning-powered artificial intelligence (MLpAI) can help deliver systems with more automation and less human intervention, but success requires a data strategy to deal with the complexity of real-world data. This research guides technical professionals involved in MLpAI on developing a data strategy to support successful deployments.
- “Enabling Data Quality for Machine Learning and Artificial Intelligence”: ML processes and deployed AI models are less effective due to poor data quality caused by disparate datasets, altered raw data and stringent data governance practices. Technical professionals must enhance data quality pipelines to support ML and AI systems.
- “Preparing IoT Data for Machine Learning”: Mass digitization and growth of machine data are pushing technical professionals who are designing and architecting IoT solutions to experiment with machine learning. Data engineers are the first impacted and must take the initiative to build proper IoT data pipelines for machine learning.
- “Solution Path for Implementing a Comprehensive Architecture for Data and Analytics Strategies”: New analytic requirements need a flexible architecture for interoperating with diverse data sources and complementary analytic solutions. Technical professionals can use this step-by-step methodology to create a comprehensive architecture to support a data and analytics strategy.

Exploit AI Functionality in Vendor Offerings

To get started on efforts to make productive use of AI in their organizations, technical professionals may want to explore vendor offerings that can jump-start these efforts. An important place to start is to look into AI offerings from the major cloud service providers (CSPs). During the past year, Gartner has seen a well-defined evolution of AI-based services from CSPs due to a stronger strategic roadmap and more applicable use cases. This is particularly true of AI-based services provided by the four leading CSPs:

- Amazon Machine Learning
- Google Cloud Machine Learning (ML) Engine
- IBM Watson Studio
- Microsoft Azure Machine Learning Studio

All of these cloud-based AI and ML services are rapidly maturing due to an explosion of applicable business use cases.

AI for IT operations (AIOps) platforms are another category of vendor offerings that accelerates practical applications of AI. AIOps platforms — such as those from Elastic, Splunk and Sumo Logic — are software systems that combine big data and AI/ML functionality to enhance and partially replace a broad range of IT operations’ processes and tasks. These tasks and processes include availability and performance monitoring, event correlation and analysis, IT service management, and automation.

CRM is another area where vendors offer functionality that can jump-start the practical application of AI in the organization. Many vendors in the CRM market are using “AI” as an umbrella term to encompass a wide array of functionality, including ML-powered data predictions and natural language processing (NLP) customer interactions (for example, via chatbots). Vendors are integrating these capabilities within their applications to enhance their CRM functionality. The integrated CRM AI capabilities offered by enterprise vendors provide a path to learn and experiment with ML and NLP services without needing deep AI-based technical skills.

Related Research

- “Comparison of Amazon, Google, IBM and Microsoft AI Cloud Services: 2018 Update”: Machine learning and artificial intelligence services are rapidly maturing due to an explosion of applicable business use cases. This research provides technical professionals with an overview of features, integration and deployment capabilities from major cloud service providers.
- “Assessing AIOps Platforms for Proactive IT Operations Management”: Artificial intelligence for IT operations platforms — such as those from Elastic, Splunk and Sumo Logic — combine big data and machine learning functionality to help IT observe, filter and act on data. This research helps technical professionals assess AIOps platforms.
- “How to Get Started, and Grow, With AI Enhancements in CRM”: Leading CRM vendors are leveraging AI capabilities, such as machine learning and NLP, to augment their application functionality. Technical professionals should start by assessing embedded AI capabilities and by exploring how to use them to solve business issues and deliver better customer engagement.
- “Enhance Your Applications With Artificial Intelligence on Demand With Azure Cognitive Services”: Microsoft is bringing machine-learning-powered AI to the masses with a growing collection of cloud-based cognitive services and APIs. Technical professionals need to understand how to work with these services and why they lower barriers to machine learning, but do not remove them altogether.

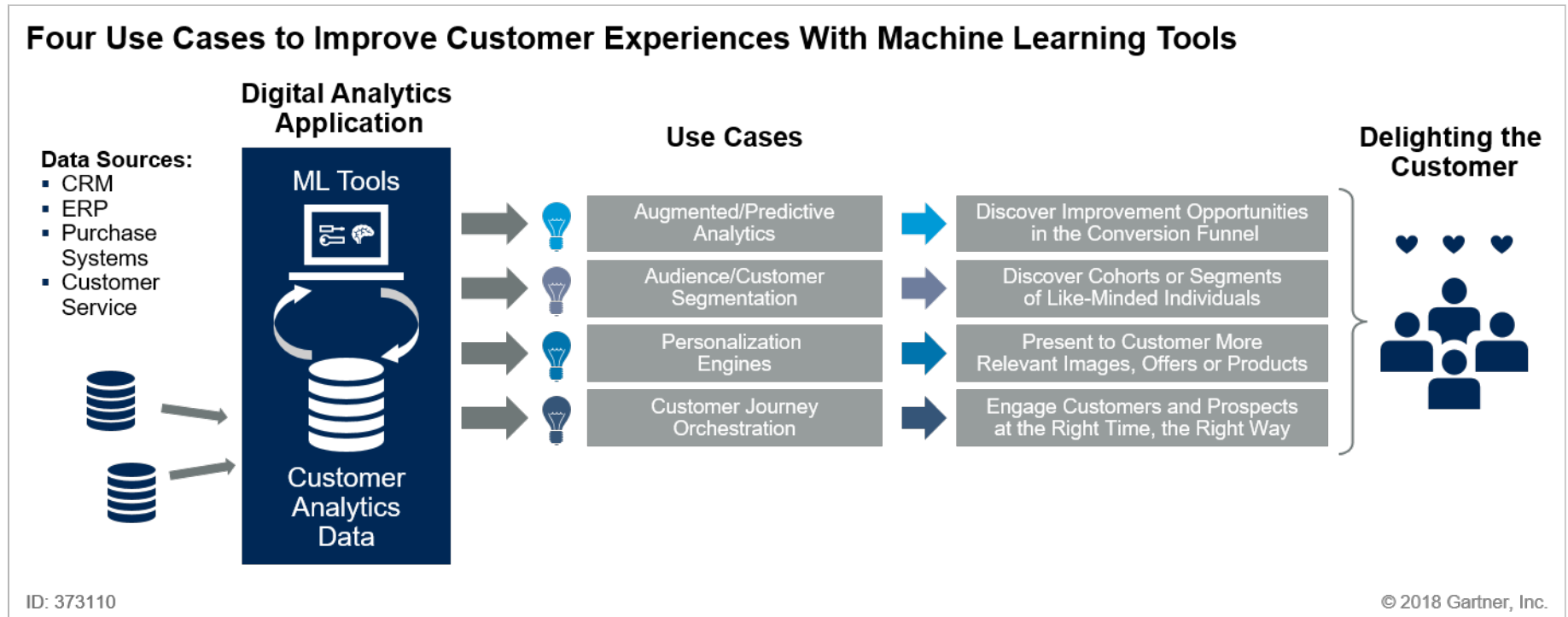
Explore Practical Applications of AI/ML in the Enterprise

Many people assume that practical enterprise benefits are still years away. However, AI and ML are already producing practical benefits in several areas, such as improving performance capabilities for information retrieval and insight. CRM is another area where AI and ML are augmenting application functionality. There are practical applications that can deliver value now to users, customers and citizens through software-based predictions. Examples include automatically classifying complex data or predicting user preferences or behavior. As a result, application architects and developers should explore how they can best access and integrate the power of ML into the applications and solutions they deliver.

Enterprise search is one example of an area where practical benefits are being delivered by AI today. AI can significantly reduce the burden of search administration and bring practical value in the enterprise by applying machine-learning-driven AI in search technologies.

AI/ML tools are also being used in digital analytics applications and platforms to improve digital customer experiences (see Figure 3).

Figure 3. Four Use Cases to Improve Customer Experiences With ML Tools



Source: Gartner (September 2018)

Another practical benefit achieved with AI in today's enterprise is its application to DevOps. AI and DevOps are complementary and have a mutually beneficial relationship. Weaving them together within the computing fabric can reduce IT overhead and deliver faster IT solutions and greater business value.

Related Research

- “Integrate DevOps and Artificial Intelligence to Accelerate IT Solution Delivery and Business Value”: DevOps and AI have a symbiotic relationship. Integration of DevOps and AI will play a significant role in shaping how technical professionals manage and deploy systems. This report assesses the current state of AI combined with DevOps, and it explores the strengths and weaknesses of this integration.
- “Transform Enterprise Search and Insight With Machine Learning and Artificial Intelligence”: AI-assisted search solutions address the most common issues and open new possibilities in information retrieval and insight. Technical professionals can leverage text analytics, natural language processing and machine learning to implement and administer effective search.
- “Optimize Digital Customer Experiences With Machine-Learning-Enhanced Analytics”: Digital analytics applications enhanced with machine learning capabilities enable businesses to stay competitive and innovate. Technical professionals responsible for CRM and CX should use this research to gauge their organization's readiness to use these tools and improve digital experiences.
- “Integrating Machine Learning Into Your Application Architecture”: Machine learning is at the peak of hype, propelled by its association with artificial intelligence. Technical professionals responsible for application architecture must cut through the hype to understand how ML technology solves real-world problems and how to integrate that technology into their solutions.

Related Priorities

Table 1. Related Priorities

Priority	Focus
Data and Analytics Programs	The right differentiating strategies and practices allow enterprises to fully exploit the convergence of data and analytics to deliver business value.
Marketing Data and Analytics	Data and analytics have become the foundation of marketing, driving efficiency and effectiveness through better data collection, modeling, optimization and greater relevance to the consumer.
Customer Relationship Management and Customer Experience	CRM and customer experience are business strategies that optimize profitability, operational efficiency, customer satisfaction and loyalty through the implementation of customer-centric processes.
Digital Workplace Program	A digital workplace program is a business strategy to boost workforce digital dexterity through an engaging and intuitive work environment.

Source: Gartner

Gartner Analysts Supporting This Trend



[Soyeb Barot](#)



[Gary Olliffe](#)



[Jeffery Skowron](#)



[Darin Stewart](#)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

“Artificial Intelligence Hype: Managing Business Leadership Expectations”

“Applying AI in the Digital Workplace”

“Staffing Data Science Teams: Map Capabilities to Key Roles”

“How to Operationalize Machine Learning and Data Science Projects”

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