Gartner

What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value

Erick Brethenoux, VP Analyst

What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value

Published 17 July 2020 - ID G00730970 - 15 min read

By Analysts Erick Brethenoux

Initiatives: Artificial Intelligence

Superheated rhetoric surrounding the potential benefits of artificial intelligence is inflating related expectations. Data and analytics leaders must demystify AI, remove technology jargon and focus conversations on real business problems and achievable use cases.

Additional Perspectives

- Summary Translation: What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value
  (10 September2020)

Overview

Key Challenges

- Marketing hyperbole is increasing confusion around artificial intelligence (AI) resulting in many enterprises struggling to put a realistic value on an important source of innovation and differentiation.
- Business leadership tends to overestimate the impact of AI and underestimate its complexity — requiring data and analytics leaders to manage their expectations, or risk costly project failures.
- Organizations face challenges — involving integration, security and privacy issues — that prevent them from efficiently moving their AI practices from prototypes to production. [1]

Recommendations

Data and analytics leaders tasked with evaluating and implementing AI techniques should:

- Defuse the hype by adopting a common taxonomy for AI technologies — based on Gartner's AI techniques framework, and taught through a multichannel education plan.
- Demonstrate the value of AI techniques by identifying specific, business-relevant use cases that can quickly benefit from their implementation.
- Strengthen your AI production efforts by unveiling the AI skills within your organization, addressing integration issues in the prototype phases and combining various AI techniques to achieve their full representation power.

Strategic Planning Assumptions

By 2023, 85% of AI solutions sold by vendors will focus on concrete domains and industry verticals.

By 2022, all personnel working on AI projects will be required to demonstrate competency in and understanding of responsible AI practices.

Introduction

AI techniques solve a wide array of business problems and generate significant returns on investment (ranging from about 20% to over 800% — see "Five Ways Artificial Intelligence and Machine Learning Deliver Business Impacts"). However, unbridled hype generated by the industry, the press and overenthusiastic software vendors is creating confusion that makes it difficult for organizations to set the right expectations regarding business outcomes. This untamed hype gives rise to projects that have no chance of success. Subsequently, business leaders with unrealistic expectations will blame the technology and the science for its inability to transform lead into gold.

> **Artificial intelligence applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.**
>
> — *Gartner Glossary*

Gartner's 2019 CIO Survey identified that, although 92% of respondents indicate that they either have AI on their radar, or have initiated projects, only 19% have projects currently deployed. [2] In Gartner client inquiries, end users have identified a wide range of reasons why these AI deployments are not sustainable.

How can data and analytics leaders mitigate the negative aspects of the hype surrounding AI, while preserving the enthusiasm rightfully associated with its power to create real value?

This research offers approaches that data and analytics leaders can use to manage business leaders' expectations of AI, set realistic goals and increase the success rate of AI projects.

Analysis

Adopt a Common Taxonomy for AI Techniques Based on Gartner's AI Techniques Framework

AI techniques go by a wide variety of names — including:

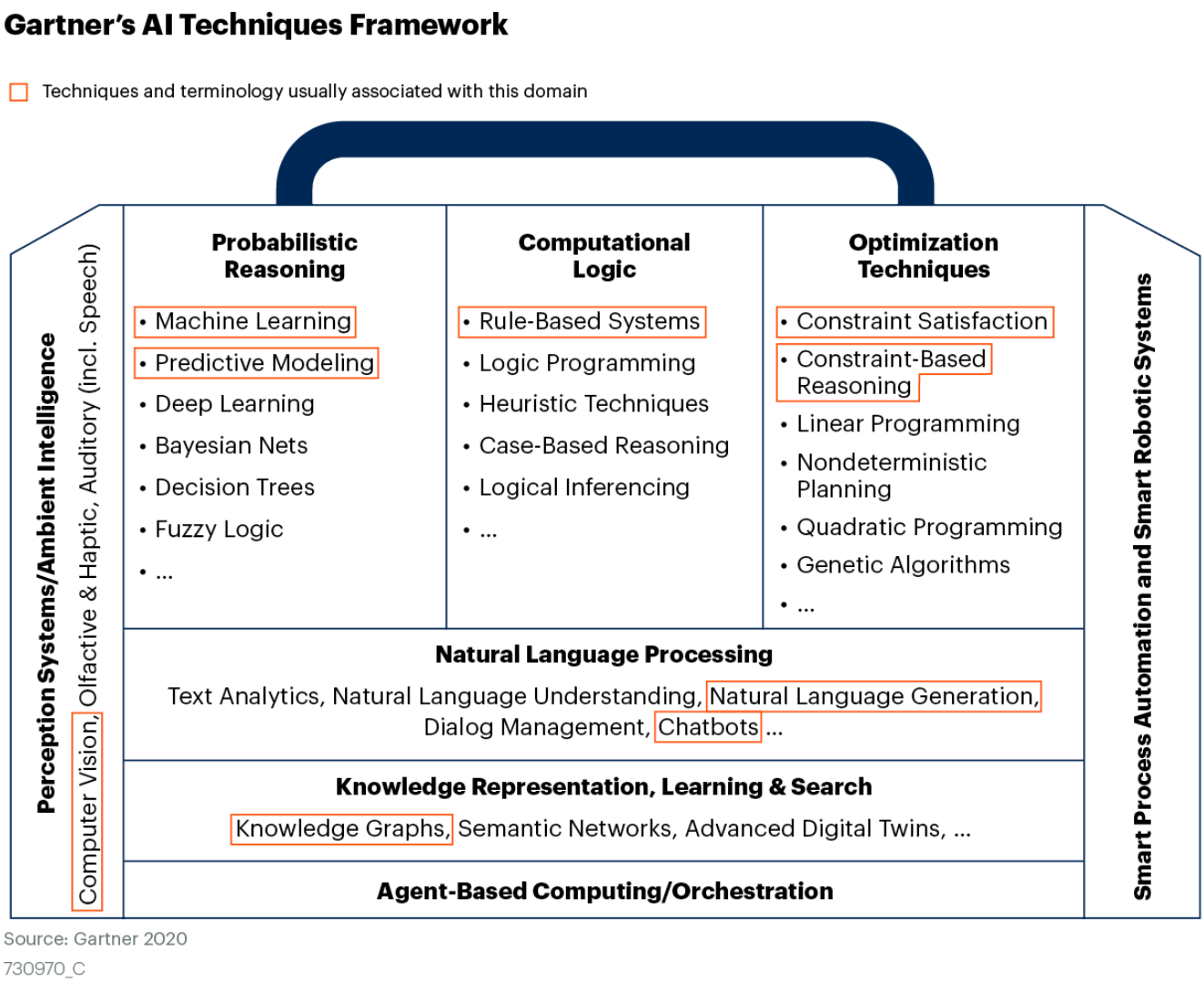
- Expert systems
- Data mining
- Predictive analytics and machine learning
- Neural networks
- Genetic algorithms
- Deep learning

Many clients find this confusing. Gartner's AI Techniques Framework consists of a set of computing engineering techniques that fall into seven principal sets (see Figure 1). This framework is essentially use-case-driven, but respects the basic principles established in Stuart Russell and Peter Norvig's reference text book "Artificial Intelligence: A Modern Approach." [3] It is an attempt to impose some order on the "wild west" of terminology related to AI.

In short, AI is mainly a computer engineering discipline. This discipline is made up of software tools aimed at solving problems, not replicating the human brain (let alone the mind). From that perspective, the AI discipline (and toolbox) comprises a series of mathematical or logic-based techniques — uncovering, capturing, coding knowledge, and using sophisticated and clever mechanisms to solve problems.

Using this framework, data and analytics leaders see through the hype, breaking the concept down into tangible pieces and removing the philosophical element from the AI discussion. They can then show how each of these techniques can solve real-world problems.

Figure 1: Gartner's AI Techniques Framework



Source: Gartner 2020
730970_C

Today, three main categories of techniques form the majority of use cases in AI. These categories are distinct and embody very different approaches and techniques that are robust and mature:

- **Probabilistic reasoning:** Those techniques (often generalized as machine learning — see Note 1) that extract value from the large amount of data gathered by enterprises. This includes techniques aimed at unveiling unknown knowledge held within a large amount of data (or dimensions). This is done by discovering interesting correlations linked to a particular goal or label within that data. This might include, for example, sifting through a large amount of customer records and identifying what are the factors, and how these factors are correlated — allowing the organization to anticipate if those customers are potential churners.

- **Computational logic:** Often referred to as rule-based systems, these techniques use and extend the implicit and explicit know-how of the organization. These techniques are aimed at capturing known knowledge in a structured manner, often in the form of rules. These rules can be manipulated by business people while the technology guarantees the coherence of the rule set (by making sure that rules do not contradict each other or lead to circular reasoning — which is

not that obvious when you are dealing with tens of thousands of rules). A new series of compliance laws has brought rule-based approaches to the forefront.

- **Optimization techniques:** Traditionally used by operations research groups, optimization techniques maximize benefits while managing business trade-offs. They do this by finding optimal combinations of resources given a number of constraints in a given amount of time. Optimization solvers often generate executable plans of action and are sometimes described as prescriptive analytics techniques. Operational research groups in asset-centric industries (such as, manufacturing and utilities) or functions (such as logistics and supply chain) have been using optimization techniques for decades.

The bottom three layers represent emerging techniques in descending order of maturity:

- **Natural language processing (NLP):** NLP provides intuitive forms of communications between humans and systems. NLP includes computational linguistic techniques (symbolic and subsymbolic) aimed at recognizing, parsing, interpreting, automatically tagging, translating and generating (or summarizing) natural languages. The phonetic part is often left to speech-processing technologies that are essentially signal-processing systems. That is why applications dealing with speech-to-text, or text-to-speech functionalities are often delivered by different software solutions. Additional knowledge capabilities, such as dictionaries or ontologies, are also part of NLP systems.

- **Knowledge representation:** Capabilities such as knowledge graphs or semantic networks aim to facilitate and accelerate the access to and analysis of data networks and graphs. Through their representations of knowledge, these mechanisms tend to be more intuitive for specific types of problems. For instance, new knowledge representations provide fertile grounds for AI techniques in situations where one needs to map out specific relationships among entities (investigative research, process optimization or manufacturing assets management, for example). Those techniques include graph traversal, memorization and hybrid learning (while using composite AI systems). For example, in the first half of 2020, knowledge graph techniques have seen a critical acceleration in adoption.

- **Agent-based computing:** This is the least mature of the AI techniques categorized in this framework, but it is quickly gaining in popularity. Software agents are persistent, autonomous, goal-oriented programs that act on behalf of users or other programs. Chatbots, for example, are increasingly popular agents. In increasing order of complexity, there are five main types of agent systems:

  - Reflex-based agents
  - Model-based agents
  - Goal-based agents

- Utility-based agents
- Learning agents

Two main classes of agents application are commonly used with existing solutions today:

1. Task-automation agents can be generic (for example, meeting scheduling assistants in email systems), or more specific (for example, contract validation softbots for sales automation applications).
2. Autonomous object programs can serve functions such as automatic temperature-setting (found in car diagnostic systems or home thermostats, for example).

Agent-based techniques also have to deal with particular orchestration principles given the distributed and autonomous nature of their operations. This means they have the ability to manage the collective behavior of dispersed computing and self-organized systems, as well as the emerging properties of these systems. Game theory and other complex systems theory disciplines can provide techniques to address software agencies' orchestration problems.

The left column of the framework depicted in Figure 1 includes systems feeding data to all techniques of the framework:

- Perception and ambient intelligence systems include a wide variety of advanced technologies continuously capturing different types of data, including audio, visual (such as computer vision), olfactory, haptic and chemical data. These technologies also capture environmental and geospatial inputs — and provide context and precision in order to develop more effective analytical assets.

The right column of the framework includes systems that capitalize on insights or execute the decisions coming from other techniques of the framework:

- Smart process automation and smart robotic systems apply AI techniques for adaptive and complex coordination of (digital or physical) execution, including feedback processing and "learning." It also refers to techniques that are needed for augmentation and advanced human-machine-interaction. This requires algorithms that go beyond standard machine engineering and process automation. Contrary to common belief, robotic process automation (RPA) and nonadaptive robotic systems are not considered to be AI systems.

See Note 2 for a representative list of vendors that provide the AI technologies outlined in this research.

Identify Where to Start Practically Implementing AI Techniques

AI does not make a lot of the products you buy. To paraphrase BASF's iconic tagline: AI does not make a lot of the software you buy, it makes a lot of the software you buy better. A clear understanding of its final business impact should be the start of every project that uses AI techniques. Line-of-business stakeholders should be able to clearly articulate the tangible business benefits they are expecting by asking:

- What is the business problem that the business is trying to tackle?
- Who is the primary consumer of the technology?
- What is the business process that will host that technique?
- How will the impact of implementing the technology be measured (compared to more traditional techniques)?
- How will the value provided by the technology be monitored and maintained? And by whom?
- Which of the subject-matter experts from the lines of business can guide the development of the solution?

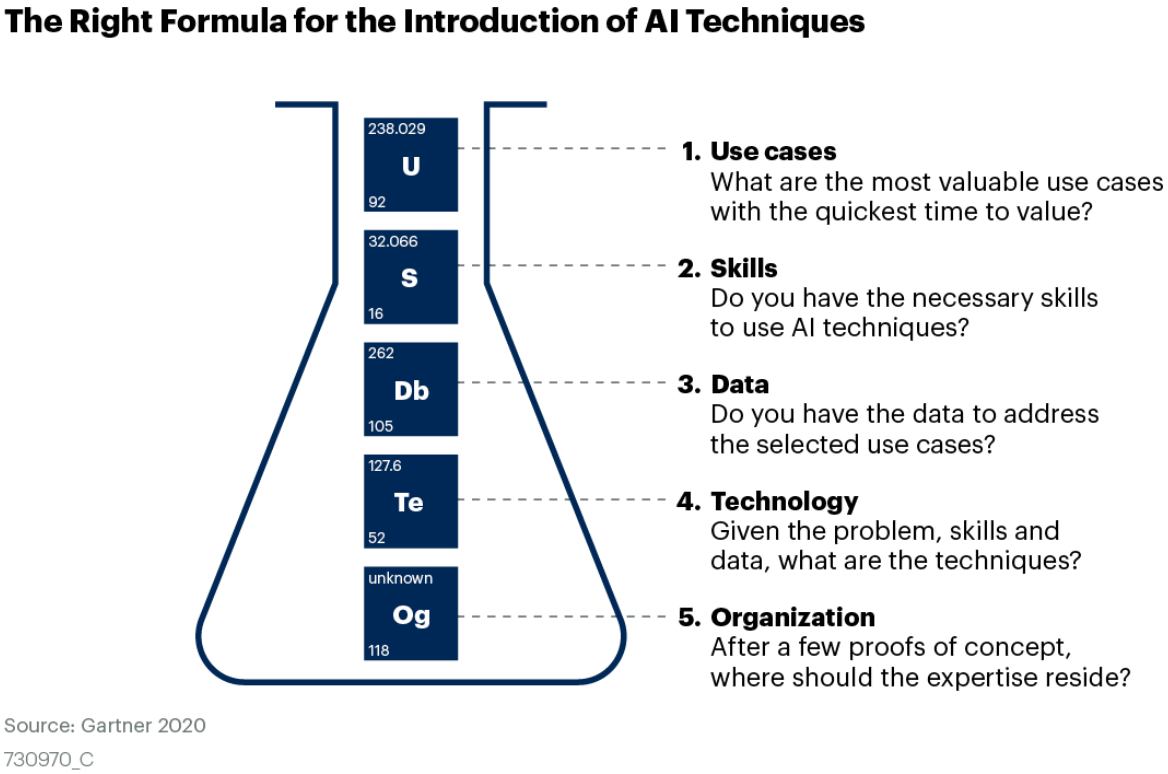
Any AI strategy initiative must first focus on the organization's readiness. It must allow for learning and practical use, before embarking on a grand AI program. Engaging in an AI strategy without first experimenting with its component techniques is putting the cart before the horse.

The practical introduction of AI techniques within an organization of any size can be achieved through five steps:

1. Use cases — Build a portfolio of impactful, measurable and quickly solvable use cases.
2. Skills — Assemble a set of talents pertinent to the use cases to be solved.
3. Data — Gather the appropriate data relevant to the selected use cases.
4. Technology — Select the AI techniques linked to the use cases, the skills and the data.
5. Organization — Structure the expertise and accumulated AI know-how.

This five-step formula (see Figure 2) is a tactical approach to the introduction of AI techniques, favoring a quick time-to-value perspective. It is not a strategic, longer-term outlook, which can be developed once the organization has established its current strengths and weaknesses (both culturally and technologically) in terms of using those techniques. See "5 Steps to Practically Implement AI Techniques" and "How to Optimize Business Value From Data and Analytics Investments … Finally."

Figure 2: The Right Formula for the Introduction of AI Techniques



Source: Gartner 2020
730970_C

Strengthen Production Efforts While Anticipating Upcoming Critical AI Trends

- **AI Integration and Operationalization:** As indicated by respondents to Gartner's 2019 AI in Organizations Survey, [1] after building numerous successful prototypes, the AI community is confronted with the challenge of scaling prototypes to enterprisewide systems (that is, building them to become an integral part of the organization ecosystem). Moving AI from exploration to sustainable production requires understanding and mastering the various AI techniques, along with the necessary infrastructures, methodologies for getting started and implementation best practices.

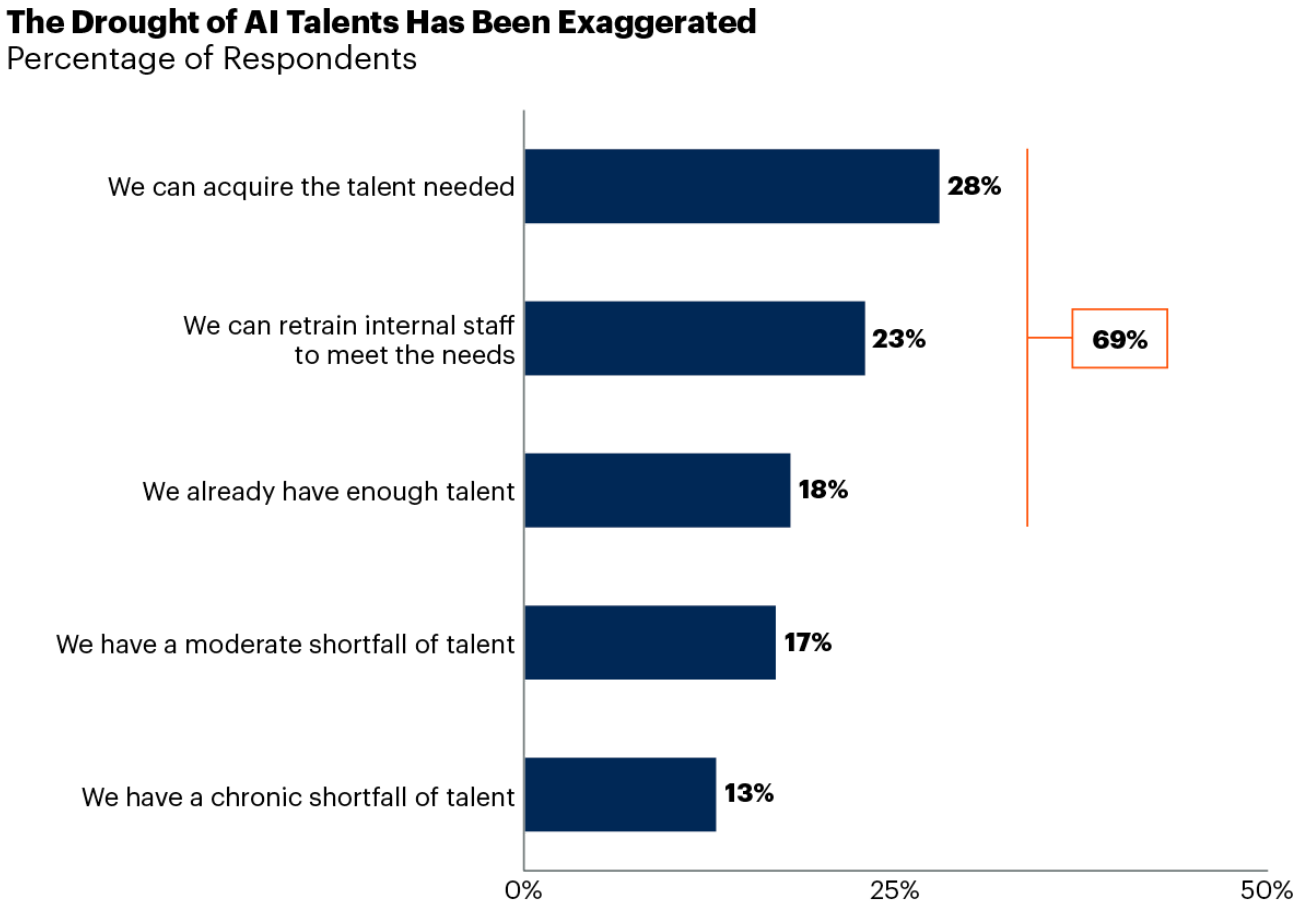
- **AI Skills:** However, while organizations are still struggling to deploy AI techniques in production, it seems that acquiring AI talent might not be as much of an issue as commonly believed. Gartner's 2019 AI in Organizations Survey showed that, of organizations using of planning to use AI within three years, almost 70% indicate that they either have skills, or the ability to uncover internal competencies or hire external talent to fulfill their demand (see Figure 3). [1]

- **Composite AI:** The COVID-19 crisis has accelerated a trend that we have been witnessing in the last few years. Organizations are combining different AI techniques to improve the efficiency of learning, to broaden the level of knowledge representations and, ultimately, to solve a wider range of business problems in a more efficient manner. We have dubbed this trend, "composite AI."

- **Decision Intelligence:** AI intersects with data science and business process management. Those three disciplines meet at the decision-modeling level — where users can describe how AI

techniques improve decision making through modeled know-how and data evidence. Decision intelligence is the discipline that enables the reengineering of those decisions, to make them adaptable and resilient.

Figure 3: The Drought of AI Talents Has Been Exaggerated



n = 605, excluding unsure

Q: Considering the talent or skills needed, versus those available for your organization's AI developments, would you say... ?

Source: Gartner's 2020 AI in Organizations Survey

730970_C

Acronym Key and Glossary Terms

AI	artificial intelligence
NLP	natural language processing
RPA	robotic process automation

Evidence

[1] Gartner's 2019 AI in Organizations Survey was conducted online during November and December 2019, among 607 respondents from organizations in the U.S., the U.K. and Germany. Quotas were established for company size and for industries, to ensure the sample had good representation across industries and company sizes. Organizations were required to have already deployed artificial intelligence (AI) or intend to deploy AI within the next three years. Respondents were screened to:

1. Be part of the organization's corporate leadership or report into corporate leadership roles.
2. Have a high level of involvement with at least one AI initiative.
3. Have one of the following roles when related to AI in their organizations:
   - Determine AI business objectives
   - Measure the value derived from AI initiatives
   - Manage AI initiatives' development and implementation

The study was developed collaboratively by Gartner analysts and the Primary Research Team.

Results of this study do not represent global findings or the market as a whole, but reflect sentiment of the respondents and companies surveyed.

[2] The 2019 Gartner CIO Survey was conducted online from 4 June 2019 through 5 August 2019 among Gartner Executive Programs members and other CIOs. The respondents were members of Gartner Executive Programs and other IT leaders.

Qualified respondents were the most senior IT leader (CIO) for their overall organization or a part of their organization (e.g., a business unit or region).

The total sample is 1,070, with representation from all geographies and industry sectors (public and private). Disclaimer: Results do not represent "global" findings or the market as a whole but reflect sentiment of the respondents and companies surveyed.

The survey was developed collaboratively by a team of Gartner analysts and was reviewed, tested and administered by Gartner's Research Data and Analytics team, with additional research contribution and review from Melissa Rossi Wood. Of respondents, 92% indicated that they either have AI on their radar or have initiated projects. However, only 19% have projects currently deployed.

[3] S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach," Prentice Hall.

Note 1: Machine Learning

Machine learning refers to a set of techniques and algorithms. It is important to note that machines do not “learn,” they store and compute. We use anthropomorphisms to more intuitively convey complex mathematical mechanisms, but this comes at the expense of attributing them qualities they do not possess. The concept of machine learning comes from a set of AI techniques known as probabilistic reasoning. Those machine learning techniques are different from traditional programming methods as — through supervised or unsupervised methods — they compute formulas from data to create “models” that operate as programs. Subsets of machine learning techniques can also be referred to as predictive analytics or data mining.

Note 2: Representative Vendors

Representative software vendors for probabilistic reasoning:

- AI Dynamics
- Algorithmia
- Alteryx
- Anaconda
- Databricks
- Dataiku
- DataRobot
- Datawatch Systems
- Domino
- FICO
- H2O.ai
- IBM
- KNIME
- MathWorks
- Microsoft Azure
- ModelOp
- RapidMiner
- Saagie

- SAP
- SAS
- Teradata
- TIBCO Software

Representative software vendors for computational logic:

- Actico
- Decisions
- FICO
- FlexRule
- IBM
- InRule
- Rulex
- Progress
- SAP

Representative software vendors for optimization techniques:

- FICO
- Frontline Systems
- Gurobi
- IBM
- LINDO Systems
- MATLAB
- MOSEK

Representative software vendors for natural language processing:

- Amazon Lex

- Amenity Analytics
- Arria NLG
- Attivio
- Automated Insights
- AYLIEN
- Clarsentia
- Cortical.io
- Converseon
- Google
- IBM
- Indico
- Insight Platforms
- Kingland
- Lexalytics
- Microsoft Azure
- Narrative Science
- NVivo
- Proxem
- Yseop

Representative software vendors for knowledge representation:

- Expert System
- Grakn
- Maana
- Neo4j
- Ontotext

- Quantexa
- Semantic Web Company
- Siren
- Stardog
- TigerGraph

Representative software vendors for agent-based computing:

- Clara Labs
- Diffeo
- PROWLER.io
- Swarm Technologies
- x.ai

Representative software vendors for perception systems:

- Aromyx
- Bambu Tech
- Cognex
- Lofelt
- Neuron soundware
- OtoSense
- Reality AI
- Remark Holdings
- RoboRealm

Document Revision History

Artificial Intelligence Hype: Managing Business Leadership Expectations - 5 June 2018

Recommended by the Author

Five Ways Artificial Intelligence and Machine Learning Deliver Business Impacts

Case Study: Internal Data Science Team Development (Eastman)

Case Study: Data and Analytics Monetization With Knowledge Graphs and AI (Turku City Data)

5 Steps to Practically Implement AI Techniques

How to Optimize Business Value From Data and Analytics Investments … Finally

How to Use AI to Create the Customer Experience of the Future

How to Organize AI Talent

How to Use Machine Learning, Business Rules and Optimization in Decision Management

Recommended For You

Artificial Intelligence Primer for 2020

Predicts 2020: Artificial Intelligence — the Road to Production

Five Ways Artificial Intelligence and Machine Learning Deliver Business Impacts

Hype Cycle for Artificial Intelligence, 2020

The Present and Future of Artificial Intelligence (Presentation Deck)

Learn more.
Dig deep.
Stay ahead.

Gartner's artificial intelligence insights can help leaders drive revenue growth and achieve business outcomes by improving quality, speed and functionality. Learn more:

gartner.com/en/information-technology/insights/artificial-intelligence

Become a Client

Get access to this level of insight all year long — plus contextualized support for your strategic priorities — by becoming a client.

gartner.com/en/become-a-client

U.S.: 1 800 213 4848

International: +44 (0) 3331 306 809

About Gartner

Gartner is the world's leading research and advisory company and a member of the S&P 500. We equip business leaders with indispensable insights, advice and tools to achieve their mission-critical priorities today and build the successful organizations of tomorrow.

Our unmatched combination of expert-led, practitioner-sourced and data-driven research steers clients toward the right decisions on the issues that matter most. We are a trusted advisor and an objective resource for more than 14,000 enterprises in more than 100 countries — across all major functions, in every industry and enterprise size.

To learn more about how we help decision makers fuel the future of business, visit gartner.com.

Gartner®