Artificial Intelligence Primer for 2022

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Initiatives: Artificial Intelligence

> Simply adding AI to existing approaches is no longer enough. Use this initiative to understand how the AI market is scaling and operationalizing to enable sustainable, industrial-grade systems within the fabric of IT departments, businesses and society.

Additional Perspectives

- Summary Translation: Artificial Intelligence Primer for 2022
  (24 February 2022)

Scope

Our insights help organizations harness the power of AI techniques, whether they are just starting out with AI or implementing enterprisewide AI-enabled systems at scale.

In addition to data and analytics leaders and business leaders, other IT roles involved in this initiative are:

- Chief information officers
- Application and software engineering leaders
- Enterprise architecture and technology innovation leaders

Topics in this initiative include:

- **AI Governance:** Develop an AI strategy that addresses the governance and responsible use of techniques and solutions, as well as the discovery, upskilling and sharing of AI competencies, and AI's deep impact on business and society.

- **AI Next:** Analyze AI trends and the future of AI, including techniques, dedicated infrastructures, upcoming hardware, best practices, and new applications, skills and governance mechanisms.

- **AI Solutions:** Investigate where and how AI techniques are applied and scaled (organically or through vendors) in order to create significant advantages and differentiate business models.

- **AI Techniques and Foundations:** Examine the fundamental AI techniques within the AI discipline's "toolbox," the data and computing infrastructures required to operationalize those techniques, and the methodologies and best practices required to generate tangible outcomes.

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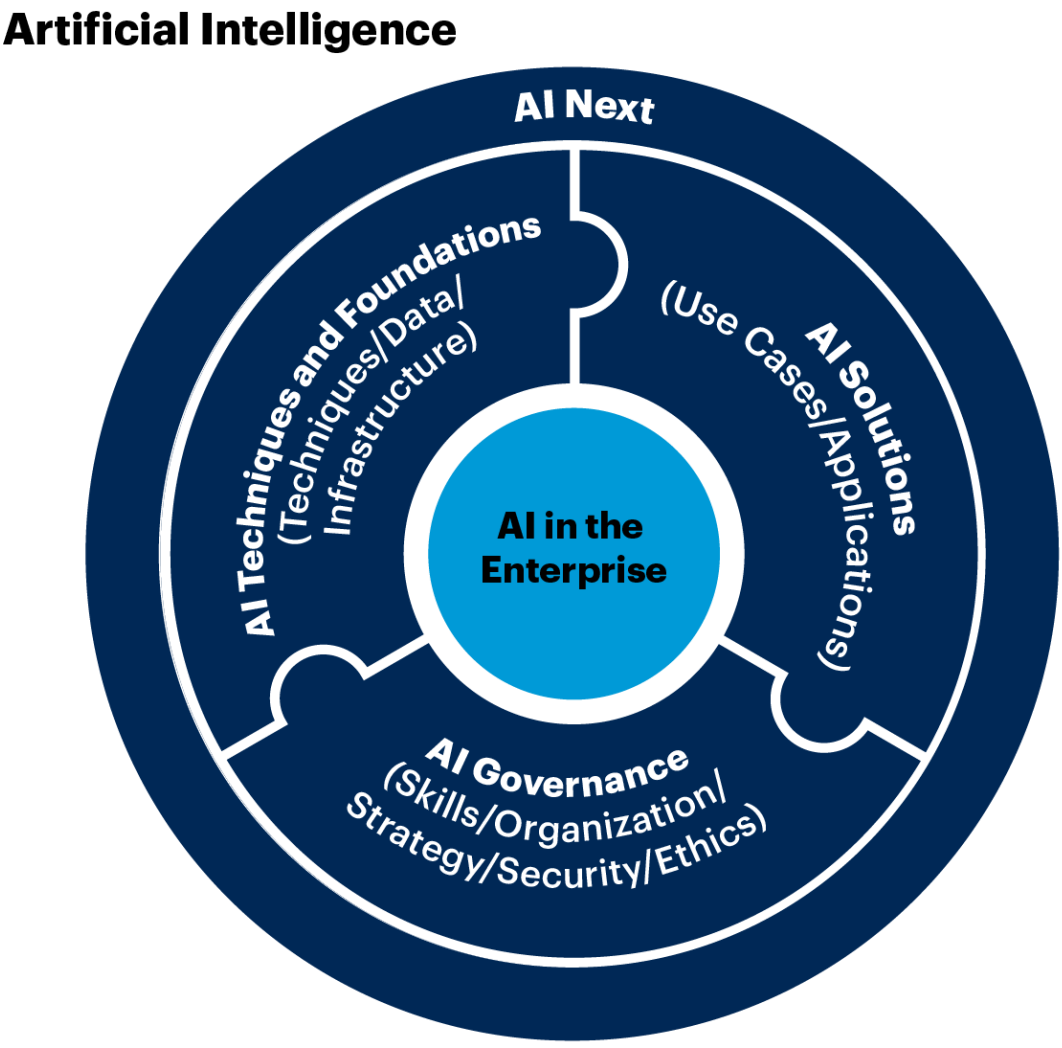
Analysis

Figure 1: Artificial Intelligence Overview



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Artificial intelligence (AI) applies advanced analysis and logic-based techniques — including machine learning (ML) — to interpret events, support and automate decisions, and take actions.

The cavalcade of new AI techniques and vendors continues apace, but approaches to AI are maturing from ad hoc proofs of concept (POCs) and experiments to something more foundational. As AI begins to tackle more executive decision making across strategic, operational and tactical issues and opportunities, enterprises must develop an approach that is less “model at a time” and more of “a system’s view.” This system’s view not only looks at AI in isolation, but also at how AI interacts with processes, people and other systems. Upgrading this vision for AI to something systemic will offer enterprises the opportunity to reengineer business models, decisions, processes, and even entire organizations and ecosystems. This socio-technical approach will require coordinated decision making, shared goal development and reusability of AI assets without which technical and cognitive debt will grow.

Simply adding AI to existing approaches is no longer enough. To take advantage of AI in a real and sustained way, data and analytics leaders need to reengineer how decisions are made. New data, new analysis, and new AI techniques and services will be much less effective if applied to traditional decision-making methods. The advent of citizen AI tools to support composable business, while a boost for production, will also challenge existing security, integration and governance approaches.

To firmly establish their competitive differentiation and survive in a business context that is shifting at an increasing pace, organizations need to scale AI systems and skills. This requires the emerging discipline of AI engineering to design, build, operate and scale ever-more complex AI systems. Scaling AI is not only about increasing the flow of models from POC to production; it is also about scaling across business silos and designing network effects to scale enterprisewide intelligence. By scaling systems that are flexible and resilient — and therefore adaptable — enterprises will be able to deliver measurable value from projects that previously required too many people or too much time; in other words, they will be able to reengineer decisions to accelerate digital business.

The maturation and composition of AI technology poses a new set of challenges. AI-enabled decisions have not only to be accurate, but also explainable and ethical. AI systems operating with various degrees of autonomy have to be trusted and their risks managed.

The shift from prototypes to operational systems, initiated in 2020, will continue through 2022 to bring the AI exploration era to the next stage of production and, eventually, to a strategic mandate. This will enable sustainable, industrial-grade AI systems within the IT, business and cultural fabric of every organization. Approaches to AI will evolve from isolated use cases to a systemic approach across business functions, the enterprise and the wider business ecosystem. To gain funding and organizational acceptance, and to deliver value, successful data and analytics leaders will consider the multidimensional aspects of risk associated with AI to ensure that money is well spent and that company reputation and performance do not suffer. It is time to reengineer decision making and, as a result, reengineer the dynamics between humans and machines.

Topics

Moving AI from the exploration phase into a sustainable production phase requires understanding and mastery of the various AI techniques, along with the necessary infrastructures, methodologies for getting started and implementation best practices. It is critical to focus on the use cases where this technology will have the most impact. However, it is also important to simultaneously establish an agile organization, secure the proper skills and governance, and set the right strategic imperatives. Although organizations should take a pragmatic approach, they must also keep an eye on the trends in, and likely future development of, AI systems. They should aim to identify disruptive techniques for differentiating use cases.

Our research in this area addresses the following topics:

AI Governance

As AI techniques proliferate within organizations, it becomes critical to develop an AI strategy that makes both effective and ethical use of assets and skills. Enterprises must balance accountability for the behavior and transparency of AI systems with the need to stimulate innovation securely and responsibly — outside of data science labs across IT and other citizen-AI-empowered business units.

Managing risk, compliance and delivering ethical, responsible AI requires a governance framework for people and skills development, as well as the broader orchestration of AI assets across the organization, including leveraging change management practices.

Questions Your Peers Are Asking

- How do we encourage lines of business to develop AI, while keeping it properly governed?
- What is the right mix of talent, and what new roles and skills are required as AI matures?
- When and how can organizations start developing an AI strategy?
- How should organizations organize and prepare themselves for the adoption of AI?
- What are the governance, responsibility and ethical issues associated with AI initiatives?
- How can I safely collaborate on AI projects?

Recommended Content

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

- AI Security: How to Make AI Trustworthy
- How to Determine the Best AI Organizational Design
- AI Ethics: Use 5 Common Guidelines as Your Starting Point
- Applying AI — Governance and Risk Management
- Use Gartner's MOST Framework for AI Trust and Risk Management
- Formulate a Strategy for AI Skills Acquisition and Upskilling
- What to Do to Boost Your AI Maturity (and What to Avoid)

Planned Research

- Organizational design and change management as AI operationalization scales
- Examples of how advanced AI practitioners handle responsible AI (including ethics, bias and transparency)
- Case studies on innovative approaches to AI governance
- Practitioner case studies on how organizations handle AI security
- Privacy-preserving approaches to AI
- How AI in the workplace changes roles and tasks — from data scientists and software engineers to designers and creatives
- Advice on how to accelerate the operationalization of AI systems when moving from POCs to minimum viable products
- What is green AI and what metrics should I use to track sustainability?
- Development and governance strategies for optimization, multiagent systems and simulation
- How can we be sure that distributed AI systems can collaborate effectively on shared goals?

AI Next

The AI discipline continues to evolve rapidly through new techniques, dedicated infrastructures and hardware, leveraged by a wide array of innovators — from data scientists to software engineers — and a broad sweep of users empowered by citizen AI.

Architectural shifts are on the horizon and the rise of techniques — such as composite AI, generative AI, multiagent systems, simulation, decision intelligence, multimodal experiences and natural language automation — all point to a more connected and networked approach to AI in the future.

From synthetic data and quantum and neuromorphic computing to the evolution of chatbots and digital humans, we will monitor developments and predict the future of AI over both the short and long term.

Questions Your Peers Are Asking

- What are the most promising emerging techniques and vendors in the AI market?
- How will new techniques change our approach to AI engineering?
- How will AI enable both incremental and radical innovations?
- What macro trends in AI will shift the economics of doing business and enable new business models?
- What will be the long-term impact of AI on organizations, people's jobs, lives and society?

Recommended Content

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- Hype Cycle for Natural Language Technologies, 2021
- Top Strategic Technology Trends for 2022: Generative AI
- Applying AI — Key Trends and Futures
- 2021 Strategic Roadmap for Enterprise AI: Natural Language Architecture
- Cool Vendors in Data for Artificial Intelligence and Machine Learning
- Decision Intelligence Is the Near Future of Decision Making
- Top Strategic Technology Trends for 2022: AI Engineering

Planned Research

- Exploration of trends in, and the future of, AI techniques and their potential implementation
- Evaluation of advanced methods of AI-driven analysis as they mature and add depth and flexibility to AI projects and products
- Examination of how AI will amplify other advanced technologies and solve a new range of business problems
- Innovation insights into composite AI, multiagent systems, simulation and optimization techniques
- Profiling of citizen AI technologies and how to ensure collaboration with data science teams
- Outline of how AI reshapes the future of work — from roles to departments
- Case studies of innovative AI-based analytics techniques
- Exploring the different leadership roles involved in AI and leading AI strategy
- How synthetic data might make your current data and analytics strategy redundant

AI Solutions

In 2022, we will investigate where and how AI techniques are currently applied. We will explore AI solutions embedded in enterprise applications and how AI services are made available via APIs, SDKs and platforms for broader consumption via OEMs and developer communities. We will support development of rationales around buy versus build and choices around best-of-breed solution adoption, all set against different AI systems and architectural models.

As a result, we can expose how AI can systematically support the foundation of applications, enable innovative solutions and even create disruption that empowers differentiated business models.

As enterprises demand more of AI, we will examine higher order executive functions such as planning, organizing, prioritizing and decision making to facilitate the construction of productive, adapted, trusted systems.

Questions Your Peers Are Asking

- Where has AI been implemented most effectively, and for what types of outcomes?
- What role should vendors play in solution development?
- What should I buy and what should I build? Is the market mature enough for best-of-breed strategies?
- How does a data-centric approach to AI change my business?
- How do I avoid technical debt in AI systems?
- Where have AI techniques been most effective for business transformation or optimization?
- What ROI should I expect for a particular use case?

Recommended Content

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

- Applying AI in Business Domains
- Applying AI in Industries
- Accelerating AI Deployments — Paths of Least Resistance
- Market Guide for Process Mining
- Magic Quadrant for Cloud AI Developer Services

Planned Research

- Advice on how to safely and productively use AI techniques for decision support, augmentation and automation
- A definition of the emerging decision intelligence market, and other emerging markets and advice on how to navigate them
- Illustration of how natural language technologies can become an enabler across the enterprise
- Case studies showing how leading practitioners solve business problems by embedding AI
- Examination of the intersections between AI and other technology and business categories
- Exploration of the primary ways in which AI can deliver business impact

AI Techniques and Foundations

In 2022, we will examine the fundamental techniques in the AI discipline's toolbox, and provide insight into the architectures and infrastructures necessary to deploy and operationalize them. We will continue to explore AI application areas in data science, computer vision and natural language technologies, and their deeper intersection using composite AI approaches. We will also highlight the methodologies and best practices across the AI engineering pipeline in order to generate tangible outcomes. Finally, we will outline how AI techniques reshape existing processes and applications, and what new techniques emerge as a result.

Questions Your Peers Are Asking

- What techniques and approaches form the AI discipline?
- What performance and benchmarks should I expect for AI?
- What are the principles, methodologies and best practices required to capitalize on AI initiatives?
- How will AI techniques reshape my architecture?
- What use cases do different AI technologies enable?
- What does it take to get started with AI?
- What techniques should I explore based on my AI maturity?
- How should I move AI initiatives from the pilot stage into production?

Recommended Content

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

- Applying AI — Techniques and Infrastructure
- Cool Vendors in AI Core Technologies
- Architecture of Conversational AI Platforms
- Hype Cycle for Artificial Intelligence, 2021

Planned Research

- An overview of ML techniques and when to use them
- AI techniques to build psychographic and behavioral models in order to analyze and support behavior — from customer experiences to employee decision making
- How data fabrics impact approaches to AI development, operations and innovation
- How to begin with simulation and optimization techniques, and profiling what self-build is required
- Examining the most productive approach to developing natural language automation competencies
- Highlighting evolution and uses of graph technologies within AI systems

Suggested First Steps

- What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value
- Applying AI — A Framework for the Enterprise
- 5 Ways Artificial Intelligence and Machine Learning Deliver Business Impacts
- 5 Steps to Practically Implement AI Techniques
- The AI Talent Crisis Is a Myth: Here Is What to Do
- Uncovering Artificial Intelligence Business Opportunities in Over 20 Industries and Business Domains

Essential Reading

- Applying AI in Business Domains
- Applying AI in Industries
- Decision Intelligence Is the Near Future of Decision Making
- 2021 Strategic Roadmap for Enterprise AI: Natural Language Architecture
- Preserving Privacy While Using Personal Data for AI Training
- Architecture of Conversational AI Platforms
- Use Gartner's 3-Stage MLOps Framework to Successfully Operationalize Machine Learning Projects
- Use 3 MLOps Organizational Practices to Successfully Deliver Machine Learning Results

Tools and Toolkits

- Tool: Use Cases to Seize AI Investment Opportunities
- Toolkit: Discover and Prioritize Your Best AI Use Cases With a Gartner Prism

Evidence

From Gartner's 2019 AI in Organizations Survey:

- Ninety percent of organizations have an AI team or lab/AI center of excellence, and 45% of those teams report directly to the C-level.
- The average proportion of projects that make it from pilot to production is 53%.
- The average time to develop from prototype to production is 8.6 months.
- Almost 70% of organizations say that AI talent is not a concern (they either have talent, or can retrain or acquire the needed talent).
- As organizations mature in AI, the focus on customer value increases, with 53% of AI-mature organizations addressing customer lifetime value analysis.
- More than one in four organizations state revenue increase/cost reductions as the reason for investing in AI versus other technology options.

- Two in three organizations assign or plan to assign a taskforce to oversee all AI implementation initiatives.
- One in three organizations are applying AI in several business processes in one business unit.

Document Revision History

Artificial Intelligence Primer for 2021 - 12 January 2021

Artificial Intelligence Primer for 2020 - 24 January 2020

Artificial Intelligence Primer for 2019 - 17 January 2019

Related Priorities

Initiative Name	Description
Analytics, BI and Data Science Solutions	The analytics, BI and data science initiative addresses the challenge to provide a governed-yet-flexible, individualized-yet-holistic analytics ecosystem that responds and leads to measurable impact.
CRM Strategy and Customer Experience	CRM and CXM must adapt to transformative changes in organizations, customers and environments. Gartner's research explains how to align internal resources with external customer needs.

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