Artificial Intelligence Primer for 2021

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By Analyst(s): Erick Brethenoux

Initiatives: Artificial Intelligence

This document outlines Gartner's research agenda for artificial intelligence in 2021. We will analyze how the AI market is progressing from the exploratory stage to a production stage that enables sustainable, industrial-grade systems within the fabric of IT departments, businesses and society.

Additional Perspectives

- Summary Translation: Artificial Intelligence Primer for 2021
  (26 January 2021)

More on This Topic

This is part of an in-depth collection of research. See the collection:

- Applying AI — Techniques and Infrastructure

Scope

Our research in 2021 will help organizations harness the power of artificial intelligence (AI) techniques, whether they are just starting out with AI or implementing enterprisewide AI-enabled systems.

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 we will cover include:

- **AI techniques and foundations** — Examination of 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.
- **AI solutions** — Investigation of where and how AI techniques are applied and scaled (organically or through vendors) in order to create significant advantages and differentiate business models.
- **AI governance** — Research focused on how to 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 society.
- **AI next** — Analysis of AI trends and the future of AI, including techniques, dedicated infrastructures, upcoming hardware, best practices, and new applications, skills and governance mechanisms.

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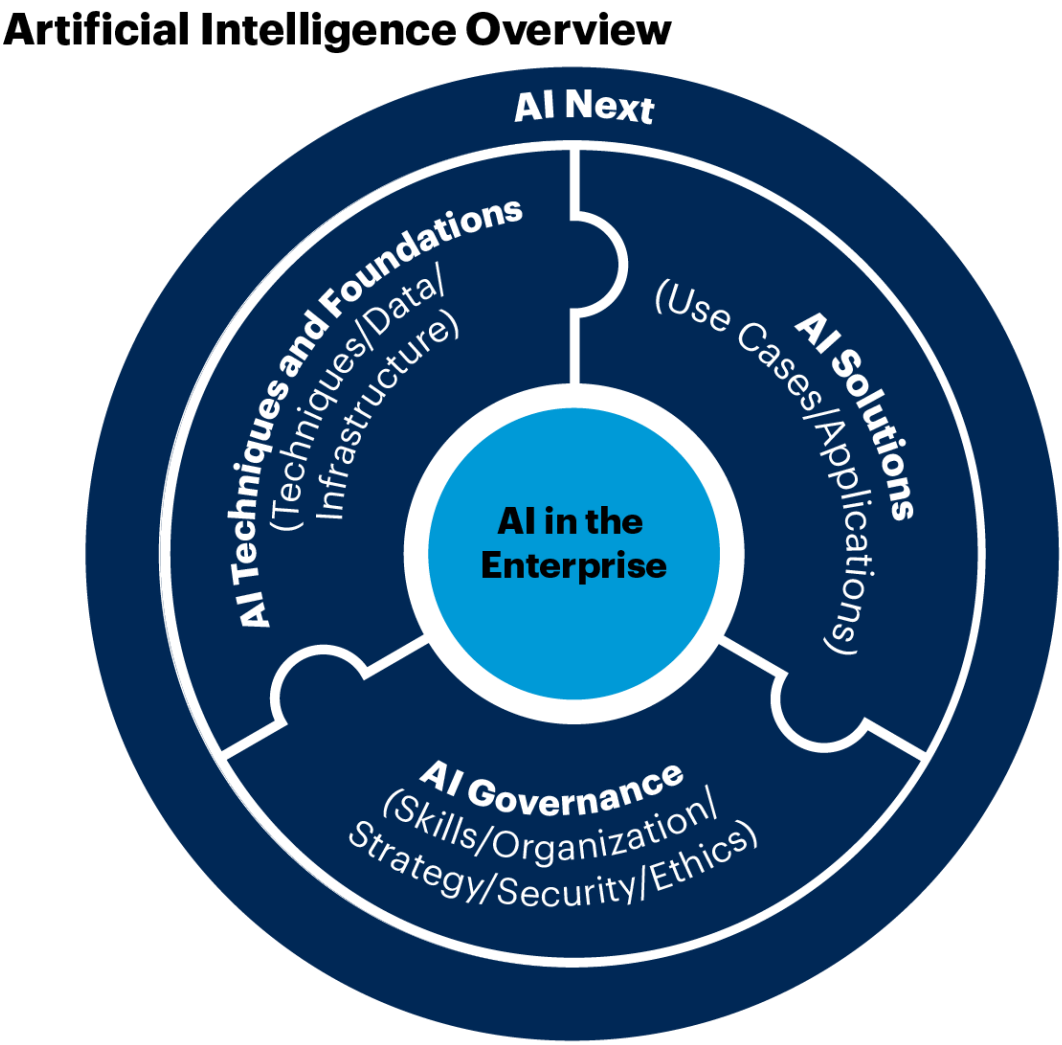
Analysis

Figure 1: Artificial Intelligence Overview



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

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 not be effective if applied to traditional decision-making methods. Reengineering decision making to create real, tangible business value should be the ultimate ambition behind putting AI systems on the road to production. After building numerous successful prototypes, the AI community is now confronted with the challenge of scaling prototypes and integrating AI models within enterprisewide systems — that is, of making these models an integral part of the organization ecosystem. Gartner's 2019 AI in the Enterprise Survey points to the fact that privacy, security and the integration of AI models within existing enterprise ecosystems remain among the principal challenges. The integration challenge is bound to become more acute as organizations prepare for the "intelligent composable business" wave.

To firmly establish their competitive differentiation and survive in a business context that is shifting at an increasing pace, CIOs and business leaders need to scale AI systems. Scaling these systems will help them build flexible and resilient — and therefore adaptable — business processes and decision models. They 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 of AI technology poses a new set of challenges. AI-enabled decisions have to be not only accurate but explainable and ethical. AI systems operating with various degrees of autonomy have to be trusted and their risks managed. Efficient AI agents should operate at the edge — at the periphery of traditional computing systems — and constantly adapt to changing conditions.

The shift from prototypes to operational systems, initiated in 2020, will continue in 2021 to bring the AI exploration era to the next stage of production. This will enable sustainable, industrial-grade AI systems within the IT, business and cultural fabric of every organization. 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, and to 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.

AI Techniques and Foundations

In 2021, we will examine the fundamental AI techniques in the AI discipline's toolbox, and provide insight into the architectures and infrastructures necessary to deploy and operationalize them. We will emphasize natural language techniques, which are increasingly important for enterprise systems and solutions. We will also highlight the methodologies and best practices — for AI engineering, for example — necessary to generate tangible outcomes, and how AI techniques reshape existing processes and applications (including composite AI systems).

Questions Your Peers Are Asking

- What is AI and what is not AI, and what techniques and approaches form the AI discipline?
- What are the principles, methodologies and best practices required to capitalize on AI initiatives?
- How will AI techniques reshape my architecture?
- What does it take to get started with AI, and especially with natural language processing (NLP) techniques?
- How should I move AI initiatives (including ML and NLP techniques) from the pilot stage into production?

Recommended Content

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

- What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value
- Survey Analysis: Moving AI Projects From Prototype to Production
- 5 Steps to Practically Implement AI Techniques
- Five Ways Artificial Intelligence and Machine Learning Deliver Business Impacts
- Architecture of Conversational AI Platforms

Planned Research

- A Magic Quadrant on the market for cloud AI developer services.
- Ignition Guides on AI techniques.
- Roadmaps for, and implementation guides on, natural language techniques and solutions.
- Case studies on how to operationalize and scale AI across an enterprise.
- Best practices for architecting, implementing, and scaling conversational agents, systems and experiences.

AI Solutions

In 2021, we will investigate where AI techniques are currently applied and anticipate where they will be implemented in future. We will explore AI solutions embedded in enterprise applications and AI services available as APIs, SDKs and platforms. We will expose how AI can form the foundation of applications, enable innovative solutions and even create disruption that enables differentiated business models. Finally, we will explore how various AI elements can be composed to define ground-breaking decision modeling, thus facilitating the construction of adaptive systems.

Questions Your Peers Are Asking

- Where has AI been implemented most effectively, and for what types of outcome?
- What role should vendors play in solution development?
- What should I buy and what should I build?
- 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.

- Accelerating AI Deployments — Paths of Least Resistance
- Tool: Use Cases to Seize AI Investment Opportunities
- Infographic: Artificial Intelligence Use Case Prism for Digital Commerce
- Improve Decision Making Using Decision Intelligence Models
- Case Study: Enterprise Chatbot Strategy (FiveTrain*)

Planned Research

- Advice on how to use AI techniques for decision support, augmentation and automation.
- A definition of the emerging decision intelligence market, and advice on how to navigate it.
- Case studies showing how leading practitioners solve business problems by embedding AI.
- Examination of the intersections between AI and application and use categories, such as customer service, the Internet of Things and advanced analysis.
- Exploration of the five main ways in which AI and ML deliver business impact.

AI Governance

As AI techniques proliferate within organizations, it becomes critical to develop an AI strategy that addresses the governance of these techniques. Governance strategies must cover issues of transparency, interpretability, ethics, privacy, trusted autonomy and security. Contrary to common belief, AI skills are not in short supply, but organizations should introduce a governance framework to address the discovery, upskilling and sharing of AI competencies. Organizational considerations to orchestrate AI techniques, tools and competencies are also in the AI governance domain.

Questions Your Peers Are Asking

- How should organizations organize and prepare themselves for the adoption of AI?
- What are the governance, responsibility and ethical issues associated with AI initiatives?
- When and how can organizations start developing an AI strategy?
- 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?

Recommended Content

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- AI Security: How to Make AI Trustworthy
- Digital Ethics: Use Facial Recognition Technology Responsibly
- Consolidate Your Chatbot Initiatives Into a Single Enterprise Strategy
- The AI Talent Crisis Is a Myth: Here Is What to Do
- Case Study: Ethical AI With an External Board (Axon)

Planned Research

- Examples of how advanced AI practitioners handle responsible AI (including ethics, bias and transparency).
- Practitioner case studies of how organizations handle AI security.
- Outlines of the new AI roles emerging within organizations as AI becomes more pervasive.
- Advice on how to accelerate the operationalization of AI systems when moving from proofs of concept to minimum viable products.
- Case studies of innovative approaches to AI governance.
- Address change management issues related to AI generated changes.

AI Next

The AI discipline is evolving rapidly, through new techniques, dedicated infrastructures and hardware. Emerging practices and applications require new skills and governance mechanisms. From the emergence of composite AI to generative AI techniques, the emergence of model-based systems and swarm system behavior, 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 in the AI market?
- What will be the long-term impact of AI on organizations, people's lives and society?
- How will the pervasiveness of AI reshape skills and roles in the workplace?
- How will AI enable both incremental and radical innovations?
- What will composite AI and generative AI be used for?

Recommended Content

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

- Hype Cycle for Artificial Intelligence, 2020
- Hype Cycle for Natural Language Technologies, 2020

- AI Development Must Embrace Empathy or Face a Human Uprising
- Cool Vendors in AI Core Technologies
- Cool Vendors in Enterprise AI Governance

Planned Research

- 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.
- Exploration of trends in, and the future of, AI techniques and their potential implementation.
- Case studies of innovative AI-based analytics techniques.
- A case study on human-machine complementarity.

Suggested First Steps

- What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value
- 5 Steps to Practically Implement AI Techniques
- Artificial Intelligence Maturity Model
- The AI Talent Crisis Is a Myth: Here Is What to Do
- Architecture of Conversational AI Platforms

Essential Reading

- Improve Decision Making Using Decision Intelligence Models
- Survey Analysis: Moving AI Projects From Prototype to Production
- 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

Document Revision History

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	Customer experience (CX) and CRM must adapt to rapidly changing organizations, customers and environments. Gartner's research explains how to align internal resources with external customer needs.

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