

What Is Artificial Intelligence (AI)?

Definition, Types, Goals, Challenges, and Trends in 2022

Artificial intelligence imitates human thinking by employing intelligent algorithms built into a dynamic computing environment.



Vijay Kanade AI Researcher

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Artificial intelligence (AI) is defined as the intelligence of a machine or computer that enables it to imitate or mimic human capabilities. This article explains the fundamentals of AI, its various types, goals, key challenges, and the top five AI trends in 2022.

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What Is Artificial Intelligence (AI)?

Artificial intelligence (AI) is the intelligence of a machine or computer that enables it to imitate or mimic human capabilities.

AI uses multiple technologies that equip machines to sense, comprehend, plan, act, and learn with human-like levels of intelligence. Fundamentally, AI systems perceive environments, recognize objects, contribute to decision making, solve complex problems, learn from past experiences, and imitate patterns. These abilities are combined to accomplish tasks like driving a car or recognizing faces to unlock device screens.

The AI landscape spreads across a constellation of technologies such as machine learning, natural language processing, computer vision, and others. Such cutting-edge technologies allow computer systems to understand human language, learn from examples, and make predictions.

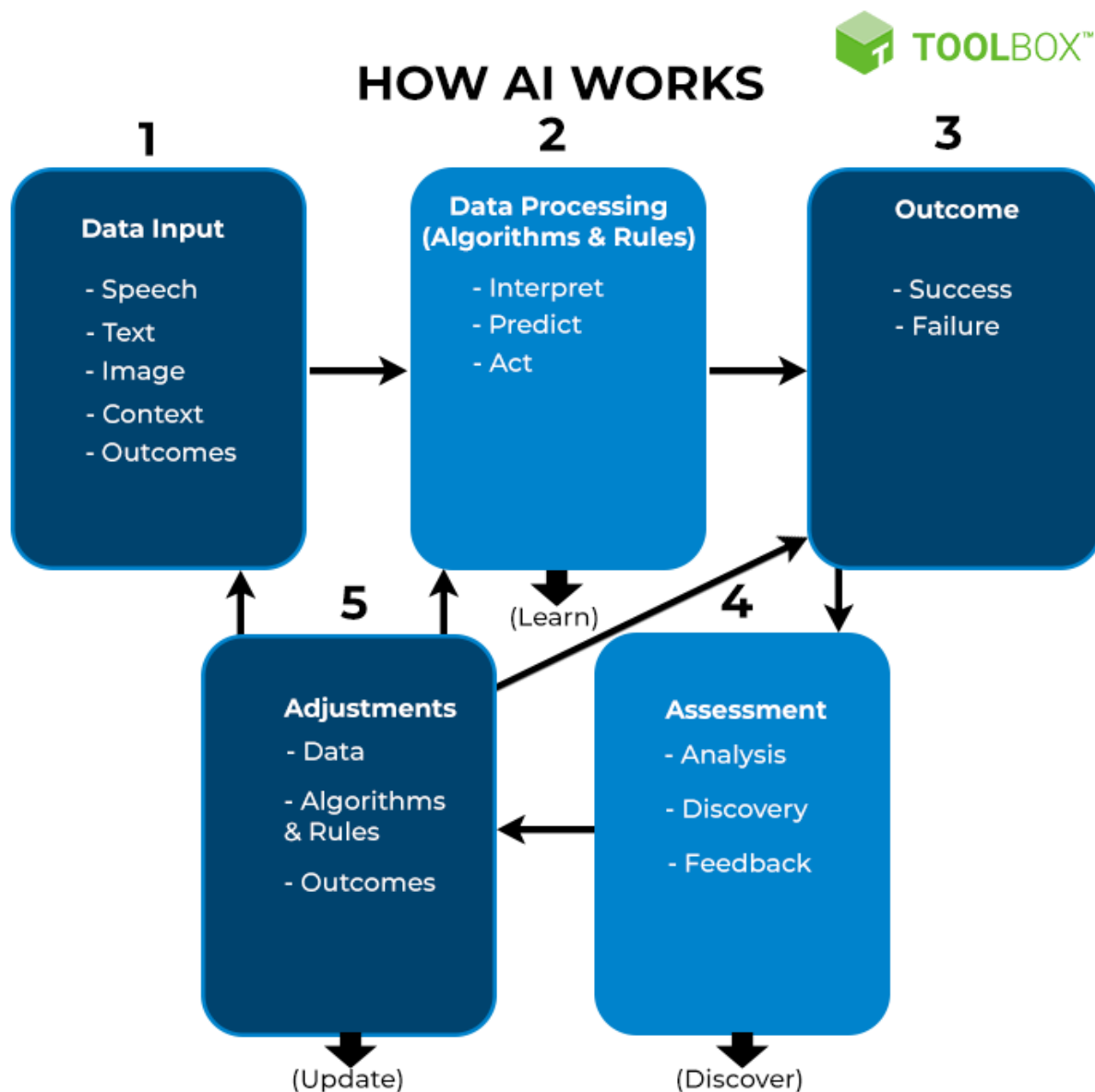
Although each technology is evolving independently, when applied in combination with other technologies, data, analytics, and automation, it can revolutionize businesses and help them achieve their goals, be it optimizing supply chains or enhancing customer service.

How does AI work?

To begin with, an AI system accepts data input in the form of speech, text, image, etc. The system then processes data by applying various



rules and algorithms, interpreting, predicting, and acting on the input data. Upon processing, the system provides an outcome, i.e., success or failure, on data input. The result is then assessed through analysis, discovery, and feedback. Lastly, the system uses its assessments to adjust input data, rules and algorithms, and target outcomes. This loop continues until the desired result is achieved.



How AI Works

See More: [Top 10 AI Companies in 2022](#)

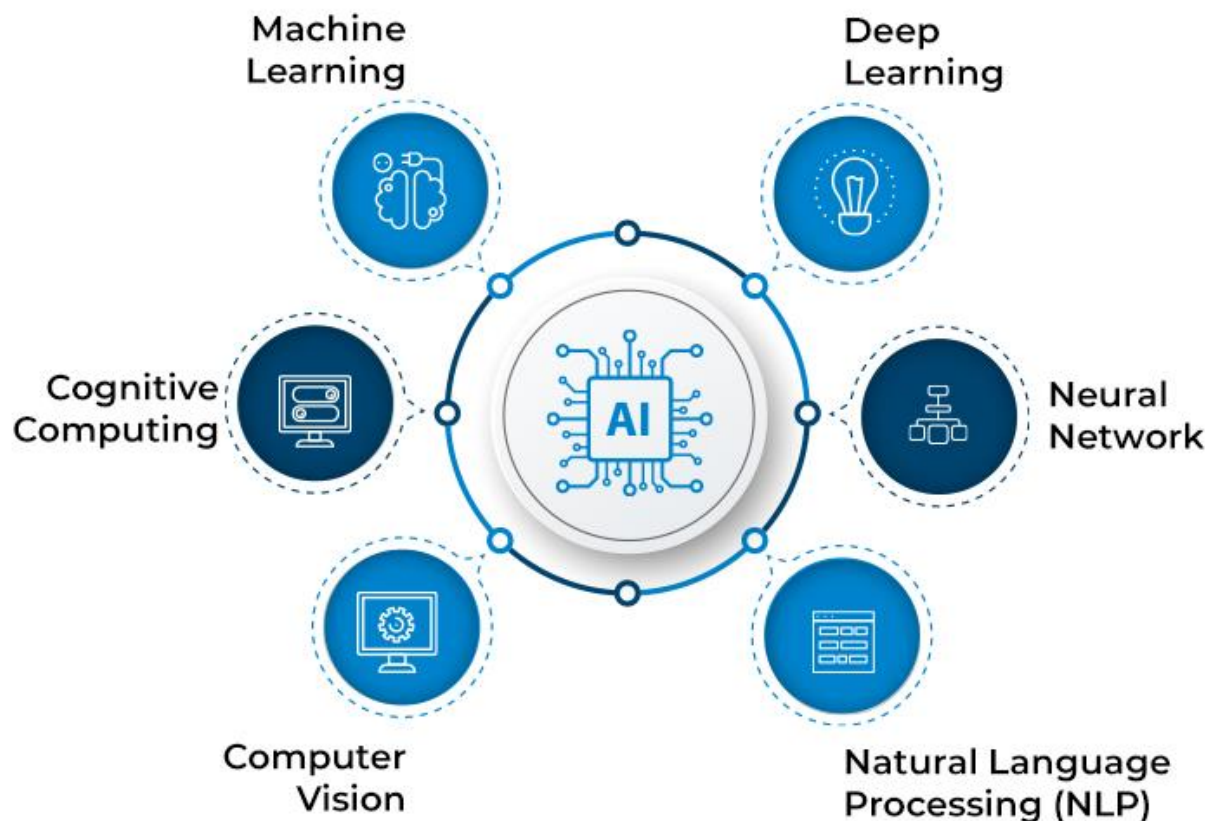


Key components of AI

Intelligence has a broader context that reflects a deeper capability to comprehend the surroundings. However, for it to qualify as AI, all its components need to work in conjunction with each other. Let's understand the key components of AI.



KEY COMPONENTS OF AI



Key Components of AI



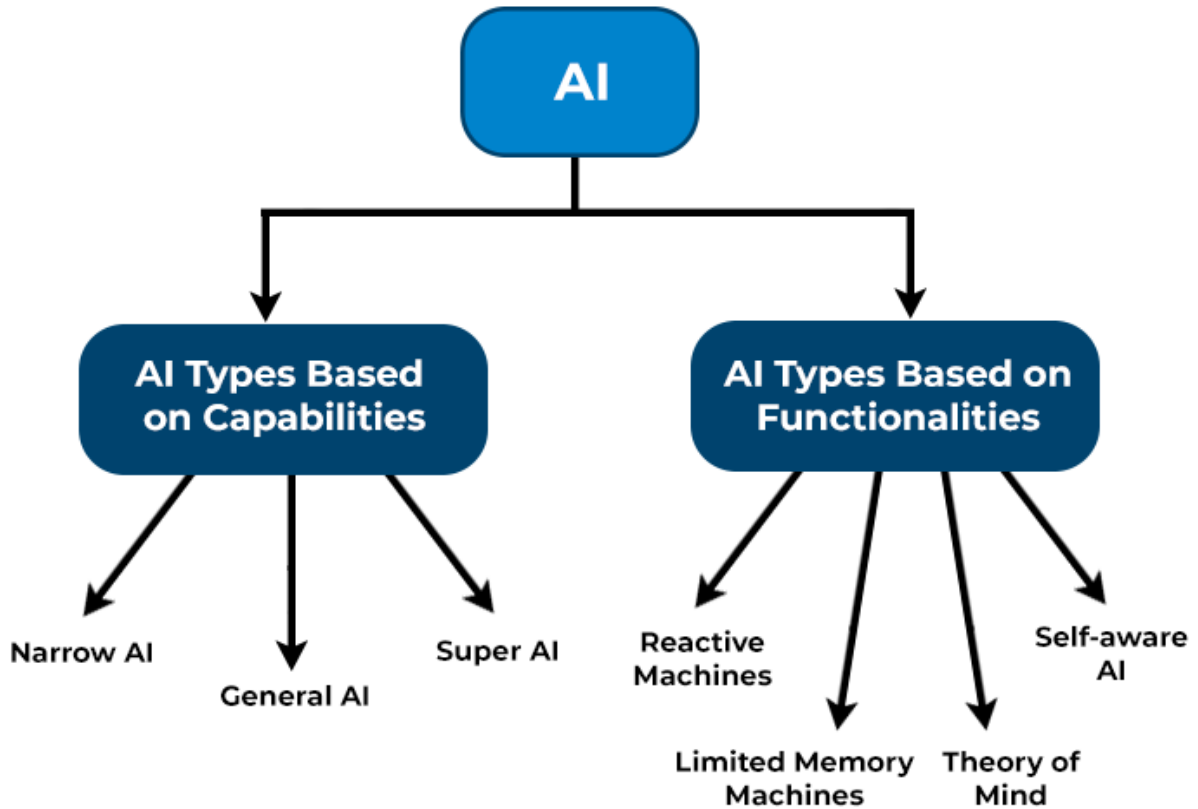
1. **Machine learning:** Machine learning is an AI application that automatically learns and improves from previous sets of experiences without the requirement for explicit programming.
2. **Deep learning:** Deep learning is a subset of ML that learns by processing data with the help of artificial neural networks.
3. Neural network: [Neural networks](#) are computer systems that are loosely modeled on neural connections in the human brain and enable deep learning.
4. Cognitive computing: Cognitive computing aims to recreate the human thought process in a computer model. It seeks to imitate and improve the interaction between humans and machines by understanding human language and the meaning of images.
5. Natural language processing (NLP): NLP is a tool that allows computers to comprehend, recognize, interpret, and produce human language and speech.
6. Computer vision: Computer vision employs deep learning and pattern identification to interpret image content (graphs, tables, PDF pictures, and videos).

Types of AI

Artificial Intelligence can be broadly divided into two categories: AI based on capability and AI based on functionality. Let's understand each type in detail.



TYPES OF AI



Types of AI


Let's first look at the types of AI based on capability.

1. Narrow AI

Narrow AI is a goal-oriented AI trained to perform a specific task. The machine intelligence that we witness all around us today is a form of narrow AI. Examples of narrow AI include Apple's Siri and IBM's Watson supercomputer.

Narrow AI is also referred to as weak AI as it operates within a limited and pre-defined set of parameters, constraints, and contexts. For





example, use cases such as Netflix recommendations, purchase suggestions on ecommerce sites, autonomous cars, and speech & image recognition fall under the narrow AI category.

2. General AI

General AI is an AI version that performs any intellectual task with a human-like efficiency. The objective of general AI is to design a system capable of thinking for itself just like humans do. Currently, general AI is still under research, and efforts are being made to develop machines that have enhanced cognitive capabilities.

3. Super AI

[Super AI](#) is the AI version that surpasses human intelligence and can perform any task better than a human. Capabilities of a machine with super AI include thinking, reasoning, solving a puzzle, making judgments, learning, and communicating on its own. Today, super AI is a hypothetical concept but represents the future of AI.

Now, let's understand the types of AI based on functionality.

4. Reactive machines

Reactive machines are basic AI types that do not store past experiences or memories for future actions. Such systems zero in on current scenarios and react to them based on the best possible action. Popular examples of reactive machines include IBM's Deep Blue system and Google's AlphaGo.

5. Limited memory machines

Limited memory machines can store and use past experiences or data for a short period of time. For example, a self-driving car can store the speeds of vehicles in its vicinity, their respective distances, speed





limits, and other relevant information for it to navigate through the traffic.

6. Theory of mind

Theory of mind refers to the type of AI that can understand human emotions and beliefs and socially interact like humans. This AI type has not yet been developed but is in contention for the future.

7. Self-aware AI

Self-aware AI deals with super-intelligent machines with their consciousness, sentiments, emotions, and beliefs. Such systems are expected to be smarter than a human mind and may outperform us in assigned tasks. Self-aware AI is still a distant reality, but efforts are being made in this direction.

See More: [What Is Super Artificial Intelligence \(AI\)? Definition, Threats, and Trends](#)

Goals of Artificial Intelligence

AI is primarily achieved by reverse-engineering human capabilities and traits and applying them to machines. At its core, AI reads human behavior to develop intelligent machines. Simply put, the foundational goal of AI is to design a technology that enables computer systems to work intelligently yet independently. The essential goals of AI are explained below.



GOALS OF ARTIFICIAL INTELLIGENCE

Develop problem
-solving ability



Allow continuous
learning



Encourage social
Intelligence



Promote
creativity



Enable human-AI
synergy




Goals of Artificial Intelligence

1. Develop problem-solving ability

AI research is focused on developing efficient problem-solving algorithms that can make logical deductions and simulate human reasoning while solving complex puzzles. AI systems offer methods to deal with uncertain situations or handle the incomplete information





conundrum by employing probability theory, such as a stock market prediction system.

The problem-solving ability of AI makes our lives easier as complex tasks can be assigned to reliable AI systems that can aid in simplifying critical jobs.

2. Incorporate knowledge representation

AI research revolves around the idea of knowledge representation and knowledge engineering. It relates to the representation of ‘what is known’ to machines with the ontology for a set of objects, relations, and concepts.

The representation reveals real-world information that a computer uses to solve complex real-life problems, such as diagnosing a medical ailment or interacting with humans in natural language.

Researchers can use the represented information to expand the AI knowledge base and fine-tune and optimize their AI models to meet the desired goals.

3. Facilitate planning

Intelligent agents provide a way to envision the future. AI-driven planning determines a procedural course of action for a system to achieve its goals and optimizes overall performance through predictive analytics, data analysis, forecasting, and optimization models.

With the help of AI, we can make future predictions and ascertain the consequences of our actions. Planning is relevant across robotics, autonomous systems, cognitive assistants, and cybersecurity.



4. Allow continuous learning

Learning is fundamental to AI solutions. Conceptually, learning implies the ability of computer algorithms to improve the knowledge of an AI program through observations and past experiences.

Technically, AI programs process a collection of input-output pairs for a defined function and use the results to predict outcomes for new inputs.

AI primarily uses two learning models—supervised and unsupervised—where the main distinction lies in using labeled datasets. As AI systems learn independently, they require minimal or no human intervention. For example, ML defines an automated learning process.

5. Encourage social Intelligence

Affective computing, also called 'emotion AI,' is the branch of AI that recognizes, interprets, and simulates human experiences, feelings, and emotions. With affective computing, computers can read facial expressions, body language, and voice tones to allow AI systems to interact and socialize at the human level. Thus, research efforts are inclined toward amplifying the social intelligence of machines.

6. Promote creativity

AI promotes creativity and artificial thinking that can help humans accomplish tasks better. AI can churn through vast volumes of data, consider options and alternatives, and develop creative paths or opportunities for us to progress.

It also offers a platform to augment and strengthen creativity, as AI can develop many novel ideas and concepts that can inspire and boost the overall creative process. For example, an AI system can provide multiple interior design options for a 3D-rendered apartment layout.



7. Achieve general intelligence

AI researchers aim to develop machines with [general AI](#) capabilities that combine all the cognitive skills of humans and perform tasks with better proficiency than us. This can boost overall productivity as tasks would be performed with greater efficiency and free humans from risky tasks such as defusing bombs.

8. Promote synergy between humans and AI

One of the critical goals of AI is to develop a synergy between AI and humans to enable them to work together and enhance each other's capabilities rather than depend on just one system.

See More: [What Is General Artificial Intelligence \(AI\)?](#)

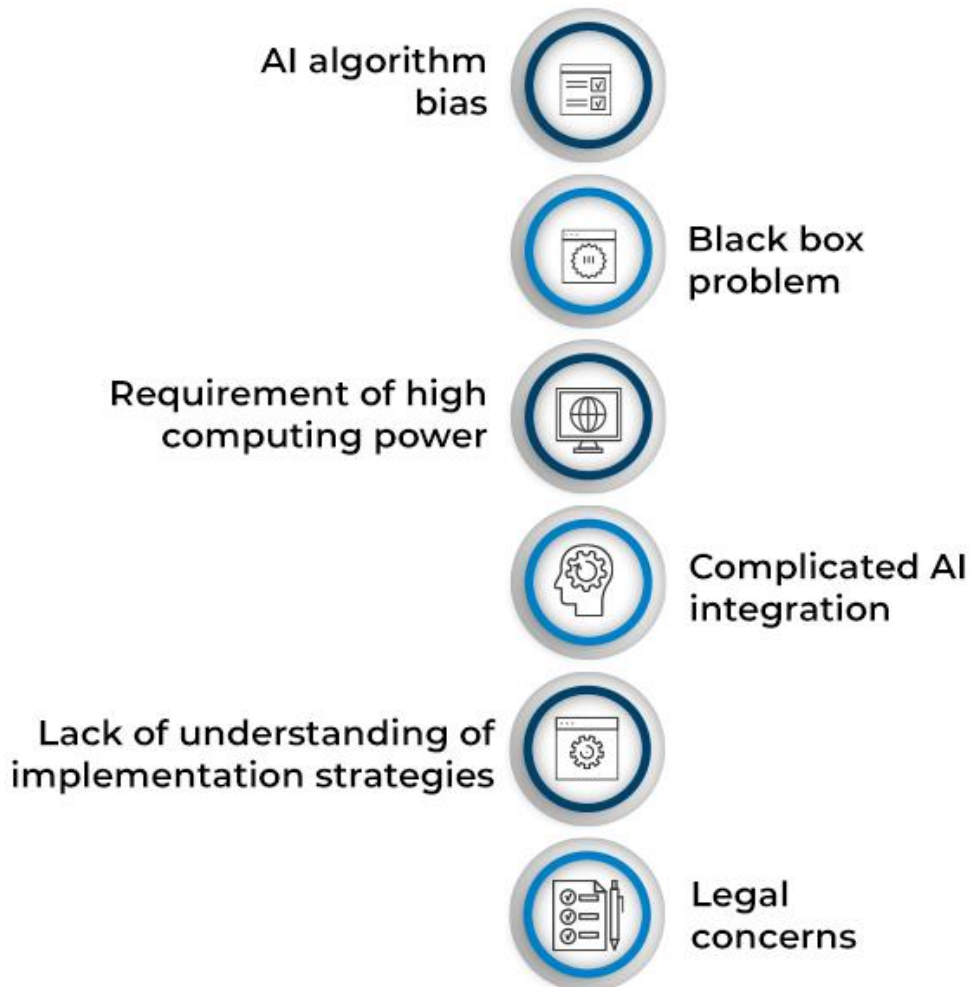
[Definition, Challenges, and Trends](#)

Key Challenges of AI

AI is poised at a juncture where its role in every industry has become almost inevitable, be it healthcare, manufacturing, robotics, autonomous systems, aviation, and plenty others. However, just because AI holds enormous potential, it does not mean that one can ignore the numerous challenges that come along with it. The critical challenges for AI that businesses can recognize and work toward resolving to propel its growth are:



KEY CHALLENGES OF AI




Key Challenges of AI

1. AI algorithm bias

AI systems operate on trained data, implying the quality of an AI system is as good as its data. As we explore the depths of AI, the inevitable bias brought in by the data becomes evident. Bias refers to racial, gender, communal, or ethnic bias. For example, today's





algorithms determine candidates suitable for a job interview or individuals eligible for a loan. If the algorithms making such vital decisions have developed biases over time, it could lead to dreadful, unfair, and unethical consequences.

Hence, it is vital to train AI systems on unbiased data. Companies such as Microsoft and Facebook have already announced the introduction of anti-bias tools that can automatically identify bias in AI algorithms and check unfair AI perspectives.

2. Black box problem


AI algorithms are like black boxes. We have very little understanding of the inner workings of an AI algorithm. For example, we can understand what the prediction is for a predicting system, but we lack the knowledge of how the system arrived at that prediction. This makes AI systems slightly unreliable.

Techniques are being developed to resolve the black box problem, such as ‘local interpretable model-agnostic explanations’ (LIME) models. LIME provides additional information for every eventual prediction, making the algorithm trustworthy since it makes the forecast interpretable.

3. Requirement of high computing power

AI takes up immense computing power to train its models. As [deep learning algorithms](#) become popular, arranging for an extra number of cores and GPUs is essential to ensure that such algorithms work efficiently. This is why AI systems have not been deployed in areas like astronomy, where AI could be used for asteroid tracking.





Moreover, complex algorithms require supercomputers to work at total capacity to manage challenging levels of computing. Today, only a few supercomputers are available globally but seem expensive at the outset. This limits the possibility of AI implementation at higher computing levels.

4. Complicated AI integration


Integrating AI with existing corporate infrastructure is more complicated than adding plugins to websites or amending excel sheets. It is critical to ensure that current programs are compatible with AI requirements and that AI integration does not impact current output negatively. Also, an AI interface must be put in place to ease out AI infrastructure management. That being said, seamless transitioning to AI is slightly challenging for the involved parties.

5. Lack of understanding of implementation strategies

Even though AI is on the verge of transforming every industry, the lack of a clear understanding of its implementation strategies is one of the major AI challenges. Businesses need to identify areas that can benefit from AI, set realistic objectives, and incorporate feedback loops into AI systems to ensure continuous process improvement. Additionally, corporate managers should be well-versed with current AI technologies, trends, offered possibilities, and potential limitations. This will help organizations target specific areas that can benefit from AI implementation.

6. Legal concerns





Organizations need to be wary of the legal concerns of AI. An AI system collecting sensitive data, irrespective of whether it is harmless or not, might very well be violating a state or federal law. Although the data collected by AI may be legal, organizations should consider how such data aggregation can have a negative impact.

In January 2020, the U.S. government set forth draft rules for AI regulation. Some critical legal issues raised relate to civil liability. For example, if a driverless car injures someone in an accident, who is the culprit in such a scenario? Who takes responsibility? Such use cases raise the question of criminal culpability.

See More: [How Is AI Changing the Finance, Healthcare, HR, and Marketing Industries](#)

Top 5 AI Trends in 2022

As we dive deeper into the digital era, AI is emerging as a powerful change catalyst for several businesses. As the AI landscape continues to evolve, new developments in AI reveal more opportunities for businesses. Here are the top five AI trends and developments that will gain momentum in 2022.



TOP 5 AI TRENDS




Top 5 AI Trends in 2022

1. Computer vision set to grow

In the race for AI supremacy, organizations and businesses are set to embrace computer vision technology at an unprecedented scale in 2022. According to a September 2021 survey by Gartner,





organizations investing in AI are expected to make the highest planned investments in computer vision projects in 2022.

Computer vision refers to AI that uses [ML algorithms](#) to replicate human-like vision. The models are trained to identify a pattern in images and classify the objects based on recognition. For example, computer vision can scan inventory in warehouses in the retail sector. Similarly, the technology finds application in several other industries such as healthcare, agriculture & farming, manufacturing, autonomous vehicles, and more.

2. Boost to the autonomous vehicle industry

As more and more car manufacturers continue to invest in autonomous vehicles, the market penetration of driverless cars is expected to rise considerably. According to Statista's Dec 2021 projections, the global autonomous vehicle market is estimated to be valued at around \$146.4 billion in 2022, a substantial rise from \$105.7 billion in 2021.

Self-driving cars enabled with computer vision are already being tested by companies like Tesla, Uber, Google, Ford, GM, Aurora, and Cruise. This trend is only expected to scale in the next 12 months. In August 2021, Tesla unveiled the 'Dojo' chip specifically designed to process large volumes of images collected by computer vision systems embedded in its self-driving cars. Around the same time, Waymo, Google's subsidiary, expanded its self-driving taxi services outside Arizona.



3. Chatbots and virtual assistants to get smarter

Another AI trend that is most talked about in 2022 is smarter chatbots and virtual assistants. This comes from the pandemic, as global industries are now comfortable giving their employees digital workplace experiences. Most chatbots and virtual assistants use deep learning and NLP technologies on the verge of automating routine tasks. Moreover, researchers and developers continue to add features and enhance these bots.


For example, Amelia, a global leader in conversational AI, performs complex conversation tasks with supplemental training provided by developers. Amelia claims to achieve 90% accuracy in identifying customer intent and a customer satisfaction rate of 91%, which is at par with human assistants. Tech companies such as Nuance, IBM, and Amazon Lex are making significant efforts to improve their virtual assistance through smarter bots.

4. Solutions for metaverse

AI agents and virtual assistants will play a key role as the tech world plunges into the concept of the metaverse. Metaverse defines a virtual environment that allows users to interact with digital tools and gives them an immersive experience. In October 2021, Mark Zuckerberg rebranded Facebook as 'Meta' and announced plans to build a metaverse.

Virtual agents are expected to use AI to enable people to connect to the virtual environment. The famous humanoid AI robot Sophia is tokenized for metaverse appearance. Developers claim that tokenized





Sophia, being AI, will interact with users from anywhere, at any time, and across devices and media platforms.

Although metaverse may not reveal itself in a full-fledged version in 2022, the blend of virtual and augmented technologies and AI will continue to stay as a backbone of the metaverse. Metaverse is therefore expected to be one of the major AI research trends in the next 12 months.

5. Improved language modeling

Another AI trend that will continue to feature in 2022 is improved language modeling. Language modeling is a technology that allows computers to understand language semantics, complete sentences via word prediction, and convert text into computer codes.

Generative Pre-trained Transformer 3 (GPT-3), by OpenAI, is a comprehensive language modeling tool available today. It uses 175 billion parameters to process and generate human-like language. Also, OpenAI, in August 2021, released a better version of its tool, Codex, which parses natural language and generates programming code in response. The company is also working on the next version of GPT-3 (i.e., GPT-4), and it is expected that GPT-4 will be 500 times the size of GPT-3 in terms of the parameters that it may use to parse a language.

Apart from the trends listed above, other popular AI trends that could grab attention in 2022 include hyperautomation in modern businesses, the rise of [artificial intelligence as a service \(AIaaS\)](#), AI in cybersecurity, and increased sophistication in AIoT (merger of AI and the internet of things (IoT)).

See More: [AI Job Roles: How to Become a Data Scientist, AI Developer, or Machine Learning Engineer](#)



Takeaway

As AI deepens its roots across every business aspect, enterprises are increasingly relying on it to make critical decisions. From leveraging AI-based innovation, enhancing customer experience, and maximizing profit for enterprises, AI has become a ubiquitous technology. This shift to AI has become possible as AI, ML, deep learning, and neural networks are accessible today, not just for big companies but also for small to medium enterprises.

Moreover, contrary to popular beliefs that AI will replace humans across job roles, the coming years may witness a collaborative association between humans and machines, which will sharpen cognitive skills and abilities and boost overall productivity.

Did this article help you understand AI in detail? Comment below or let us know on [LinkedIn](#), [Twitter](#), or [Facebook](#). We'd love to hear from you!

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