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Factors Driving the AI Explosion

While AI research and development has a long history, the past few years have witnessed an unprecedented surge in advancement and widespread adoption of AI. This article illustrates the pivotal factors that have markedly fuelled this growth and progress in AI throughout the 2000s.

Although there are a few elements that have been crucial in the energising of the surge in AI, it is the convergence of all the factors listed below that have created a perfect storm for the rapid growth and adoption of AI technologies in the 2000s, and set the stage for the continued expansion of AI applications in subsequent years.

- **Increase in Computing power:** The 2000s saw a substantial increase in computing power, driven by improvements in hardware, especially the development of more powerful and efficient processors. This increase in computational capabilities allowed researchers to train larger and more complex AI models.
- **Availability of Large Datasets:** The growth of the internet and digital technologies led to the generation and accumulation of massive datasets. In AI, especially in machine learning and deep learning, having access to vast amounts of data is crucial for training models. The availability of large datasets facilitated the development of more accurate and sophisticated AI algorithms.
- **Advancements in Machine Learning Algorithms**: Researchers made significant progress in developing and refining machine learning algorithms, particularly in the areas of supervised learning, unsupervised learning, and reinforcement learning. Techniques such as support vector machines, decision trees, and neural networks were further explored and improved.
- **Open Source and Collaboration:** The open-source movement gained momentum in the 2000s, leading to increased collaboration among researchers and developers. Shared resources, code repositories, and open-source frameworks (e.g., TensorFlow and PyTorch) made it easier for the AI community to collaborate and build upon each other's work.
- **Rise of Big Tech Companies:** Major technology companies, including Google, Facebook, Microsoft, and others, began investing heavily in AI research and development. These companies had the resources to attract top talent, fund ambitious projects, and deploy AI technologies at scale.
- **Deep Learning Revolution:** Deep learning, a subset of machine learning based on artificial neural networks, experienced a renaissance in the 2000s. Researchers demonstrated the effectiveness of deep learning in solving complex problems, and the development of graphical processing units (GPUs) provided the computational power needed to train deep neural networks efficiently.
- **Success in AI Applications:** Breakthroughs in AI applications, such as natural language processing, image recognition, and speech recognition, demonstrated practical success and encouraged further investment and interest in AI technologies.
- **Recognition of AI's Economic and Strategic Importance:** Governments, industries, and academia recognized the economic and strategic importance of AI. Funding and support for AI research and development increased, contributing to the growth of the field.

The next important step was the realisation of the very high efficiency of GPUs being able to accelerate the calculation of learning algorithms. The process is very iterative and before 2010 it could take weeks to process an entire sample set. The computing power of these GPU cards, capable of more than a thousand billion transactions per second, enabled considerable progress in reducing these times and at a limited financial cost.

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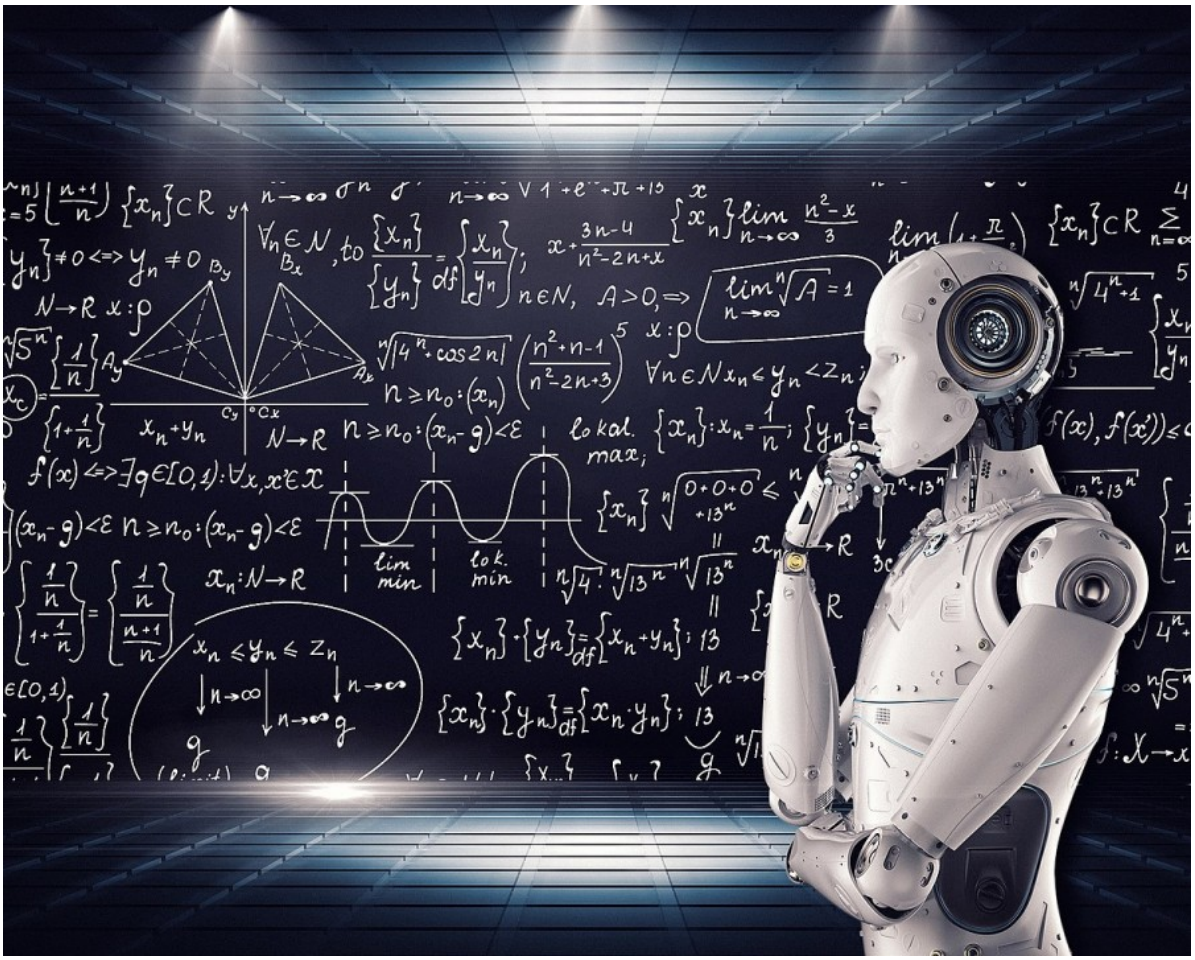
HOW does AI work



AI systems process large amounts of data through algorithms in order to find patterns that will help them understand and replicate human intelligence by predicting future behaviour from an end-user. For example, when using an AI-powered chatbot, the system will work to pre-empt a user's next question by offering information as a real chat agent would. In order to do this, an AI system needs to be built based on three main cognitive skills:

- **Learning**: an AI program needs to be able to gather information that is turned into algorithms.
- **Reasoning**: once the algorithms are set, the AI needs to know how to select the right one for different scenarios.
- **Self-correction**: in any AI machine, the algorithms need to be regularly updated based on new data in order to get a more accurate result.

The primary benefit of using AI is that these systems can potentially complete tasks better and more efficiently than humans. This is especially relevant when it comes to mundane or repetitive tasks, which these machines are able to perform at a higher pace and with a much lower chance of error.

According to the original outline of Arend Hintze, there are four main types of AI.

- **Reactive machines**: In reactive machines, the AI's main goal is to complete a task by reacting to the information presented to it. This type of artificial intelligence system isn't able to store memory of previous data; therefore, it cannot use data in order to fine-tune its responses to a present task. For this reason, reactive AI machines are generally used to perform specific tasks with set outcomes rather than learn from a multitude of different scenarios. IBM's Deep Blue is an example of a reactive machine. Deep Blue was able to look at a chessboard and identify chess pieces and potential moves, but its intelligence was limited to making predictions on moves and taking the most logical next move. The machine wasn't able to learn about its opponent by gathering data about his habits, game-play flaws, or signature chess moves.

- **Limited memory**: A limited memory AI system is able to learn, to a limited extent, from the information it has already seen in order to inform its future actions. The opportunities with limited memory AI systems are a lot greater since they're able to improve their behaviour using the data they're exposed to. In order to create this limited memory, human teams need to train the AI system with a model so that it can learn to analyse new data. The machine needs to be consistently exposed to new data so that when it's faced by a user, it has the existing memory necessary to predict what comes next. An example of limited memory technology is self-driving cars, which are exposed to enough data and models of different driving scenarios so that it can make its own decisions when on the road.

- **Theory of mind**: Theory of mind AI systems have a much deeper psychological core, as they're able to read and interpret human emotions and learn from social intelligence in addition to raw data. This level of AI system has yet to be achieved. However, AI programs falling under the theory of mind category would be able to understand how humans make decisions based on emotions so that it could more accurately predict behaviour. This would allow for more of a symbiotic relationship between man and AI-powered machines.

- **Self-awareness**: The self-aware type of artificial intelligence also does not exist, but might conjure up images from films of robots taking over humanity as we know it. While that scenario is highly unlikely, the notion of AI developing into something with consciousness is the final type of artificial intelligence technology. In addition to being able to understand the psychology and emotions of others as we saw in the theory of mind programs, this type of machine would also be aware of its own existence and place in the world. However, for now, this kind of AI remains the stuff of science fiction as it will take tons of advanced research into fully understanding and reproducing a human-like consciousness.