# Artificial Intelligence Technologies in Business and Engineering

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## Abstract

*Artificial intelligence (AI) is making its way back into the mainstream of corporate technology, this time at the core of business systems which are providing competitive advantage in all sorts of industries, including electronics, manufacturing, marketing, humanresource, financial services software, medicine, entertainment, engineering and communications.*

*Designed to leverage the capabilities of humans rather than replace them, today's AI technology enables an extraordinary array of applications that forge new connections among people, computers, knowledge, and the physical world. Some AI enabled applications are information distribution and retrieval, database mining, product design, manufacturing, inspection, training, user support, surgical planning, resource scheduling, and complex resource management. AI technologies help enterprises reduce latency in making business decisions, minimize fraud and enhance revenue opportunities.*

## Introduction

Business applications utilize the specific technologies mentioned earlier to try and make better sense of potentially enormous variability (for example, unknown patterns/relationships in sales data, customer buying habits, and so on). However, within the corporate world, AI is widely used for complex problem-solving and decision-support techniques in real-time business applications. The business applicability of AI techniques is spread across functions ranging from finance management to forecasting and production.

In the fiercely competitive and dynamic market scenario, decision-making has become fairly complex and latency is inherent in many processes. In addition, the amount of data to be analyzed has increased substantially. AI technologies help enterprises reduce latency in making business decisions, minimize fraud and enhance revenue opportunities.

### AI and is its goal

AI (1) is a field of science and technology based on disciplines such as computer science, biology, psychology, linguistics, mathematics and engineering. The goal of AI is to develop computers that can think, as well as see, hear, walk, talk, and feel. A major thrust of AI is the development of computer functions normally associated with human intelligence, such as reasoning, learning, and problem solving.

Enterprises that utilize AI-enhanced applications are expected to become more diverse, as the needs for the ability to analyze data across multiple variables, fraud detection and customer relationship management emerge as key business drivers to gain competitive advantage.

Artificial Intelligence is a branch of Science which deals with helping machines, finds solutions to complex problems in a more human-like fashion. This generally involves borrowing characteristics from human intelligence, and applying them as algorithms in a computer friendly way. A more or less flexible or efficient approach can be taken depending on the requirements established, which influences how artificial the intelligent behavior appears.

AI is generally associated with Computer Science, but it has many important links with other fields such as Math's, Psychology, Cognition, Biology, Philosophy and management. Among many others. Our ability to combine knowledge from all these fields will ultimately benefit our progress in the quest of creating an intelligent artificial being.

### Emergence of AI in business

Artificial Intelligence (AI) has been used in business applications since the early eighties. As with all technologies, AI initially generated much interest, but failed to live up to the hype. However, with the advent of web-enabled infrastructure and rapid strides made by the AI development community, the application of AI techniques in real-time business applications has picked up substantially in the recent past.

Computers are fundamentally well suited to performing mechanical computations, using fixed programmed rules. This allows artificial machines to perform simple monotonous tasks efficiently and reliably, which humans are ill-suited to. For more complex problems, things get more difficult... Unlike humans, computers have trouble understanding specific situations, and adapting to new situations. Artificial Intelligence aims to improve machine behavior in tackling such complex tasks.

Together with this, much of AI research is allowing us to understand our intelligent behavior. Humans have an interesting approach to problem-solving, based on abstract thought, high-level deliberative reasoning and pattern recognition. Artificial Intelligence can help us understand this process by recreating it, then potentially enabling us to enhance it beyond our current capabilities.

### Attributes of intelligent behavior

AI attempts to duplicate the following capabilities in computer based systems: -
* Think and reason
* Use reason to solve problems
* Learn or understand from experience
* Acquire and apply knowledge
* Exhibit creativity and imagination
* Deal with complex or perplexing situations
* Respond quickly and successfully to new situations
* Recognize the relative importance of elements in a situation
* Handle ambiguous, incomplete or erroneous information

## Applications of AI

The potential applications of Artificial Intelligence are abundant. They stretch from the military for autonomous control and target identification, to the entertainment industry for computer games and robotic pets, to the big establishments dealing with huge amounts of information such as hospitals, banks and insurances, we can also use AI to predict customer behavior and detect trends. AI is a broad discipline that promises to simulate numerous innate human skills such as automatic programming, case-based reasoning, decision-making, expert systems, natural language processing, pattern recognition and speech recognition etc. AI technologies bring more complex data-analysis features to existing applications.

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## Real life applications of ANN [Artificial Neural Networks]

The tasks to which artificial neural networks are applied tend to fall within the following broad categories:
* Function approximation, or regression analysis, including time series prediction and modeling.
* Classification, including pattern and sequence recognition, novelty detection and sequential decision making.
* Data processing, including filtering, clustering, blind source separation and compression.

Application areas include system identification and control (vehicle control, process control), game-playing and decision making (backgammon, chess, racing), pattern recognition (radar systems, face identification, object recognition and more), sequence recognition (gesture, speech, handwritten text recognition), medical diagnosis, financial applications (automated trading systems), data mining (or knowledge discovery in databases, "KDD"), visualization and e-mail spam filtering.

The proven success of Artificial Neural Networks (ANN) and expert systems has helped AI gain widespread adoption in enterprise business applications. In some instances, such as fraud detection, the use of AI has already become the most preferred method. In addition, neural networks have become a well-established technique for pattern recognition, particularly of images, data streams and complex data sources and, in turn, have emerged as a modeling backbone for a majority of data-mining tools available in the market. Some of the key business applications of AI/ANN include fraud detection, cross-selling, customer relationship management analytics, demand prediction, failure prediction, and non-linear control.

A majority of the enterprises adopt horizontal or vertical solutions that embed neural networks such as insurance risk assessment or fraud-detection tools, or data-mining tools that include neural networks (for instance, from SAS, IBM and SPSS) as one of the modeling options.

## Artificial intelligence in manufacturing

As the manufacturing industry becomes increasingly competitive, sophisticated technology has emerged to improve productivity. Artificial Intelligence in manufacturing can be applied to a variety of systems. It can recognize patterns, plus perform time consuming and mentally challenging tasks. artificial Intelligence can optimize your production schedule and production runs. In order for organizations to meet ever increasing customer demands, and to be able to survive in an environment where change is inevitable, it is crucial that they offer more reliable delivery dates and control their costs by analyzing them on a continual basis. For businesses, being capable of delivering high quality goods at low costs and short delivery times is akin to operating in a whirlpool environment like the Devil's Triangle, and this is no easy task for any organization. Managing so that production takes place at the right time, on the right equipment, and using the right tools will minimize any deviations in delivery dates promised to the customer. Utilizing equipment, personnel and tools to their maximal efficiency will no doubt improve any organization's competitive strength. In return, proper utilization of these capabilities will result in lower costs for the organization Optimal scheduling of jobs on equipment, without the use of computer software, is a truly difficult undertaking. Performing planning using the "Deterministic Simulation Method" will provide you with schedules that will indicate job loads per equipment. Even in the case limited to a single piece of equipment, as the number of jobs to schedule on that equipment increases, finding the right solution in the "Possible Solutions Set" becomes next to impossible. And in the real world, the difficulties arising from the large size of the solutions set due to the recipes formed by jobs, equipment and products, and shaped by the technological restrictions, as well as the complexity in finding a close to ideal solution, are readily apparent.

Research and studies are being conducted worldwide on the subject of scheduling. Software vendors working in this area follow developments closely, and they are coming out with new products to better meet demands. "Genetic Algorithms", "Artificial Intelligence", and "Neural Networks" are some of the technologies being used for scheduling.

### Advantages

- View your best product runs and the corresponding settings.
- Increase efficiency and quality by using optimal settings from past production.
- Artificial Intelligence can optimize your schedule beyond normal human capabilities.
- Increase productivity by eliminating downtime due to unpredictable changes in the schedule.

## Artificial Intelligence in Financial services

AI has found a home in financial services and is recognized as a valuable addition to numerous business applications. Sophisticated technologies encompassing neural networks and business rules along with AI-based techniques are yielding positive results in transaction-oriented scenarios for financial services. AI has been widely adopted in such areas of risk management, compliance, and securities trading and monitoring, with an extension into customer relationship management (CRM). Tangible benefits of AI adoption include reduced risk of fraud, increased revenues from existing customers due to newer opportunities, avoidance of fines stemming from non-compliance and averted securities trade exceptions that could result in delayed settlement, if not detected.

Warren Buffet is known as the ultimate investor in this age. So good is he, in fact, that artificial intelligence software developed in Carnegie Mellon that predicts stock movements was named after him by. But can machines really take the place of human traders, much less surpass them? When Deep Blue defeated Chess Grandmaster Kasparov in 1997, AI was propelled into the limelight. Indeed, if a machine can whiz through the intricacies of the ultimate game of strategy, why not beat man in other fields as well – thereby facilitating work, decreasing costs and errors and increasing productivity and quality. This study focuses on applying AI in Finance, particularly in stock trading. In the field of Finance, artificial intelligence has long been used. Some applications of Artificial Intelligence are

- Credit authorization screening
- Mortgage risk assessment
- Project management and bidding strategy
- Financial and economic forecasting
- Risk rating of exchange-traded, fixed income investments
- Detection of regularities in security price movements
- Prediction of default and bankruptcy
- Security/and or Asset Portfolio Management

Artificial intelligence types used in finance include neural networks, fuzzy logic, genetic algorithms, expert systems and intelligent agents. They are often used in combination with each other. When AI first appeared a decade ago, it generated mass media hype but delivered inconsistent results. A number of those who praised its ability were paralyzed in the end. One such case is Fidelity Investments. In this paper, we set the stage by describing how traditional stock trading differs from AI-powered stock trading. We define the various AI systems available and also explore the various solutions available in the market, their IT foundations and how salient they are. Then, we move into how AI systems for stock trading will affect traders, companies and individuals. Benefits, risks and competitive strategy will be defined and real-world examples cited, as grounding for our recommendations in the end. Recommendations include getting management buy-in, implementing the system and managing the whole structure to succeed.

## Artificial Intelligence in Marketing

Advances in artificial intelligence (AI) eventually could turbo-boost customer analytics to give companies speedier insights into individual buying patterns and a host of other consumer habits.

Artificial intelligence functions are made possible by computerized neural networks that simulate the same types of connections that are made in the human brain to generate thought. Currently, the technology is used mostly to analyze data for genetics, pharmaceutical and other scientific research. It's seeing little use in CRM right now, though it has tremendous potential in the future

AI-enhanced analytics programs also provide survival modeling capabilities -- suggesting changes to products based on use. For example, customer patterns are analyzed to learn ways to extend the life of light bulbs or to help decide the correct dosage for medications.

High-tech data mining can give companies a precise view of how particular segments of the customer base react to a product or service and propose changes consistent with those findings. In addition to further exploring customers" buying patterns, analytics could help companies react much more quickly to the marketplace.

### Artificial Intelligence in HR

It is widely believed that the role of managers is becoming a key determinant for enterprises' competitiveness in today's knowledge economy era. Owing to fast development of information technologies (ITs), corporations are employed to enhance the capability of human resource management, which is called human resource information system (HRIS). Recently, due to promising results of artificial neural networks (ANNs) and fuzzy theory in engineering, they have also become candidates for HRIS. The artificial intelligence (AT) field can play a role in this, especially; in assuring that the fuzzy neural network have the characteristics and functions of training, learning, and simulation to make an optimal and accurate judgment according to the human thinking model. The main purposes of the study are to discuss the appointment of managers in enterprises through fuzzy neural network, to construct a new model for evaluation of managerial talent, and accordingly to develop a decision support system in human resource selection.

## Conclusion

It is difficult for business to see general relevance from AI .This is probably one of the reasons for the mpartmentalization of AI

into things like Knowledge Based Systems, Neural Networks, and Genetic Algorithms etc. Some of these separate sub topics have been shown to be very useful in solving certain difficult business and industrial problems and consequently funding bodies influence research directions by encouraging work on these more application based areas. This can have a positive effect for business benefit and has lead to some very useful systems that have found their way into the heart of business activity. Business should not lose sight of where AI could go because there are many potential benefits to current and new businesses of future research. The idea of robotic domestic workers is still farfetched but companies are making progress even here. There is already a Robot Vacuum Cleaner marketed by Electrolux and doubtless improved systems with better functionality will follow.

I would like to close by quoting from Tom Peters, a leading management guru: "When you think you've reached the top, tear down everything and do it all over again. If you don't, your competitor will." To this, I would like to add my own: "If your competitor won't, new investors will enter the market segment that will do the same job better."

## Engineering Domains of AI

AI applications can be grouped under the three major areas of cognitive science, robotics, and natural interfaces.

### Cognitive science

This area of AI is based on research in biology, neurology, psychology, mathematics and many allied disciplines. It focuses on how the human brain works and how humans think and learn. The results of such research in human information processing are basis for the development of a variety of computer-based applications in AI like, development of expert systems and other knowledge-based systems that add a knowledge base and some reasoning capability to information systems.

Also included are adaptive learning systems that can modify their behaviors based on information they acquire as they operate. Fuzzy logic systems can process data that are incomplete or ambiguous, i.e., fuzzy data. Thus, they can solve unstructured problems with incomplete knowledge by developing approximate inferences and answers, as humans do. Neural network software can learn by processing sample problems and their solutions. As neural nets start to recognize patterns, they can begin to program themselves to solve such problems on their own. Genetic algorithm software uses Darwinian (survival of the fittest), randomizing, and other mathematical functions to simulate evolutionary processes that can generate increasingly better solutions to problems. And intelligent agents use expert system and other AI technologies to serve as software surrogates for a variety of end user applications.

## Robotics

AI, engineering, and physiology are the basic disciplines of robotics. This technology produces robot machines with computer intelligence and computer-controlled, human-like physical capabilities. This area thus includes applications designed to give robots the powers of sight, or visual perception; touch, or tactile capabilities; dexterity, or skill in handling and manipulation; locomotion, or the physical ability to move over any terrain; and navigation, or the intelligence to properly find one's way to a destination. Robotics can be widely applied in computer-aided manufacturing (CAM).

## Natural interfaces

The development of natural interfaces is a major area of AI applications and is essential to the natural use of computers by humans. The development of natural languages and speech recognition are major thrusts of this area of AI. Being able to talk to computers and robots in conversational human languages and have them "understand" us as easily as we understand each other is a goal of AI research. Other natural interface research applications include development of multisensory devices that use a variety of body movements to operate computers. This is related to the emerging application of virtual reality. Virtual reality involves using multisensory human-computer interfaces that enable human users to experience computer-simulated objects, spaces, activities, and "worlds" as if they actually exist.

## Conclusion

Indeed, for anyone who schedules, plans, allocates resources, designs new products, uses the Internet, develops software, is responsible for product quality, is an investment professional, heads up IT, uses IT, or operates in any of a score of other common capacities and arenas, new Artificial Intelligent Technologies can provide competitive advantage.

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