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# Artificial Intelligence and Its Applications

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**Abstract: In the future, intelligent machines will replace or enhance human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. Artificial Intelligence is becoming a popular field and it has enhanced the human life in many areas. Artificial intelligence in the last two decades has greatly improved performance of the manufacturing and service systems. Study in the area of artificial intelligence has given rise to the rapidly growing technology known as expert system. Application areas of Artificial Intelligence is having a huge impact on various fields of life as expert system is widely used these days to solve the complex problems in engineering, business, medicine, weather forecasting. The areas employing the technology of Artificial Intelligence have seen an increase in the quality and efficiency.**

**Keywords: Artificial Intelligence, Detection Systems, Neural Networks.**

## I. INTRODUCTION

Artificial intelligence is playing an increasing role in the research of management science and operational research areas. Intelligence is commonly considered as the ability to collect knowledge and reason about knowledge to solve complex problems. In the near Future intelligent machines will replace human capabilities in many areas. Artificial intelligence is the study and developments of intelligent machines and software that can reason, learn, gather knowledge, communicate, manipulate and perceive the objects. It is the study of the computation that makes it possible to perceive reason and act. Artificial intelligence is different from psychology because it emphasis on computation and is different from computer science because of its emphasis on perception, reasoning and action. It makes machines smarter and more useful. It works with the help of artificial neurons (artificial neural network) and scientific theorems (if then statements and logics). AI technologies have matured to the point in offering real practical benefits in many of their applications. Major Artificial Intelligence areas are Expert Systems, Natural Language Processing, Speech Understanding, Robotics and Sensory Systems, Computer Vision and Scene Recognition, Intelligent Computer-
Aided Instruction, Neural Computing. From these Expert System is a rapidly growing technology which is having a huge impact on various fields of life. The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic, Evolutionary Computing, and Hybrid Artificial Intelligence.
Artificial intelligence has the advantages over the natural intelligence as it is more permanent, consistent, less expensive, has the ease of duplication and dissemination, can be documented and can perform certain tasks much faster and better than the human.

**The Turing Test Approach:** The Turing test was proposed Alan Turing (1950) .This test was designed to test that whether a particular machine can think or not. The test involves a human interrogator who interacts with a human and with a machine and has to tell who is human and which one is machine. The computer passes the test if an interrogator after posing some written questions, cannot tell whether the written response is coming from human or from the machine.[2]

## II History of AI

The field of Artificial Intelligence (AI) was originally born and christened at a 1956 workshop organized by John McCarthy at the Dartmouth Summer Research Project on Artificial Intelligence. The goal was to investigate ways in which machines could be made to simulate aspects of intelligence—the essential idea that has continued to drive the field forward. McCarthy is credited with the first use of the term "artificial intelligence" in the proposal he co-authored for the workshop with Marvin Minsky, Nathaniel Rochester, and Claude Shannon.[11] Many of the people who attended soon led significant projects under the banner of AI, including Arthur Samuel, Oliver Selfridge, Ray Solomono, Allen Newell, and Herbert Simon. Although the Dartmouth workshop created a unified identity for the field and a dedicated research community, many of the technical ideas that have come to characterize AI existed much earlier. In the eighteenth century, Thomas Bayes provided a framework for reasoning about the **probability** of events.[12] In the nineteenth century, George Boole showed that **logical reasoning**—dating back to Aristotle—could be performed *systematically* in the same manner as solving a system of equations.13 By the turn of the twentieth century, progress in the experimental sciences had led to the emergence of the field of **statistics**, [14] which enables inferences to be drawn rigorously from data. The idea of physically engineering a machine to execute sequences of instructions, which had captured the imagination of pioneers such as Charles Babbage, had matured by the 1950s, and resulted in the construction of the first **electronic computers**.[15] Primitive **robots**, which could sense and act autonomously, had also been built by that time.[16]

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The most in influential ideas underpinning computer science came from Alan Turing, who proposed a formal model of computing. Turing's classic essay, *Computing Machinery and Intelligence*, [17] imagines the possibility of computers created for simulating intelligence and explores many of the ingredients now associated with AI, including how intelligence might be tested, and how machines might automatically *learn*. Though these ideas inspired AI, Turing did not have access to the computing resources needed to translate his ideas into action. Several focal areas in the quest for AI emerged between the 1950s and the 1970s.[18] Newell and Simon pioneered the foray into **heuristic search**, an efficient procedure for finding solutions in large, combinatorial spaces. In particular, they applied this idea to construct proofs of mathematical theorems, first through their Logic Theorist program, and then through the General Problem Solver.[19] In the area of **computer vision**, early work in character recognition by Selfridge and colleagues[20] laid the basis for more complex applications such as face recognition.[21] By the late sixties, work had also begun on **natural language processing**.[22]"Shakey", a wheeled robot built at SRI International, launched the field of **mobile robotics**. Samuel's Checkers-playing program, which improved itself through self-play, was one of the first working instances of a **machine learning** system.[1] Rosenblatt's *Perceptron*,[24] a computational model based on biological neurons, became the basis for the field of **artificial neural networks**. Feigenbaum and others advocated [25]the case for building **expert systems**—knowledge repositories tailored for specialized domains such as chemistry and medical diagnosis.[26]

Early conceptual progress assumed the existence of a symbolic system that could be reasoned about and built upon. But by the 1980s, despite this promising headway made into different aspects of artificial intelligence, the field still could boast no significant *practical* successes. This gap between theory and practice arose in part from an insufficient emphasis within the AI community on *grounding* systems physically, with direct access to environmental signals and data. There was also an overemphasis on Boolean (True/False) logic, overlooking the need to quantify uncertainty. The field was forced to take cognizance of these shortcomings in the mid-1980s, since interest in AI began to drop, and funding dried up. Nilsson calls this period the "AI winter." A much needed resurgence in the nineties built upon the idea that "Good Old- Fashioned AI"[27]was inadequate as an end-to-end approach to building intelligent systems. Rather, intelligent systems needed to be built from the ground up, at all times *solving* the task at hand, albeit with different degrees of proficiency.[28] Technological progress had also made the task of building systems driven by real-world data more feasible. Cheaper and more reliable hardware for sensing and actuation made robots easier to build. Further, the Internet's capacity for gathering large amounts of data, and the availability of computing power and storage to process that data, enabled statistical techniques that, by design, derive solutions from data. These developments have allowed AI to emerge in the past two decades as a profound influence on our daily lives.

## III AREAS OF ARTIFICIAL INTELLIGENCE

**1** *Problem Solving*

This is the first application area of AI research, the objective of this particular area of research is how to implement the procedures on AI systems to solve the problems like Human Beings.

*2 Game Playing*

Much of early research in state space search was done using common board games such as checkers, chess and 8 puzzle. Most games are played using a well-defined set of rules. This makes it easy to generate the search space and frees the researcher from many of the ambiguities and complexities inherent in less structured problems. The board Configurations used in playing these games are easily represented in computer, requiring none of complex formalisms. For solving large and complex AI problems it requires lots of techniques like Heuristics. We commonly used the term intelligence seems to reside in the heuristics used by Human beings to solve the problems.

*3 Theorem Proving*

Theorem proving is another application area of AI research., i.e. To prove Boolean Algebra theorems as a humans we first try to prove Lemma., i.e it tell us whether the Theorem is having feasible solution or not. If the theorem is having feasible solution we will try to prove it otherwise discard it. In the same way whether the AI system will react to prove Lemma before trying to attempting to prove a theorem, is the focus of this application area of research.

*4 Natural Language understanding*

The main goal of this problem is we can ask the question to the computer in our mother tongue the computer can receive that particular language and the system gave the response with in the same language. The effective use of a Computer has involved the use off a Programming Language of a set of Commands that we must use to Communicate with the Computer. The goal of natural language processing is to enable people and language such as English, rather than in a computer language.
It can be divided in to two sub fields.

*Natural Language Understanding*

Which investigates methods of allowing the Computer to improve instructions given in ordinary English so that Computers can understand people more easily.

 

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*Natural Language Generation:* This aims to have Computers produce ordinary English language so that people can understand Computers more easily.

*5. Perception*

The process of perception is usually involves that the set of operations i.e. Touching, Smelling Listening,Tasting, and Eating. These Perceptual activities incorporation into Intelligent Computer System is concerned with the areas of Natural language Understanding & Processing and Computer Vision mainly. There are two major Challenges in the application area of Perception.

**1. Speech Recognition**

**2. Pattern Recognition**

*Speech Recognition*

The main goal of this problem is how the Computer System can recognize our Speeches. (Next process is to understand those Speeches and process them i.e. Encoding & Decoding i.e. producing the result in the same language.) It's one is very difficult; Speech Reorganization can be described in two ways.

*1. Discrete Speech Recognition*

Means People can interact with the Computer in their mother tongue. In such interaction whether they can insert time gap in between the two words or two sentences (In this type of Speech Reorganization the computer takes some time for searching the database).

**2.** *Continuous Speech Recognition*

Means when we interact with the computer in our mother tongue we cannot insert the time gap in between the two words or sentences , i.e. we can talk continuously with the Computer (For this purpose we can increase speed of the computer).[3]

*¨Pattern Recognition*

In Pattern Recognition the computer can identify the real world objects with the help of "Camera". It's one is also very difficult, because

- To identify the regular shape objects, we can see that object from any angle; we can imagine the actual shape of the object (means to picturise which part is light fallen) through this we can identify the total structure of that particular object.

-To identify the irregular shape things, we can see that particular thing from any angle; through this we cannot imagine the actual structure. With help of that we can attach the Camera to the computer and picturise certain part of the light fallen image with the help of that whether the AI system can recognize the actual structure of the image or not? It is somewhat difficult compare to the regular shape things, till now the research is going on. This is related the application area of Computer Vision.

A Pattern is a quantitative or structured description of an object or some other entity of interest of an Image. Pattern is found an arrangement of descriptors. Pattern recognition is the research area that studies the operation and design of systems that recognize patterns in data. It encloses the discriminate analysis, feature extraction, error estimation, cluster analysis, and parsing (sometimes called syntactical pattern recognition). Important application areas are image analysis, character recognition, speech recognition and analysis, man and machine diagnostics, person identification and industrial inspection.

*Image Processing*

Where as in pattern reorganization we can catch the image of real world things with the help of Camera. The goal of Image Processing is to identify the relations between the parts of image.[4]

It is a simple task to attach a Camera to a computer so that the computer can receive visual images. People generally use Vision as their primary means of sensing their environment. We generally see more than we here. I.e. how can we provide such perceptual facilities touch, smell, taste, listen, and eat to the AI System? The goal of Computer Vision research is to give computers this powerful facility for understanding their surroundings. Currently, one of the primary uses of Computer Vision is in the area of Robotics.

**In Image Processing the process of image recognition can be broken into the following main stages.**

- **Image capture**
- **Edge detection**
- **Segmentation**
- **Recognition and Analysis.**
    a. **Intermediate Level of processing**
    b. **Low Level Processing**
    c. **High Level Processing**

*Expert system* Expert means the person who had complete knowledge in particular field, i.e. is called as an expert. The main aim of this problem is with the help of experts, to load their tricks on to the compute and make available those tricks to the other users. The expert can solve the problems with in the time.The goal of this problem is how to load the tricks and ideas of an expert on to the computer, till now the research will be going on.

*Computer Vision*

It is a simple task to attach a camera to a computer so that the computer can receive visual images. People generally use vision as their primary means of sensing their environment. We generally see more than we here, feel, smell, or taste.The goal of computer vision research is to give computers this powerful facility for understanding their surroundings. Currently, one of the primary uses of computer vision is in the area of Robotics.

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Robotics

A robot is an electro – mechanical device that can be programmed to perfume manual tasks. The robotics industries association formally defines to move a Robot as a "Programmable multi-functional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of variety of tasks". Not all robotics is considered to be part of AI. A Robot that perform sonly the actions that it is has been pre-programmed to perform is considered to be a "dumb" robot, includes some kind of sensory apparatus, such as a camera , that allows it to respond to changes in its environment , rather than just to follow instructions "mindlessly".

*Intelligent Computer – Assisted Instruction*

Computer - Assisted Instruction (CAI) has been used in bringing the power of the computer to bear on the educational process. Now AI methods are being applied to the development of intelligent computerized "Tutors" that shape their teaching techniques to fit the leaning patterns of individual students.

*Automatic Programming* is the process of telling the computer exactly what we want to do. The goal of automatic programming is to create special programs that act as intelligent "Tools" to assist programmers and expedite each phase of the programming process. The ultimate aim of automatic programming is a computer system that could develop programs by itself, in response to an ins according with the specifications of the program developer.

*Planning and Decision Support system*

When we have a goal, either we rely on luck and providence to achieve that goal or we design and implement a plan. The realization of a complex goal may require to construction of a formal and detailed plan. Intelligent planning programs are designed to provide active assistance in the planning process and are expected to the particularly helpful to managers with decision making responsibilities.

*Engineering Design & Camical Analysis*

Artificial Intelligence applications are playing major role in Engineering Drawings & Camical analysis to design expert drawings and Camical synthesis.

The research that fuels the AI revolution has also seen rapid changes. Foremost among them is the maturation of machine learning, stimulated in part by the rise of the digital economy, which both provides and leverages large amounts of data. Other factors include the rise of cloud computing resources and consumer demand for widespread access to services such as speech recognition and navigation support. Machine learning has been propelled dramatically forward by impressive empirical successes of artificial neural networks, which can now be trained with huge data sets and large-scale computing. This approach has been come to be known as "deep learning." The leap in the performance of information processing algorithms has been accompanied by significant progress in hardware technology for basic operations such as sensing, perception, and object recognition. New platforms and markets for data-driven products, and the economic incentives to find new products and markets, have also stimulated research advances. Now, as it becomes a central force in society, the field of AI is shifting toward building intelligent systems that can collaborate effectively with people, and that are more generally *human-aware*, including creative ways to develop interactive and scalable ways for people to teach robots. These trends drive the currently "hot" areas of AI research into both fundamental methods and application areas:

**Large-scale machine learning** concerns the design of learning algorithms, as well as scaling existing algorithms, to work with extremely large data sets.

**Deep learning**, a class of learning procedures, has facilitated object recognition in images, video labeling, and activity recognition, and is making significant inroads into other areas of perception, such as audio, speech, and natural language processing.

**Reinforcement learning** is a framework that shifts the focus of machine learning from pattern recognition to experience-driven sequential decision-making. It promises to carry AI applications forward toward taking actions in the real world. While largely connected to academia over the past several decades, it is now seeing some practical, real-world successes.

**Natural Language Processing**, often coupled with automatic speech recognition, is quickly becoming a commodity for widely spoken languages with large data sets. Research is now shifting to develop refined and capable systems that are able to interact with people through dialog, not just react to stylized requests. Great strides have also been made in machine translation among different languages, with more real-time person-to-person exchanges on the near horizon.

**Collaborative systems** research investigates models and algorithms to help develop autonomous systems that can work collaboratively with other systems and with humans.

**Crowdsourcing and human computation** research investigates methods to augment computer systems by making automated calls to human expertise to solve problems that computers alone cannot solve well.

**Algorithmic game theory and computational social choice** draw attention to the economic and social computing dimensions of AI, such as how systems can handle potentially misaligned incentives, including self-interested

 

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human participants or firms and the automated AI-based agents representing them

**Internet of Things (IoT)** research is devoted to the idea that a wide array of devices, including appliances, vehicles, buildings, and cameras, can be interconnected to collect and share their abundant sensory information to use for intelligent purposes.

IV. AI APPLICATION IN DAILY LIFE

## A. AI as personal assistant

Artificial intelligence (AI) might seem like the realm of science fiction, but you might be surprised to find out that you're already using it. AI has a huge effect on your life, whether you're aware of it or not, and its influence is likely to grow in the coming years. Here are 10 examples of artificial intelligence that you're already using every day.Siri, Google Now, andCortana are all intelligent digital personal assistants on various platforms (iOS, Android, and Windows Mobile). In short, they help find useful information when you ask for it using your voice; you can say "Where's the nearest Chinese restaurant?", "What's on my schedule today?", "Remind me to call Jerry at eight o'clock," and the assistant will respond by finding information, relaying information from your phone, or sending commands to other apps.

AI is important in these apps, as they collect information on your requests and use that information to better recognize your speech and serve you results that are tailored to your preferences. Microsoft says that Cortana "continually learns about its user" and that it will eventually develop the ability to anticipate users' needs. Virtual personal assistants process a huge amount of data from a variety of sources to learn about users and be more effective in helping them organize and track their information.

## B. Current applications using AI

**Video Games**

One of the instances of AI that most people are probably familiar with, video game AI has been used for a very long time—since the very first video games, in fact. But the complexity and effectiveness of that AI has increased exponentially over the past several decades, resulting in video game characters that learn your behaviors, respond to stimuli, and react in unpredictable ways. 2014's*Middle Earth:Shadow of Mordor* is especially notable for the individual personalities given to each non-player character, their memories of past interaction, and their variable objectives.First-person shooters like *Far Cry* and *Call of Duty* also make significant use of AI, with enemies that can analyze their environments to find objects or actions that might be beneficial to their survival; they'll take cover, investigate sounds, use flanking maneuvers, and communicate with other AIs to increase their chances of victory. As far as AI goes, video games are somewhat simplistic, but because of the industry's huge market, a great deal of effort and money are invested every year in perfecting this type of AI.

**Inside PostSmart Cars**

You probably haven't seen someone reading the newspaper while driving to work yet, but self-driving cars are moving closer and closer to reality; Google's self-driving car project and Tesla's "autopilot" feature are two examples that have been in the news lately. Earlier this year, the *Washington Post* reported on an algorithm developed by Google that could potentially let self-driving cars learn to drive in the same way that humans do: through experience. The AI detailed in this article learned to play simple video games, and Google will be testing that same intelligence in driving games before moving onto the road. The idea is that, eventually, the car will be able to "look" at the road ahead of it and make decisions based on what it sees, helping it learn in the process. While Tesla's autopilot feature isn't quite this advanced, it's already being used on the road, indicating that these technologies are certainly on their way in.

**Purchase Prediction**

This can be used in a wide variety of ways, whether it's sending you coupons, offering you discounts, targeting advertisements, or stocking warehouses that are close to your home with products that you're likely to buy. As you can imagine, this is a rather controversial use of AI, and it makes many people nervous about potential privacy violations from the use of predictive analytics.

**Fraud Detection**

Have you ever gotten an email or a letter asking you if you made a specific purchase on your credit card? Many banks send these types of communications if they think there's a chance that fraud may have been committed on your account, and want to make sure that you approve the purchase before sending money over to another company. Artificial intelligence is often the technology deployed to monitor for this type of fraud.In many cases, computers are given a very large sample of fraudulent and non-fraudulent purchases and asked to learn to look for signs that a transaction falls into one category or another. After enough training, the system will be able to spot a fraudulent transaction based on the signs and indications that it learned through the training exercise.

**Online Customer Support**

Many websites now offer customers the opportunity to chat with a customer support representative while they're browsing—but not every site actually has a live person on the other end of the line. In many cases, you're talking to a rudimentary AI. Many of these chat support bots amount to

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little more than automated responders, but some of them are actually able to extract knowledge from the website and present it to customers when they ask for it.

**News Generation**

Did you know that artificial intelligence programs can write news stories? According to *Wired*, the AP, Fox, and Yahoo! all use AI to write simple stories like financial summaries, sports recaps, and fantasy sports reports. AI isn't writing in-depth investigative articles, but it has no problem with very simple articles that don't require a lot of synthesis. Automated Insights, the company behind theWordsmith software, says that e-commerce, financial services, real estate, and other "data-driven" industries are already benefitting from the app.

**Security Surveillance**

A single person monitoring a number of video cameras isn't a very secure system; people get bored easily, and keeping track of multiple monitors can be difficult even in the best of circumstances. Which is why training computers to monitor those cameras makes a great deal of sense. With supervised training exercises, security algorithms can take input from security cameras and determine whether there may be a threat—if it "sees" a warning sign, it will alert human security officers.

**Music and Movie Recommendation Services**

While they're rather simple when compared to other AI systems,apps like Spotify, Pandora, and Netflix accomplish a useful task: recommending music and movies based on the interests you've expressed and judgments you've made in the past. By monitoring the choices you make and inserting them into a learning algorithm, these apps make recommendations that you're likely to be interested in.This is the basis of many recommendation services; and while it's not futuristically advanced, it does do a pretty good job of helping you discover new music and movies.

**Smart Home Devices**

Many smart home devices now include the ability to learn your behavior patterns and help you save money by adjusting the settings on your thermostat or other appliances in an effort to increase convenience and save energy. For example, turning your oven on when you leave work instead of waiting to get home is a very convenient ability. A thermostat that knows when you're home and adjusts the temperature accordingly can help you save money by not heating the house when you're out. Lighting is another place where you might see basic artificial intelligence; by setting defaults and preferences, the lights around your house (both inside and outside) might adjust based on where you are and what you're doing; dimmer for watching TV, brighter for cooking, and somewhere in the middle for eating, for example. The uses of AI in smart homes are limited only by our imagination.

**Automated functionality in highways**

| Context | Automated Functionality | Release Date |
|---|---|---|
| Parking | Intelligent Parking Assist System | Since 2003[5] |
| Parking | Summon | Since 2016[6] |
| Arterial & Highway | Lane departure system | Since 2004 in North America[7] |
| Arterial & Highway | Adaptive cruise control | Since 2005 in North America[8] |
| Highway | Blind spot monitoring | 2007[9] |
| Highway | Lane changing | 2015[10] |

## V. CONCLUSION:

Cities already have begun to deploy AI technologies for public safety and security.

By 2030, most of the cities will rely heavily upon them. These include cameras for surveillance that can detect anomalies pointing to a possible crime, drones, and predictive policing applications. As with most issues, there are benefits and risks. Gaining public trust is crucial. While there are legitimate concerns that policing that incorporates AI may become overbearing or pervasive in some contexts, the opposite is also possible. AI may enable policing to become more targeted and used only when needed. And assuming careful deployment, AI may also help remove some of the bias inherent in human decision-making**.** One of the more successful uses of AI analytics is in detecting white collar crime, such as credit card fraud.Cyber security (including spam) is a widely shared concern, and machine learning is making an impact. AI tools may also prove useful in helping police manage crime scenes or search and rescue events by helping commanders prioritize tasks and allocate resources, though these tools are not yet ready for automating such activities ,it is already started with smartphone, cars, bank, and house all use artificial intelligence on a daily basis; sometimes it's obvious what its' doing, like when you ask Siri to get you directions to the nearest gas station. Sometimes it's less obvious, like when you make an abnormal purchase on your credit card and *don't* get a fraud alert from your bank. AI is everywhere, and it's making a huge difference in our lives every day.

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