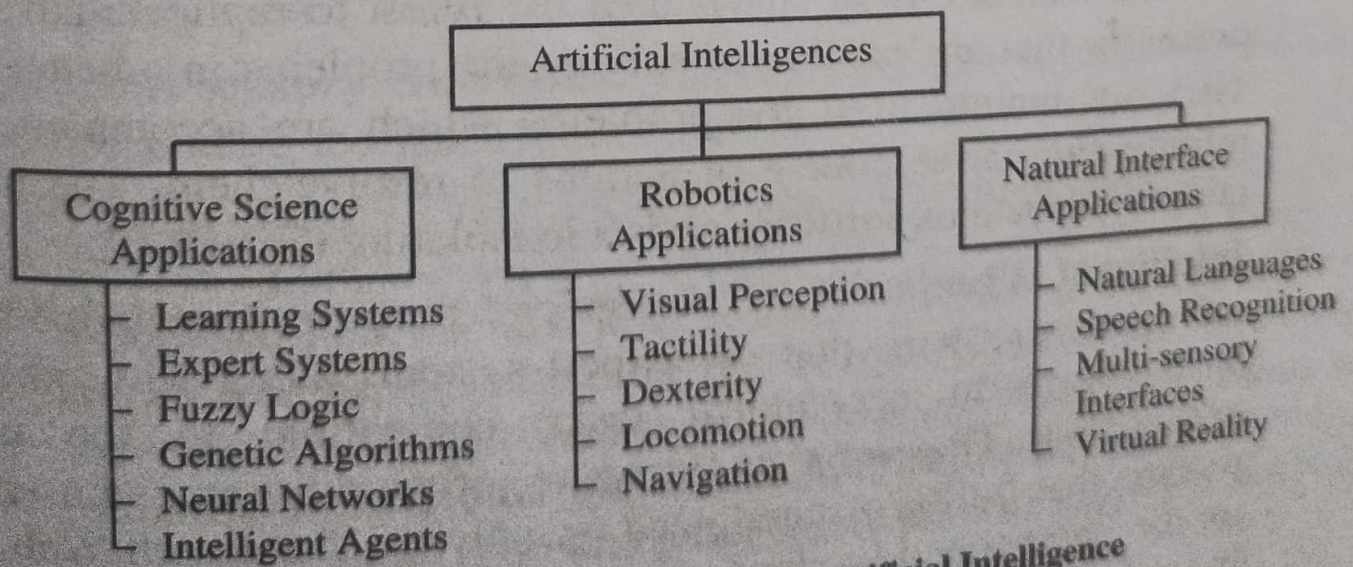


## 2.2.6. Applications/Domain of Artificial Intelligence

Figure 2.2 illustrates the major domains of AI research and development.



**Figure 2.2: Applications of Artificial Intelligence**



AI applications can be grouped under three major areas: **cognitive science**, **robotics**, and **natural interfaces**, though these classifications do overlap each other, and other classifications can be used.

1) **Cognitive Science Applications:** This branch of AI is concerned with incorporating knowledge from varied disciplines, such as biology, neurology, psychology, mathematics, and several linked disciplines. It is typically concerned with studying the functioning of human brain. The human information processing research is conducted to learn how humans think and learn. The various applications in the cognitive science area of AI are:

- i) **Learning Systems:** The learning gathered during functioning is used by the adaptive learning systems to incorporate changes in their own behavior.
- ii) **Expert Systems:** This knowledge-based system is basically involved in providing information through a reasoning and analysis ability. The role of a knowledge engineer forms the crux of the system. Their job is to interview experts in a subject area and embody the knowledge so acquired in a computer program for carrying out some task.
- iii) **Fuzzy Logic:** This is an area in which AI is close to the human level. Fuzzy logic is an approach of dealing with imperfect data in a meticulous way. It is concerned with processing uncertain data and using the results/inferences to solve many unstructured issues to a great extent if not completely.
- iv) **Neural Networks:** This involves the art of learning pattern recognition by processing sample problems and their solutions. It looks for patterns in the set of examples, and learns from those examples by associating the input patterns with the correct answer. It is used mainly for credit assessment and fraud detection.
- v) **Genetic Algorithms:** This is a technique for getting problems to solve a task by randomizing and other mathematics functions. It uses Darwinian law of survival of the fittest to replicate advanced processes that are capable of solving the problems in a better way. They are mainly used for problems which are accompanied by infinite alternative course of actions to resolve them. The use of genetic algorithms software assists in isolating the best fit.
- vi) **Intelligent Agents:** These are special purpose knowledge-based information systems that use expert systems along with other AI technologies to accomplish tasks compatible to the user's expectations. They serve as surrogate software for an end user or a process that fulfills a stated need or activity. The search Web sites on the Internet and intranets exemplify the use of intelligent agent in furthering the e-commerce revolution.



- 2) **Robotics:** Based on the disciplines of engineering, AI, and physiology, robotics is concerned with building robot machines with physical capabilities akin to human beings, which are controlled by computers. The functioning of these machines is supplemented by providing computer intelligence. These machine vision inspection systems are used in Computer Aided Manufacturing (CAM), where they are involved with gauging, guiding, identifying, and inspecting products. They provide the users with a competitive edge by performing the tasks efficiently in a lesser time frame as compared to humans. The robots are capable with certain abilities, as listed below, to assist their role performance:
- i) **Visual Perception:** The powers of sight.
  - ii) **Tactility:** Power of touch or corporeal assessment.
  - iii) **Dexterity:** Agility and adroitness in handling and manipulating the tasks with both hands.
  - iv) **Locomotion:** Mobility to work in any territory irrespective of the environment
  - v) **Navigation:** The power to find directions to reach the final objective in time.
- 3) **Natural Interfaces:** A breakthrough in the AI intelligence, the development of natural interfaces is a prerequisite to the optimal use of computers by human beings. It incorporates:
- i) **Natural Languages:** The computer programming languages are essentially concerned with being able to communicate with computers and robots in conversational human languages. This ensures a platform for crystal clear communication between computer or robots and the user, and facilitates understanding of instructions given by the user. It increases the responsiveness of the machine.
  - ii) **Speech Recognition:** Essentially motivated by success in development and use of natural languages, voice recognition and response technology has evolved, which permits the user to substitute the conventional use of keyboard and mouse to input data by merely using their speech.
  - iii) **Multi-sensory Interfaces:** These devices use diverse human body movements to maneuver computers.
  - iv) **Virtual Reality (VR):** Uses a range of multi-sensory input/output devices (human-computer interfaces) that enable the user to experience and interact with computer-simulated objects, entities, and environments as if they actually exist. The most extensive use of VR is in the field of computer-aided design. Other applications are in the field of medical diagnostics and treatment, flight simulation for training pilots and astronauts, game playing, scientific analysis, engineering, and human resource training and recreation.

**Note:** Expert systems are just one of many important AI applications.