Q.2   a. What is the basic idea behind turing test? Explain how it is done. What is the interpretation?
Answer:
Turing held that in future computers can be programmed to acquire abilities rivaling human intelligence. As part of his argument Turing put forward the idea of an 'imitation game', in which a human being and a computer would be interrogated under conditions where the interrogator would not know which was which, the communication being entirely by textual messages. Turing argued that if the interrogator could not distinguish them by questioning, then it would be unreasonable not to call the computer intelligent. Turing's 'imitation game' is now usually called 'the Turing test' for intelligence.

Turing Test

Consider the following setting. There are two rooms, A and B. One of the rooms contains a computer. The other contains a human. The interrogator is outside and does not know which one is a computer. He can ask questions through a teletype and receives answers from both A and B. The interrogator needs to identify whether A or B are humans. To pass the Turing test, the machine has to fool the interrogator into believing that it is human.

        b. Write six tasks where AI systems have been able to achieve success or limited success. What can AI systems not do yet? List any four.
Answer:
 Today's AI systems have been able to achieve limited success in some of these tasks.
 • In Computer vision, the systems are capable of face recognition
 • In Robotics, we have been able to make vehicles that are mostly autonomous.
 • In Natural language processing, we have systems that are capable of simple machine translation.
 • Today's Expert systems can carry out medical diagnosis in a narrow domain
 • Speech understanding systems are capable of recognizing several thousand words continuous speech
 • Planning and scheduling systems had been employed in scheduling experiments with the Hubble Telescope.
 • The Learning systems are capable of doing text categorization into about a 1000 topics
 • In Games, AI systems can play at the Grand Master level in chess (world champion), checkers, etc.

 What can AI systems NOT do yet?
 • Understand natural language robustly (e.g., read and understand articles in a newspaper)
 • Surf the web
 • Interpret an arbitrary visual scene
 • Learn a natural language
 • Construct plans in dynamic real-time domains
 • Exhibit true autonomy and intelligence

Q.4   a. Briefly describe the procedure used for knowledge Acquisition.
Answer: Page Number 53 of Text Book

   b. What is the object of a Knowledge Representation? What are the four categories of knowledge representation? Explain.
Answer: Page Number 53 of Text Book

Q.6 a. Explain Hill Climbing search technique. How is it different from A* search technique?
Answer: Page Number 131 of Text Book

Q.7 b. Explain inference mechanism in rule-based Expert System with the help of an example.
Answer:
 Three steps are as follows:
 1. *Match* the premise patterns of the rules against elements in the working memory.
 Generally the rules will be domain knowledge built into the system, and the working memory will contain the case based facts entered into the system, plus any new facts that have been derived from them.
 2. If there is more than one rule that can be applied, use a ***conflict resolution*** strategy to choose one to apply. Stop if no further rules are applicable.
 3. *Activate* the chosen rule, which generally means adding/deleting an item to/from working memory. Stop if a terminating condition is reached, or return to step 1.

   c. Discuss the following learning situations of Artificial Neural Networks:
      Supervised and Unsupervised Learning.
Answer:
 Supervised learning or Associative learning in which the network is trained by providing it with input and matching output patterns. These input-output pairs can be provided by an external teacher, or by the system which contains the neural network (self-supervised).
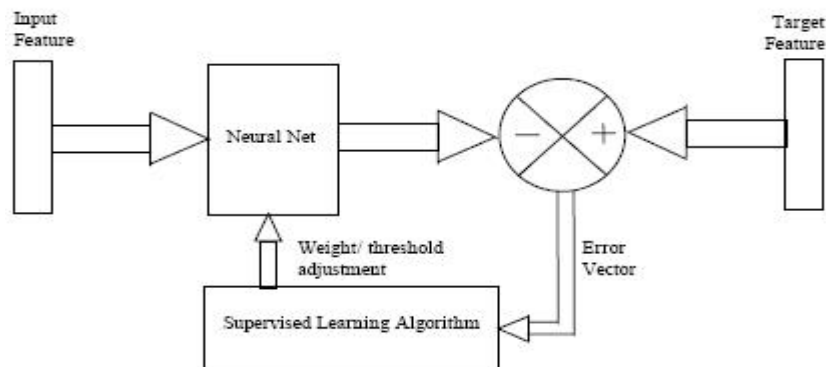
- **Unsupervised learning** or Self-organisation in which an (output) unit is trained to respond to clusters of pattern within the input. In this paradigm the system is supposed to discover statistically salient features of the input population. Unlike the supervised learning paradigm, there is no a priori set of categories into which the patterns are to be classified; rather the system must develop its own representation of the input stimuli.

- **Reinforcement Learning** This type of learning may be considered as an intermediate form of the above two types of learning. Here the learning machine does some action on the environment and gets a feedback response from the environment. The learning system grades its action good (rewarding) or bad (punishable) based on the environmental response and accordingly adjusts its parameters. Generally, parameter adjustment is continued until an equilibrium state occurs, following which there will be no more changes in its parameters. The selforganizing neural learning may be categorized under this type of learning.

Q.8 a. Discuss advantages and disadvantages of Neural networks.
Answer:
 Advantages:

- A neural network can perform tasks that a linear program can not.
- When an element of the neural network fails, it can continue without any problem by their parallel nature.
- A neural network learns and does not need to be reprogrammed.
- It can be implemented in any application.
- It can be implemented without any problem.
    Disadvantages:

- The neural network needs training to operate.
- The architecture of a neural network is different from the architecture of microprocessors therefore needs to be emulated.
- Requires high processing time for large neural networks.

 b. Explain perceptron training algorithm. Give an example also.
Answer: Page Number 228 of Text Book

Q.9 Write notes on the following with respect to use of Artificial Intelligence in:
(i) Online Negotiation
(ii) Online Auctions
(iii) Diagnosing and Treating Problems In Industry
Answer:
 (i)
Negotiation takes place when a buyer (i.e., user) likes a product and there is at least some conflict of interest between the buyer and the seller. Negotiation is a process with the goal of intended benefit, in which the buyer and the seller bargain resources such as price, product features, etc. CBR approach is extensively used for some important characteristics/methods to represent a CBR-based negotiation process are: active or passive agent method, single or multiple dimension modification, over- or under-specification of customer demands Active agents explicitly suggest refinements/modifications to customer demands. The customer finally finds a satisfying product or exit after a few iterations. For example, if the customer is looking for a required television set then the system may modify one or more specifications such as

size, color, etc. Passive agents can only provide different methods for the user on how to change his demands. For example, if the product is a television set then the system can only specify the user on what attributes and how they can be changed. Most recently, hybrid agent approaches are developed.

In these approaches, the agent acts as an active agent for user's high priority features and acts as a passive agent for the low priority features. In case of modification in single dimension, it is possible to change only one feature of the product during one negotiation cycle.

With over-specified constraints/demands, it may not be possible to find a suitable product as no single product may satisfy all the demands. For example, if a user is looking for a television set with many constraints such as size, color, manufacturer, model, screen-type etc., then the chance of getting a matching product is less. The demands need to be relaxed eventually. Under-specified demands may cause retrieval of too many products. For example, if a user simply specifies a black color television then hundreds of product specifications may be displayed. In that case, more demands need to be imposed during the course of negotiation

(ii) As of today, there are around 200 online auction sites on the Internet. Most of the online auctions are *common -value auctions*. For example, auctions for cars or computers. Configurable agent techniques are generally used to represent users in online auctions. The agents can be configured, initiated, and monitored from an online interface.

In general, "winner's curse" happens if a bidder has big positive error in his evaluation. If a customer can evaluate the item correctly then he may avoid winner's curse. In order to evaluate the item more correctly, the user needs to find or approximate the market price of the item, because the market price enables the customer to evaluate the item more correctly. User can bid for optimal price of an item if he predicts the item's market value. Information gathered from different auction sites provides useful information on the item's market value.

But it is a difficult task for a user to work with multiple auction sites simultaneously. AI approaches are used to help customers. They are used for information gathering and prediction purposes. These approaches are based on agent technologies. They incorporate a number of bidder agents and a master agent to coordinate them. Different bidder agents are assigned to different auction sites. The agents simultaneously monitor prices of an item at several auction sites and cooperate among themselves, with the help of the master agent, to arrive at an estimated value of the required item. In reality, a user approximates a market price based on price information gathered by the agents.

(iii) Systems that diagnose and treat problems -- whether illnesses in people or problems in hardware and software -- are now in widespread use. Diagnostic systems based on AI technology are being built into photocopiers, computer operating systems, and office automation tools to reduce service calls. Stand-alone units are being used to monitor and control operations in factories and office buildings. AI-based systems assist physicians in many kinds of medical diagnosis, in prescribing treatments, and in monitoring patient responses.

Text Book

Introduction to Artificial Intelligence, Rajendra Akerkar, PHI, 2005