Emergence of Artificial Intelligence: A Review

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Abstract:

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 in the words Artificial Intelligence's scientific goal is to understand intelligence by building computer programs that exhibit intelligent behavior.

This paper presents some back ground and potential of Artificial Intelligence and its implementation in various fields and its history. We discuss issues that have not been studied in detail within the expert systems setting, yet are crucial for developing theoretical methods and computational architectures for automated reasons. The tools that are required to construct expert systems are discussed in detail. We put the foundational ideas in artificial intelligence and important concepts in Search Techniques, Knowledge Representation, Language Understanding, Machine Learning, Neural Computing and such other disciplines.

Keywords-Artificial Intelligence, Expert System, Computer Science, AI Winter.

Introduction:

AI is generally associated with *Computer Science*, but Artificial intelligence is the study of ideas to bring into being machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention. In the simple words the term Artificial Intelligence (AI) mean "the science and engineering of making intelligent machines" that can take decision like a humans. For this we try to combine knowledge from all fields will ultimately benefit our progress in the quest of creating an intelligent artificial being. Each such machine should engage in critical appraisal and selection of differing opinions within itself. Produced by human skill and labor, these machines should conduct themselves in agreement with life, spirit and sensitivity, though in reality, they are imitations.

HISTORY

The birth of artificial intelligence

In the 1940s and 50s, a handful of scientists from a variety of fields (mathematics, psychology, engineering, economics and political science) began to discuss the possibility of creating an artificial brain. The field of artificial intelligence research was founded as an academic discipline in 1956.

1956	The first Dartmouth College summer AI conference is organized by John McCarthy, Marvin Minsky, Nathan Rochester of IBM and Claude Shannon.
1966	Machine Intelligence workshop at Edinburgh – the first of an influential annual series organized by Donald Michie and others.
1974	Ted Shortliffe's PhD dissertation on the MYCIN program (Stanford) demonstrated a very practical rule-based approach to medical diagnoses, even in the presence of uncertainty. While it borrowed from DENDRAL, its own contributions strongly influenced the future of expert system development, especially commercial systems.
1988	Pearl s Probabilistic Reasoning in Intelligent Systems
1997	The Deep Blue chess machine (IBM) beats the world chess champion, Garry Kasparov.
2005	Honda's ASIMO robot, an artificially intelligent humanoid robot, is able to walk as fast as a human, delivering trays to customers in restaurant settings.
2015	Google DeepMind's AlphaGo defeated 3 time European Go champion 2 dan professional Fan Hui by 5 games to 0.

The field of artificial intelligence dawned in the 1950s. Up to 1980s AI development experienced an AI winter due to failure to achieve expectations and lack of governmental funding. During the 1990s and 2000s AI has become very influenced by probability theory and statistics. After the September 11, 2001 attacks, there has been much renewed interest and funding for threat-detection AI systems.

Areas of Artificial Intelligence

Knowledge Representation

Importance of knowledge representation was realized during machine translation effort in early 1950's. Dictionary looks up and word replacement was a tedious job. There was ambiguity and ellipsis problem i.e. many words have different meanings. Therefore having a dictionary used for translation was not enough.

One of the major challenges in this field is that a word can have more than one meaning and this can result in ambiguity.

E.g.: Consider the following sentence
Spirit is strong but flesh is weak.
When an AI system was made to convert this sentence into Russian & then back to English, following output was observed.
Wine is strong but meat is rotten.
Thus we come across two main obstacles. First, it is not easy to take informal knowledge and state it in the formal terms required by logical notation, particularly when the knowledge is less than 100% certain. Second, there is a big difference between being able to solve a problem "in principle" and doing so in practice.
Even problems with just a few dozen facts can exhaust the computational resources of any computer unless it has some guidance as to which reasoning steps to try first.
A problem may or may not have a solution. This is why debugging is one of the most challenging jobs faced by programmers today. As the rule goes, it is impossible to create a program which can predict whether a given program is going to terminate ultimately or not.
Development in this part was that algorithms were written using foundational development of vocabulary and dictionary entries. Limitations of the algorithm were found out. Later Formal Systems were developed which contained axioms, rules, theorems and an orderly form of representation was developed.
For example, Chess is a formal system. We use rules in our everyday lives and these rules accompany facts. Rules are used to construct an efficient expert system having artificial intelligence. Important components of a Formal System are - Backward Chaining i.e. trying to figure out the content by reading the sentence backward and link each word to another, Explanation Generation i.e. generating an explanation of whatever the system has understood, Inference Engine i.e. submitting an inference or replying to the problem.

Reasoning

It is to use the stored information to answer questions and to draw new conclusions. Reasoning means, drawing of conclusion from observations.

Reasoning in AI systems work on three principles namely:
DEDUCTION: Given 2 events 'P' & 'Q', if 'P' is true then 'Q' is also true.
E.g.: If it rains, we can't go for a picnic.
INDUCTION: Induction is a process where in , after studying certain facts , we reach to a conclusion.
E.g.: Socrates is a man; all men are mortal; therefore Socrates is mortal.
ABDUCTION: 'P' implies 'Q', but 'Q' may not always depend on 'P'.
E.g.: If it rains , we can't go for a picnic.
The fact that we are not in a position to go for a picnic does not mean that it is training. There can be other reasons as well.

Learning

The most important requirement for an AI system is that it should learn from its mistakes. The best way of teaching an AI system is by training & testing. Training involves teaching of basic principles involved in doing a job. Testing process is the real test of the knowledge acquired by the system wherein we give certain examples & test the intelligence of the system. Examples can be positive or negative. Negative examples are those which are 'near miss' of the positive examples.

APPLICATIONS

Artificial intelligence has been used in a wide range of fields including medical diagnosis, stock trading, robot control, law, remote sensing, scientific discovery and toys etc.

List of applications

Banks: Banks use artificial intelligence systems to organize operations, invest in stocks, and to manage properties.

• Medical clinic: A medical clinic can use artificial intelligence systems to organize bed schedules, make a staff rotation, and provide medical information.

- Robotics
  - Behavior-based robotics
  - Cognitive
  - Cybernetics
  - Developmental robotics (Epigenetic)
  - Evolutionary robotics

- Pattern recognition
  - Optical character recognition
  - Handwriting recognition
  - Speech recognition
  - Face recognition

CONCLUSION:

Over the next four decades, despite many stumbling blocks, AI has grown from a dozen researchers, to thousands of engineers and specialists; and from programs capable of playing checkers, to systems designed to diagnose disease. As we progress in the development of artificial intelligence, other theories are available in addition to building on what we can do with AI.

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