Artificial Intelligence and its Application as an Integrated Approach

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Abstract
As technology, and, importantly, our understanding of how our minds work, has progressed, our concept of what constitutes AI has changed. Rather than increasingly complex calculations, work in the field of AI concentrated on mimicking human decision making processes and carrying out tasks in ever more human ways.
AI devices, which are designed to act very intelligently are often categorized into one of two fundamental groups, applied or general. Applied AI systems can intelligently trade stocks and shares, or even stretch as far as maneuvering an autonomous vehicle. These type of AI systems are generally widespread.
Neural networks have been instrumental in teaching machines to understand world the same way we do. They accomplish this objective, while retaining innate advantages, such as speed, accuracy.

Keyword
Neural Network, Fuzzy Logic, Expert System, Artificial intelligence devices

I. Introduction

Artificial intelligence devices, which are designed to act very intelligently, are often categorized into one of two fundamental groups, applied or general. Applied AI systems can intelligently trade stocks and shares, or even stretch as far as maneuvering an autonomous vehicle. These type of AI systems are generally widespread. AI is a way of making a computer, a computer controlled robot, or a software think intelligently in the similar manner the intelligent human think. AI is science and technology based on disciplines' such as computer science, biology, mathematics, and engineering.

A. Impact on Personal and Social Lives

- We have already started witnessing massive changes in people's personal and social life patterns. The impact of AI can be observed from three perspectives.
- AI enhances the effectiveness and efficiency of the other factors.
- AI enables the development of intelligent and cognitive systems.
- AI enables better decision-making, both at individual and organizational levels, through data-driven approaches.

B. Impact on Jobs

- The long-term impact of AI on jobs is going to be positive. There will obviously be short-term pains. At a broader level, the impact of AI is two-fold.
- It enables the production of current outputs at significantly greater levels and with increased efficiencies like faster cycle time, reduced costs and higher quality.
- It enables the creation of new outputs that were not possible before.

C. Impact on Organizations

The value created by AI is going to be unevenly distributed among organizations, at least till the foreseeable future. This differentiation is on account of four principal factors.
Organizations depend on raw materials, and those that mine and consume these more efficiently than others will emerge as long-term leaders. In today's age, data and AI talent are key raw materials. Companies with better data mining and talent management capabilities will reap significantly greater benefits.
We will witness gradual but long-term human-robot partnership in corporations, especially for manual labor and repeatable processes. Bot resources will replace humans for jobs at the lower end of the spectrum, while human resources will focus on the high-end ones. Bots will gradually move to the higher end of the spectrum, and the spectrum itself will keep shifting north. Additionally, a significant focus will be on performing work-at-scale.As employees truly understand the way AI systems operate and the value of each data point, they will focus on deep-level information exchange, on greater integration and holistic organizational consolidation, thus breaking internal barriers and organizational silos.The enterprise adoption of AI is slowly leading to the emergence of new-age business models, creation of new roles andresponsibilities, and non-specialists gradually transitioning over to specialist roles.

II. Methodology

There are mainly three techniques:

1. Expert systemtechniques,
2. Artificial neural networks,
3. Fuzzy logicsystems.

- Since expert systems are basically computer programs, theprocess of writing codes for these programs is simpler thanactually calculating and estimating the value of parametersused in generation, transmission and distribution.
- Any modifications even after design can be easily donebecause they are computer programs.
- As artificial neural networks operate on biologicalinstitutes and perform biological evaluation of real worldproblems, the problems in generation, transmission anddistribution of electricity can be fed to the artificial neuralnetworks so that a suitable solution can be obtained.

III. Areas of Artificial Intelligence

A. Language Understanding

The ability to "understand"and respond to the natural language. To translate fromspoken language to a written form and to translate fromone natural language to another natural language.

B. Learning and Adaptive Systems

The ability to adaptbehavior bagged on previous experience, and to developgeneral rules concerning the world based on suchexperience.

C. Problem Solving

Ability to formulate a problem in asuitable representation, to plan for its solution and toknow when new information is needed and how to obtain it ;

1. Inference (Resolution-Based Theorem Proving,Plausible Inference and Inductive Inference)
2. Interactive Problem Solving
3. Automatic Program Writing
4. Heuristic Search

D. Perception (Visual)

The ability to analyze a sensedscene by relating it to an internal model which representsthe perceiving organism's "knowledge of the world." Theresult of this analysis is a structured set of relationshipsbetween entities in the scene.

1. Pattern Recognition
2. Scene Analysis

E. Modeling

The ability to develop an internalrepresentation and set of transformation rules which canbe used to predict the behavior and relationship betweensome set of real-world objects or entities.

1. The Representation Problem for Problem SolvingSystems
2. Modeling Natural Systems (Economic, Sociological, Ecological, Biological etc.)
3. Hobot World Modeling (Perceptual and Functional Representations)

F. Robots

A combination of most or all of the aboveabilities with the ability to move over terrain andmanipulate objects.

1. Exploration
2. Transportation/Navigation
3. Industrial Automation (e.g., Process Control,Assembly Tasks, Executive Tasks)
4. Security
5. Other (Agriculture, Fishing, Mining, Sanitation,Construction, etc.)
6. Military
7. Household

G. Games

The ability to accept a formal set of rules forgames such as Chess, Go, Kalah, Checkers, etc., and totranslate these rules into a representation or structurewhich allows problem-solving and learning abilities to beused in reaching an adequate level of performance.Artificial Intelligence Approaches for MedicalImage Classification: Artificial intelligence techniquesare used for diagnostic sciences in biomedical imageclassification. Model-based intelligent analysis anddecision-support tools are important in medical imagingfor computer-assisted diagnosis and evaluation. CADhelps radiologist who uses the output from acomputerized analysis of medical images as a secondopinion in detecting lesions, assessing extent of disease,and improving the accuracy and consistency ofradiological diagnosis to reduce the rate of false negativecases.

1. Artificial Neural Networks Approach on Diagnostic Science

The following subsections willdiscuss how ANN is utilized for image classification overgenerations.Endoscopic Images: Image classification is animportant step in CAD. In classification of endoscopicimages a hybrid implementation by advanced fuzzyinference neural network which combines fuzzy systemsand Radial Basis Function (RBF) was proposed. Theconcept of fusion of multiple classifiers dedicated tospecific feature parameters with an accuracy of 94.28%but RBF was characterized by a very fast training ratethan fuzzy. It extracted both texture and statisticalfeatures.

2. Application of Artificial Intelligence in Accounting Databases

The use of artificial intelligence is investigated as thebasis to mitigate the problems of accounting databases.The following are some difficulties with existingaccounting database systems.The needs of decision makers are not met byaccounting information. Humans do not understand orcannot process the computerized accounting databases. Systems are not easy to use. There is focus on thenumeric data. Integrating intelligent systems with accountingdatabases can assist (either with the decision maker orindependent of decision maker) in the investigation oflarge volumes of data with or without direct participationof the decision maker. Thus, the systems can analyze thedata and assist the users understanding or interpretingtransactions to determine what accounting events arecaptured by the system .With the artificial intelligencewe store and retrieve knowledge in natural language. There are some artificial intelligence tools or techniquesthat help in the broader understanding of events capturedby the accounting system. There is more emphasis onsymbolic or text data rather than just numeric data tocapture context. The artificial intelligence and expertsystem builds intelligence into the database to assistusers. Without users direct participation such models helpthe users by sorting through large quantities of data. Suchmodels also assist the decision makers under timeconstraints; suggest alternatives in the searching andevaluation of data.

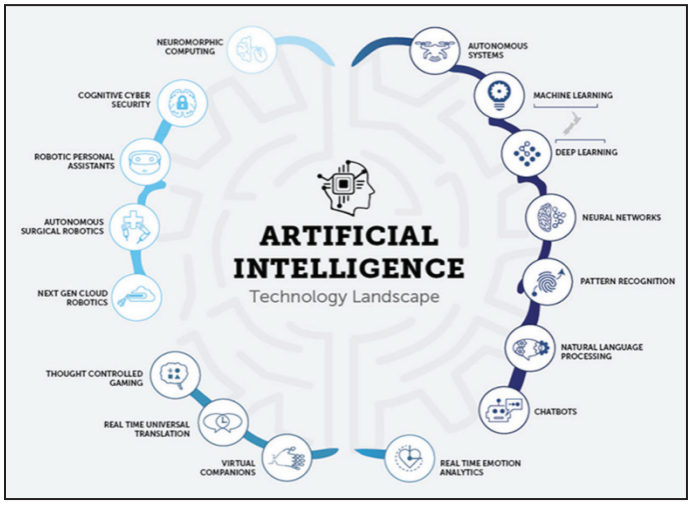

Fig. 1: Artificial Intelligence in Accounting Databases

IV. Popular Search Algorithms;

A. Brute-Force Search Strategies

They are most simple, as they do not need any domain-specific knowledge. They work fine with small number of possible states.

Requirements -

- State description
- A set of valid operators
- Initial state
- Goal state description

B. Informed (Heuristic) Search Strategies

To solve large problems with large number of possible states, problem-specific knowledge needs to be added to increase the efficiency of search algorithms.

C. Heuristic Evaluation Functions

They calculate the cost of optimal path between two states. A heuristic function for sliding-tiles games is computed by counting number of moves that each tile makes from its goal state and adding these number of moves for all tiles.

D. Pure Heuristic Search

It expands nodes in the order of their heuristic values. It creates two lists, a closed list for the already expanded nodes and an open list for the created but unexpanded nodes.

In each iteration, a node with a minimum heuristic value is expanded, all its child nodes are created and placed in the closed list. Then, the heuristic function is applied to the child nodes and they are placed in the open list according to their heuristic value. The shorter paths are saved and the longer ones are disposed.

E. Local Search Algorithms

They start from a prospective solution and then move to a neighboring solution. They can return a valid solution even if it is interrupted at any time before they end.

F. Hill-Climbing Search

It is an iterative algorithm that starts with an arbitrary solution to a problem and attempts to find a better solution by changing a single element of the solution incrementally. If the change produces a better solution, an incremental change is taken as a new solution. This process is repeated until there are no further improvements.

G. Simulated Annealing

Annealing is the process of heating and cooling a metal to change its internal structure for modifying its physical properties. When the metal cools, its new structure is seized, and the metal retains its newly obtained properties. In simulated annealing process, the temperature is kept variable.

We initially set the temperature high and then allow it to 'cool' slowly as the algorithm proceeds. When the temperature is high, the algorithm is allowed to accept worse solutions with high frequency.

H. Artificial Neural Networks

The idea of ANNs is based on the belief that working of human brain by making the right connections, can be imitated using silicon and wires as living neurons and dendrites.

The human brain is composed of 86 billion nerve cells called neurons. They are connected to other thousand cells by Axons. Stimuli from external environment or inputs from sensory organs are accepted by dendrites. These inputs create electric impulses, which quickly travel through the neural network. A neuron can then send the message to other neuron to handle the issue or does not send it forward.

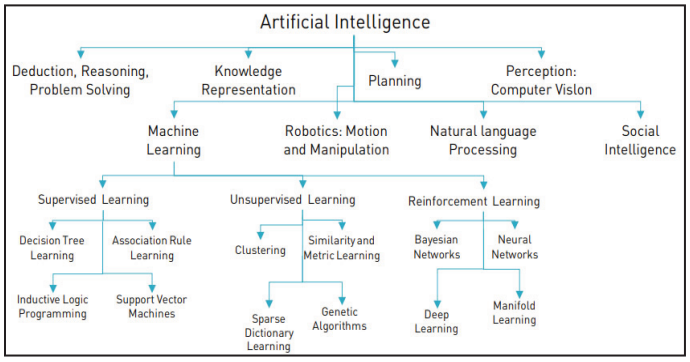

Fig. 2: Artificial Intelligence Diagram

V. Natural Language Processing

The goal of the NaturalLanguage Processing (NLP) is to design and buildsoftware that will analyze, understand, and generatelanguages that humans use naturally, so that eventuallyyou. Will be able to address your computer as though youwere addressing another person. This goal is not easy toreach. "Understanding" language means, among otherthings, knowing what concepts a word or phrase standsfor and knowing how to link those concepts together in ameaningful way.

VI. Components of NLP System

Entering material into the computer, using speech,printed text or handwriting, or text either keyed in orintroduced electronically. Recognizing the language of the material,distinguishing separate words, for example, recordingit in symbolic form and validating it.

- Building an understanding of the meaning of thematerial, to the appropriate level for the particularapplication. Using this understanding in an application such astransformation (e.g. speech to text), informationretrieval, or human language translation.
- Generating the medium for presenting the results ofthe application finally, presenting the results tohuman users via a display of some kind: a printer ora plotter; a loud speaker or the telephone.

VII. Advantages of NLP System

The benefits to be gained from successful NaturalLanguage Processing are immense. They include:

- Improved service from our public administration andpublic service agencies
- Wide accessibility of information through easier useof computer systems and Information Services.
- Enhanced ability to compete in global markets.
- Saving time by using intelligent computer systems asour agents.
- Improvements in the quality of information recordedin information systems.
- Better filtering of information when we need it.
- More effective international co-operation.
- Improved safety through 'hands-free' operation ofequipment.
- Greater security through voice verificationtechniques.DFAs for artificial intelligenceanother application of finite automata is programming simple agents to respond to inputs and produce actions in some way. You can write a full program, but a DFA is often enough to do the job. DFAs are also easier to reason about and easier to implement.The AI for Pac-Man uses a four-state automaton:

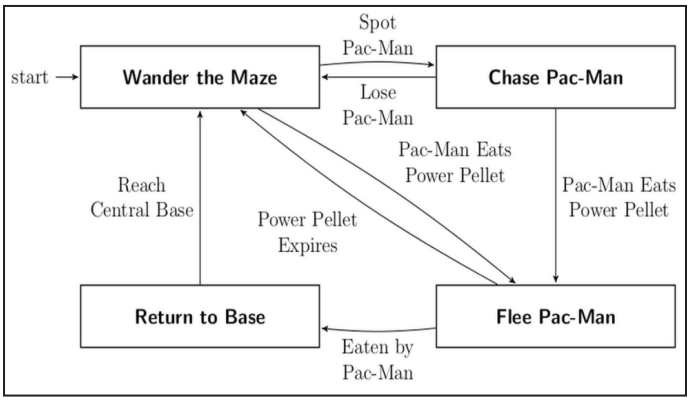

Fig. 3: Universal artificial intelligence

$$\text{AIXI} \quad a_k := \arg\max_{a_k} \sum_{o_k r_k} \ldots \max_{a_m} \sum_{o_m r_m} [r_k + \ldots + r_m] \sum_{q:U(q,a_1..a_m)=o_1 r_1..o_m r_m} 2^{-\ell(q)}$$

Games that have successfully integrated Artificial Intelligence

1. AlphaGo

AlphaGo has revolutionized the AI space with the most recent feat that involved beating top Go player, Lee Sedol. AlphaGo essentially uses a Monte Carlo tree search to base its move upon previously "learned" knowledge from machine learning techniques. The program also uses artificial neural network by extensive training, both from human and computer play.

2. IBM Watson

IBM Watson playing Jeopardy against two human opponentsToday IBM Watson is a robust cloud-powered, AI-based platform; facilitating healthcare providers to deliver optimal medical services. The IBM technology platform had famously won in 2011, in the game of Jeopardy, much before the success of the new AlphaGo program. Watson was pit against Brad Rutter and Ken Jennings, only to emerge victorious by defeating the two world champions.

3. Darkforest

Named after Liu Cixin's science fiction novel by the same name, Darkforest is also another Go program developed by Facebook. The program is based on deep learning, and uses a convolutional neural network. Like AlphaGo, Darkforest has also been tested against a professional human player at the 2016 UEC cup.

4. Deep Blue

1985 marked the beginning of work for Deep Blue with a ChipTest project at Carnegie Mellon University, which eventually gave way to Deep Thought. IBM took note of this development, and hired the development team, rebranding the project to Deep Blue. Interestingly, the development team had signed Grandmaster Joel Benjamin too.

The program faced Kasparov another time in 1997, winning the six-game match, following which Kasparov accused IBM of cheating, demanding a rematch. IBM refused to accept the offer, and eventually retired Deep Blue.

5. F.E.A.R.

This game was developed by Monolith Productions in 2005. First Encounter Assault Recon, or F.E.A.R., as it is popularly called employs a first-person shooter game play. The player must contain supernatural phenomenon, and armies of cloned soldiers.

For first time in gaming history, F.E.A.R. introduced a planner to generate context-sensitive behaviors, which is referenced today globally by several gaming studios. The AI-powered enemies can cleverly use the environment, finding cover behind tables, tipping bookshelves, opening doors,

6. Half-Life

The sci-fi based plot follows a theoretical physicist, Dr. Gordon Freeman, stuck inside an underground research facility. The story escalates when the teleportation experiments go wrong unexpectedly. The game combines scripting and AI to avoid any interruption during the gameplay. Valve developed this game in 1998.

7. Halo: Combat Evolved

Developed by Bungie in 2001, the game is essentially a first-person shooter. The player assumes the role of the Master Chief within this game, battling various aliens on foot or inside vehicles.The AI allows the enemies to use cover wisely, while employ suppressive fire and grenades. The underlying technology, called "behavior tree" is one of the most popular technologies used by the gaming industry. Additionally, the game pays a lot of attention to minute details. Few years, back, this game has stood as one of the most popular games, word wide. Users continue to play this game till date, and are sure to appear on any gaming list involving AI.

8. Stockfish

A free and open-sourced chess engine, Stockfish is available on several desktop and mobile platforms. The program was developed by Marco Costalba, Joona Kiiski, Gary Linscott, and Tord Romstad. Contributions also came from a community of open-source developers. The program has been currently ranked first or near the top of most chess engine rating lists.
Features:

It can use up to 512 CPU cores in multiprocessor systems.The maximum size of its transposition table is 1 TB.The AI implements an advanced alpha-beta search, and uses bitboards.
It is characterized by its great search depth, due in part to more aggressive pruning and late move reductions.

9. TD-gammon

Developed in 1992 by Gerald Tesauro, the program was a computer backgammon game. The name has been derived from a form of temporal-difference learning, specifically referred as TD-lambda. This helps in training the artificial neural net. The program achieved a level of gaming, slightly below that of the top human players of the game.
Besides, the program explored strategies, not pursued by humans. This game also has integrated AI-based algorithms, which not only enhance the gaming performance, but also makes the gameplay more interesting. TD-gammon was developed in 1992 by Gerald Tesauro at IBM's Thomas J. Watson Research Center.

10. Thief: The Dark Project

The first-person perspective game combines elements of a stealth game, and is set in the medieval/Victorian era. The central character is called Garret, who is a master thief in the game. The game was developed by Looking Glass Studios in 1998.

VIII. Conclusion

AI is at the centre of a new enterprise to build computational models of intelligence. The main assumption is that intelligence (human or otherwise) can be represented in terms of symbol structures and symbolic operations which can be programmed in a digital computer. There is much debate as to whether such an appropriately programmed computer would be a mind, or would merely simulate one, but AI researchers need not wait for the conclusion to that debate, nor for the hypothetical computer that could model all of human intelligence. Aspects of intelligent behavior, such as solving problems, making inferences, learning, and understanding language, have already been coded as computer programs, and within very limited domains, such as identifying diseases of soybean plants, AI programs can outperform human experts. Now the great challenge of AI is to find ways of representing the commonsense knowledge and experience that enable people to carry out everyday activities such as holding a wide-ranging conversation, or finding their way along a busy street. Conventional digital computers may be capable of running such programs, or we may need to develop new machines that can support the complexity of human thought.

If AI is seen to contribute to business success via enabling a better understanding of customers, along with a more rapid response to their needs, then its uptake within the world of work is likely to continue. In the future, many tasks will have the opportunity of input from AI. However, rather than replacing humans, it is the combination of AI and humans that is likely to bring the greatest benefits to the working world. Therefore, we might conclude that it will be how AI 'interacts' with humans that will influence its role in the future world of work. If human values are carefully articulated and embedded into AI systems then socially unacceptable outcomes might be prevented.Some AI experts predict that AI will be able to do anything that humans can do but do it better. This is a questionable assumption, but AI will surely surpass humans in specific domains. A chess computer beating the world chess champion was the first example.

If AI were to develop to the point that it can do everything better than humans, it would mean that it would also do better in science and technology. It may decide that it is no longer worthwhile to develop a certain field of research - or it may decide space travel is a waste of time as long as humans on earth are living in poverty and more than a billion people have no access to clear drinking water.Most scenarios about future AI are hypothetical, but AI presents us with existential questions. It shows that where science stops, philosophy and spirituality begin.

References

[1] N Ramesh, C Kambhampati, JRT Monson, PJ Drew, "Artificial intelligence", 2004.

[2] Charles Weddle, Graduate Student, Florida State University,"Artificial Intelligence and Computer Games", unpublished.

[3] Daniel B. Neill,"Using Artificial Intelligence and Integrated Approach".

[4] Daniel E.O.,"Leary Artificial Intelligence and Expert System in Accounting Databases: Survey and Extensions", Expert Systems with Applications, Vol. 3, 1991.

[5] Fatai Adesina Anifowose, Safiriyu Ibiyemi Eludiora, "Application of Artificial Intelligence in Network Intrusion Detection", World Applied Programming, Vol (2), No (3), March 2012.

[6] F. D. Laramee,"Genetic Algorithms: Evolving the Perfect Troll, AI Game Programming Wisdom", Charles River Media, Inc., Hingham, MA, 2002.

[7] Distinct Ways to Scrutinize Cyber Security as Amalgamated Approach. [Online] Available: http://www.ijsr.net. International Journal of Science and Research (IJSR), Vol. 7, Issue 7, July 2018

[8] "Software Cost Estimation", International Journal of Scientific and Innovative Research 2017; [Online] Available: http://www.ijsir.co.in.

[9] "Iot Data Analytics and Visualization, Mining, Partitioning", International Journal of Scientific and Innovative Research 2018; [Online] Available: http://www.ijsir.co.in.

[10] "Swarm Intelligence and Fuzzy Logic System for Software Effort Estimation" "National Journal for Digital Technology to Digital Economy" (TECHNIA) ch-19, February 2017.

[11] "Cost Estimation Techniques", "National Journal for IIMT College Greater Noida" June 2017.

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