**Machine learning for predicting the occurrence of an event**

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Abstract

The ever increasing presence of large datasets and greater availability of computing power has led to the dominance of machine learning, which is the use of algorithms dwvwloped for use by a computer for decision making without direct input from the programmers. This has led to a gradual death of the classical human influenced model of computer programming and algorithmic design earlier advanced in computer science.

In the past two decades, machine learning (ML) applications have grown in quantity and quality to be an ubiquitous part of our daily lives..

Machine learning is the ability to program computing systems to learn from data or recognize data with the attendant effect of using the learning outcomes in disparate fields such as entertainment, finance, agriculture, healthcare, housing and transportation to mention but a few through the process of pattern recognition, model building and response prediction.

Background to the study

It is extremely difficult to explain a term as commonly heard as intelligence, but in a contextual sense for performing tasks, intelligence has been defined by Robert Sternberg as "the mental abilities necessary for adaptation to, as well as shaping and selection of, any environmental context (1997, p. 1).

The branches that constitute artificial intelligence (AI) include the following:

Philosophy

Mathematics

Economics

Neuroscience

Psychology

Computer Engineering

Control theory and cybernetics

Linguistics

Philosophy concerned itself with the following questions among which included how theories could be formulated from hypotheses, the metaphysical aspect of the mind as opposed to the physical brain, knowledge formulation and the logical actions to be undertaken based on the knowledge formulated from the theory of the existence of the mind.

Renaissance philosophers like Leonardo Da Vinci and Thomas Hobbes made propositions that the reasoning in machines could be likened to that of humans which was the addition and subtraction of thoughts, and even designed simple machines which proved the functionality of their hypotheses. Actual construction was made ny philosophers such as Blaise Pascal whose Pascaline machine was more similar to human action that that of animals. This was subsequently improved upon by Liebniz, and when empiricism, or the scientific accumulation of knowledge through observation was propounded by Francis Bacon, this led to induction. When the rule of induction was found to be valid whereby general rules can be extracted from daily actions, the doctrine that all knowledge is characterised by logical theories garnered from observation came into being.

The connection between knowledge and action attempted to address the meaning of mind. Here, action must be justified by thought, no matter how simplistic the thought may be. The thought in itself must be justified by some intelligence behind it.

Mathematics has been described as the formalization of philosophy through logic, and the fundamental question propounded by logic, probability , and computation in AI is as follows:

“How do we arrive at a logical basis for computing for reason on the basis of uncertain information?”

George Boole was an early mathematician who discovered Boolean algebra. There are numerous applications of Boolean algebra in mathematics and computer science, In mathematics, it has been described as a branch where the variables are restricted to true and false as represented by 1 and 0, as opposed to formal math variables of numbers, and where operators are restricted to conjunction (AND), disjunction (OR), and negation (NOT), as opposed to the myriad operators available in formal math operations.

Furthermore Boolean algebra in computing can be said to be available to logic with applicattions extended to multivalued logic rather than two-valued logic, laying a foundation for probability. This is the foundation for fuzzy logic and probabilistic logic. Finally Boolean algebra is applicable in Set theory and mathematics.

Economics plays a role in AI as rational actions should be carried out by machines with regard to long term an short term profit. This is in the event that the machine should be able to predict or forecast a number of variables, seemingly evaluating each variable as it comes into its proximity.

Here the machine as an agent is able to use elements of Decision theory, bringing together psychology, statistics, philosophy, and mathematics to analyze the decision-making process for positive outcome. Here it is assume that machines can participate in Game theory where social situations among competing players and produce optimal decision-making of independent and competing actors in a strategic setting lead to real world scenarios where AI may lead to an edge in competition, marketing etc. with a predictable outco,e for the observer of the AI system.

In Operations research, and overlapping disciplines which include statistical analysis, management science, game theory, optimization theory, artificial intelligence and network analysis, AI computers use the following to achieve their goal of solving complex problems and improving quantitative decisions:

They identify the problem, constructing a model around the problem to simulate the real world and variables, use the model to derive solutions to the problem, test each solution on the model and if successful, implementing the solution on the problem.

Neuroscience through study of the brain and its component structures, particularly the parts that make up the nerve cells and the brain, has tried to understand the basis for learning in the brain. However, despite these advances, we are still a long way from understanding how we actually think.

The final conclusion is that a collection of brain cells can lead to thought, and in turn action, and consciousness an so brains cause minds.

An alternative theory is mysticism or metaphysics, which is beyond physical science. Computers have a cycle time that is a million times faster than a brain. The brain makes up for that with far more storage and interconnection than even a high-end personal computer, although the largest supercomputers have a capacity that is similar to the brain. Though a computer of virtually unlimited capacity, would not achieve the brain’s intelligence power,

Psychology is concerned with how computers think and act like rational beings. Here, studies have observed how computers can be trained to mimic how humans and animals recognize objects, leading to advances in the field of computer vision, and indirectly to Optical Character Recognition technology. A major aspect of cognitive psychology however has to deal with training computers, to like humans, be able to deal with non material words and assign them equal weight with material words. For example, a word such as “modest” should have equal weight with “median” or “mean” in the English language. In Psychology, the ability of a computer to think and thuse show cognition is in its ability to model its external reality and its own actions to advance itself within its head, whilst trying out various alternatives, to conclude which is the best of them for it. The ability to react to future situations before they arise, using prior knowledge of past events in dealing with the present and future,makes the AI computer capable of cognition in terms of cognitive psychology.

Computer engineering is primarily concerned with building an efficient computer?

Over the past decades, intelligent people have built machines called computers. The computer has been the child of circumstance as it was birthed out of the efforts of scientists in three countries embattled in World War II.

Alan Turing’s team developed the first operational computer which was an electromechanical computer named Heath Robinson, built in 1940 by for a single purpose: deciphering German messages. In 1943, the same group developed the Colossus, a powerful general-purpose machine based on vacuum tubes. Konrad Zuse in Germany in 1941, invented the the first operational programmable computer, the Z-3. Zuse also invented floating-point numbers and the first high-level programming language, Plankalkül. ENIAC, developed as part of a secret military project at the University of Pennsylvania by a team including John Mauchly and John Eckert, proved to be the most influential forerunner of modern computers.

Each generation of computer hardware has brought an increase in speed and capacity and a decrease in price, obeying Moore's Law. Performance doubled every 18 months or so until around 2005, when power dissipation problems led manufacturers to start multiplying the number of CPU cores rather than the clock speed. Current expectations are that future increases in power will come from massive parallelism—a curious convergence with the properties of the brain.

The software side of computer science has also played a major role, via the invention of the operating systems, programming languages, and tools needed to write modern programs. As a result, AI is a leading technology that has fertilized many innovations in computer science, such as compilers, time sharing, voice automated interactive interpreters, personal computers with windows and mice, rapid development environments, integrated development environments, the linked list data type, microprocessors, automatic storage management, and key concepts of symbolic, functional, declarative, and object-oriented programming.

Cybernetics in AI systems has as its goal the design of optimum systems, in terms of their transition from a current state to a goal state. This was first pioneered in ancient times with the construction of a self regulatory water clock, and in modern times by the thermostat and the steam engine governor created by Cornelis Drebbel and James Watt respectively. AI systems programming branched out out cybernetics since the scientists in the field did not wish to be hindered by the boundries of calculus and matrices as they felt AI was broader than those fields of mathematics. This branching out allowed AI researchers to use the tools of computation and logical inference, allowing them explore fields such as planning, language and vision which those fields out mathematics could not adequately explain. This served as a break betweeen AI and control theory where the focus was on regulatory mechanisms to minimize error through the use of regulatory machanisms. In particular, the idea was propagated that the use of homeostatic techniques such as feedback loops could mimic intelligence by creating stable adaptative behaviour.

Linguistice in AI has the broad field of Natural Language Processing (NLP) pioneered by Skinner B.F. and Choasky N. where computers are programmed to learn how the tools of language operate and put them to use, an example being how children make mistakes in speech construction as they grow until they are able to form syntactically correct sentences over time. A problem with language is the dual concept of context, which is the particular usage of the word or sentence, as an idiom is not to be taken literally, and the subject matter, since different fields of different disciplines may use the exact same words with totally different meaning. The study of how to put knowledge into syntax that a computer can understand and act upon with little bias for error has been tied to language and this knowledge representation is informed by research in linguistics, which is the philosophical analysis of language.

Types of Artificial Intelligence

AI has its roots in the 1940s where where work done by Warren McCulloch and Walter Pitts (1943) drew on three sources: knowledge of the basic physiology and function of neurons in the brain; a formal analysis of propositional logic due to Russell and Whitehead; and Turing’s theory of computation. Here a model of artificial neurons was proposed with each neuron being “on” or “off,” and having a switch to “on” when prompted by electical means by a sufficient number of neighboring neurons. The "state" of a

neuron therefore equivalent to the prompts from its neighbouring neurons.

Through this model, it was proven that any achievable state was a computation from the network of connected neurons, using Boolean algebra (and, or, not, etc.)

and implemented by simple networks of such neurons.

Donald Hebb (1949) demonstrated a simple updating rule which made each neuron more receptive to the prompts of a particular neighbour or network of neighbours. He proved the validity of McCulloch and Pitts suggestion that suitably defined networks could learn. His rule, now called Hebbian learning, remains an influential model to this day.

Based on earlier work, Minsky and Edmonds, built SNARC, the first neural network computer in 1950.

Minsky studied universal computation in neural networks and was later to prove influential theorems showing the limitations of neural network research.

Alan Turing also studied neural networks and his vision was most influential, as he gave lectures on the topic and articulated a persuasive agenda in his 1950

article “Computing Machinery and Intelligence.” Therein, he introduced the Turing Test, machine learning, genetic algorithms, and reinforcement learning. He proposed the Child Programme idea, explaining “Instead of trying to produce a programme to simulate the adult mind, why not rather try to produce one which simulated the child’s?”

tIn the 1950s, McCarthy convinced Minsky, Claude Shannon, and Nathaniel Rochester to help him bring together U.S. researchers interested in automata theory, neural nets, and the study of intelligence. Their ideas for the use of AI in improving or at least mimicry of creativity, self improvement and language use was not possible and they failed to achieve any substantial brakthroughs.

In the late 1950s and early 1960s AI limited itself to solving simple human problems. This was emphasize by thinking like a human rather than trying to supersede human abilities.

a pioneer AI scientist that proposed many modern theories named Alan Turing proposed that a proper test of artificial intelligence would be the ability of a computer, to be programmed to mimic a human in an appropriate scenario, such as one where an investigator by asking appropriate questions would in a finite time be able to distinguish between either human sex, the computer being in mimicry of the role of either a man or a woman, and the computer, in a reversal of roles would also in finite time be able to distinguish as an interrogator between the sex of two humans.

However he further argued that a limitation of machines with respect to the human intellect is the inability of computing machines to satisfactorily answer questions framed in descriptive manner, with only boolean answers sufficient for the perceived intellect of a computing machine.

Finally, Turing advanced a model whereby by the computer could overcome these limitations and become more like a human by the construction of the appropriate instruction sets whereby it could "learn" to perform a task through tools as scientific observation, propounding of a hypothesis and finally formulation of a theory.

Artificial intelligence is therefore the ability of agents created by humans using algorithms to perform the tasks outlined by this definition. These include the ability of these agents to possess general intelligence or awareness of their purpose, primary mental abilities or the ability to carry out their primary tasks in an unassisted manner, and category specific intelligence, or the ability to carry out specialized tasks with little or no interference from the environment beyond the presentation of data to the agent.

These scales are used in determining the level of intelligence of the artificial agent, as the more an agent lends itself to these definitions, the more "intelligent" it can be said to be.

The computer science definition of artificial intelligence lends itself heavily to the concept of rationality with little or no place for emotion, rather emotion maybe the logical output of a combination of rational thought and rational action whereby the computer agent does a perfect mimicry of the ideal logical human being in thinking logically and rationally, whilst also acting logically and rationally.

Haugeland (1985) investigated the postulate of Descartes identified as the mind/body problem where the mind as opposed to the brain was said to exist with the power of will. He however did not take sides with Descartes or opponents of Descartes, but philosophized that the problem of Artificial Intelligence was the application of materialism, since all phenomena is matter, lending his view that in AI the mind, though abstract, is matter.

The explanations of Turing and Haugeland expect thinking or AI computers to be able to think automatically, solve problems via Turings postulations, simulate mental models to compute solutions, and be able in turn to enforcing intelligent behaviour through passing instruction sets via programming to other computers.

These definitions have further given rise to the different fields of AI as

natural language processing to enable it to communicate successfully in English or any other language, knowledge representation to store what it knows or hears and automated reasoning to use the stored information to answer questions and to draw new conclusions and finally machine learning to enable the computer formulate new thought and behaviour from input data and existing instruction sets.

The computer can also be thought of as an agent, whereby it can fulfill the aforementioned tasks expected of any AI compliant machine, with the addition of versatility and goal fulfillment. This is while acting logically and rationally to arrive at a conclusion the average human in the same state would. This is because ways of acting rationally exist that are intuitive and not rational. For example, cramming for a test or exam with limited time is a reflex action that is usually more successful than trying to read and understand an entire textbook the day before an exam.

Review of related literature

Scope and limitation of the study

The scope of the present study is to investigate the theoretical foundations of multimedia databases. The study is restricted to relevant literature on the aforementioned topics, with respects to the features of requirements analyses of multimedia databases, their advantages and disadvantages.

Aim and objectives.

The aim is the study of the theoretical background of multimedia databases. To that effect the objectives of the present study include:

Acquaintance of readers with requirements engineering, multimedia data and databases

Suggest different ways for accessing information effectively and efficiently through multimedia databases.

Research methodology

The present study was carried out to know the theory and practice regarding the use of multimedia databases. The method of Literature Review (LR) is used as a tool to construct a base of further research questions in multimedia databases which are formulated from the identification of factors revealed via analysis of the literature in the aforementioned topics

Discussion/Conclusion

References