Cognitive Technology in Various Applications

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Abstract— Our aim is to overcome the problems faced by human in day-to-day life and in reducing the burden of humans, so this technology is used as a substitute, further the results of some well-known experiments shows that its denying human reasoning, so the wrong design and assumptions in these experiments are analysed and discussed in this chapter, and further techniques are been implemented to support cognitive radio technology.

Keywords: Reduce, Substitute, Reasoning, Analysed, Techniques

I. INTRODUCTION

A. Cognitive Computing

Cognitive computing systems use computerized models to reproduce the human cognition process to find solutions under complex situations where the outputs are puzzling and doubtful. Cognitive computing overlaps with AI and involves many of some underlying technologies to power various cognitive applications, including expert systems, neural networks, robotics and virtual reality (VR).

B. Cognitive Computing with AI

Cognitive computing is often used interchangeably with AI. But there are nuance between the two terms, which can be found within their purposes and applications. With AI systems, data is fed into the algorithm over a long period of time so that the system learn variables and can predict outcomes. Applications based on AI include intelligent assistants such as Amazon's Alexa Apple's Siri, and driverless cars. Human cognition involves real-time analysis of environment, context among many other variables that inform a person's ability to solve problems. In general, it is used to assist humans in their decision-making process. Some examples of cognitive computing applications include supporting doctors in the treatment of disease. IBM Watson for Oncology, for example, has been used at Memorial Sloan Kettering Cancer Center to provide oncologists with evidence-based treatment options for cancer patients. When medical staff input some questions, Watson generates a list of hypotheses and offers treatment options for doctors to consider.

C. Cognitive Computing than AI

AI relies on algorithms to solve a problem by identifying patterns in form of keys hidden in data, cognitive computing systems have the goal of creating new algorithms that minimize the human brain's reasoning process to solve an array of problems as the data and the problems change.

II. EXISTING SYSTEM

A. Self-Driving Car Project

In 2014 Cognitive Technologies released its computer vision technology and announced its cooperation with car manufacturers to create self-driving vehicles. On 3rd February 2015 Cognitive Technologies joined with Kamaz and proposed the self-driving truck project.
In June 2015 the prototype successfully passed the first field tests.

The system developed by Cognitive Technologies does not require building of smart cities and smart roads equipped with multiple sensors rather it works the opposite way, by trying to understand the situation on the road like humans do. This system uses a video camera like a driver who uses his eyes for analyzing the information and focusing on the relevant data. For this purpose the system uses a special type of computer vision such as foveal. Only 5–7% of the data is gathered by video cameras and sensors that are processed by the system as relevant. This prototype is being tested in Russia on rough roads, on roads without marking, with the goal to prepare the system for work in difficult situations and on bad roads all around the world.

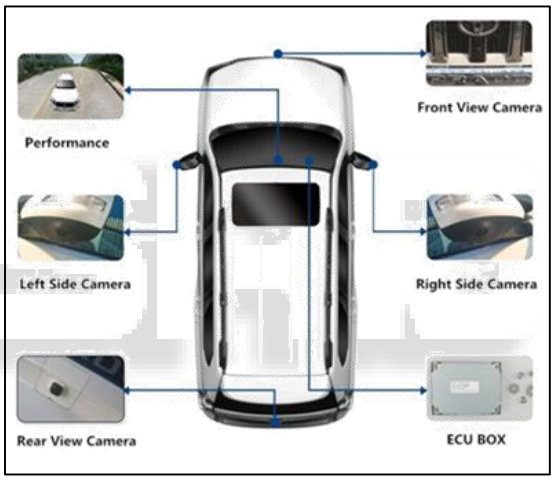

Fig. 1: Self Driving Car

B. C-Pilot ADAS Project

In August 2016 Cognitive Technologies started to develop its own ADAS development project C-Pilot for ground transport control automation.

- By 2017, the company will start to develop a number of varities for warning the drivers in cases of road situations requiring increased attention: lane departure warning system, traffic sign recognition system, forward collision warning system is been discovered, blind spot detection system, pedestrian protection system
- By 2018 a system of active driver assisting scheme will be developed, which is capable of interfering with the vehicle's systems (automatic steering, automatic braking, maintaining a safe distance with the vehicle ahead within the lane). unless, such system would require direct control of the road situation by the driver.
- In 2019–2022 the developers plan to finalize the technological components to enable automatic movement in several modes (traffic jams or motorways). The final stage of the project will be to ensure the possibility of fully automatic driving.

Cognitive Technology is the initiator for forming an international working group to develop a single software standard for the self-driving vehicle control.

C. Self-Driving Tractors and Harvesters Project

In January 2016 Cognitive Technologies and Innopolis city (Tatarstan region) announced the "Smart Farming" as a joint initiative within the Agropolis project. Cognitive Technology team have decided to develop AI technologies for self automatic driving harvesters and tractors both together with the leading Russian farming equipment manufacturer Rostselmash and the agricultural enterprise Soyuz Agro.

The specialist from Cognitive Technology tells that the system will track stones, poles, and other obstacles that might be endangered for the vehicles. This data will enable engineers to develop an interactive field map with GPS coordinates for stones and other obstacles. Eventually, this results an alternate way for the harvester's movement pattern in preventing it from running into stones and other objects that may inflict damage. Harvester's will work autonomously on the field of the territory that is narrowed by radio beacons.

Fig. 2: Self Driving Tractor

III. HUMAN REASONING AND LOGIC

The logical representation of reasoning is a natural result of the cultivation of human cognitive capabilities and attempts to understand and describe our reasoning. Our starting point is counter-argumentation via the search for counter examples. If anyone wants to prove that the arguments of his/her opponent is wrong, she/he may try to construct a similar flow of claims which leads a true premises from a false conclusion. There is an analogy of attempts to falsify general statements. The best procedure is to find a special case for which the general statement is not true.

There is a nice example in the history of human thought. Socrates mastered the art of counter-argumentation and constructing of counter examples as a tool of rational dialogue, most importantly as a tool of uncovering the false in someone's beliefs, as a tool of supporting one's knowledge via arguing against unsupported claims. His influence lead through Plato to an invention of a logical system by Aristotle. The change from counter argumentation to logic is simple. First, we emphasize that the construction of counter examples entails a shift from the content of sentences to their form. counter examples are of the same form as the attacked sentences.

Second, the focus is shifted from the construction of counter arguments to finding ways of reasoning which are immune from counter arguments. In other words, the attention of logic was focused on truth-preserving schemes of reasoning. Remember the well-known algorithm if each A is B and each B is C, then each A is C. It is impossible to find a counterexample such that each A is B, each B is C, but there are some A, which are not C. On the other hand, you can find a counterexample to the following form of reasoning if some A's are B, some B's are C then some A is C. The first scheme of reasoning preserves some truth.

The second scheme is obviously not truth-preserving. An important feature of proper human reasoning is an factor to preserve truth of basic postulates, facts and starting points in the flow of reasoning to the truth of several circumstances. A basic functionality of logic for cognitive science is based on that observation.

We have to interpret the development of logic from Ancient times to the state, where a rich variety of logical systems and ways how to do logic is available.

Scheduled form of reasoning undiscovered by a logical system preserve truth, if logical constants are understood in the way specified by the logical system. Reasoning to an interpretation, as understood by is a procedure leading to a selection of an appropriate understanding of logical constants for a given reasoning task. further, a need to specify and to model in an abstract way new logical constants or some new meaning of a logical constant leads often to a new logical operation and to a new selection for a reasoning to an interpretation.

However, the variety of reasoning procedures and styles is not exhausted by simple truth preservation. Different types of scheduled schemes of truth-preserving reasoning provide a characterization of varies forms of deduction. We have to mention as how tedious reasoning also. Fortunately, some of the people reason even if they do not have only true premises at their disposal. This types are precisely, a various types of reasoning is studied intensively in artificial intelligence. Non-unique reasoning and defensible reasoning are the terms used in artificial intelligence.

IV. FEATURES OF COGNITIVE REASONING TECHNOLOGY

There are two important features of human reasoning they are preservation of truth and accepting of admissible sets of assumptions. The logical point of view can be characterized as focused on truth-preservation or on admissibility of assumptions (arguments).

Methods of logic consist in an abstraction from the content of pieces of knowledge or sets of sentences, in the construction of some symbolic, formal languages, which enables an abstract and general treatment for a kind of reasoning.

It is important to note that the method enables a highly detailed description of reasoning and that it is possible to construct computational models of reasoners and to implement them in real applications. Logical point of view and methods of logic contribute to understand and model correct reasoning in accordance with the principles mentioned above.

A. Effects on Industries

Eventhough cognitive technology have a wide range of applications, the industry sector mostly affected will be the software sector with 95% that are projected to adopt the technology in 2020. With emerging technologies changing professional industries including banking, eCommerce, healthcare and education, staying up to date on the latest trends will give you a better understanding. The various task of humans in day to day life are replaced by the information technology in accordance with cognitive technology.

V. PROPOSED SYSTEM

A. Roomba Robotic Vaccum Cleaner

cognitive technologies has the ability to develop products and services and can also bring about entirely new classes of products and services that can make new markets and generate large profits for inventors.

The Roomba robotic vacuum cleaner, created a new category that achieved sales of 10 million units and created several competitors.

Fig. 3: Roomba robotic vacuum cleaner

B. Hongkong Sub-Way System

The Hong Kong subway system provides a good example of the use of cognitive technologies for automation to improve quality and efficiency. The performance of the system overall is impressive. It carries over 5 million passengers daily and boasts a 99.9 percent on-time record. In a typical week 10,000 workers carry out some 2,600 engineering activities across the system to keep it running smoothly. The operator of the Hong Kong subway system implemented cognitive technologies to automate and optimize the planning of these engineering works. The planning system encodes rules of thumb learned by experts over years of experience plus constraints such as schedules and regulations about maximum noise levels allowed at night. It employs a "genetic algorithm" that pits many solutions to the same problem against each other to find the best one, producing an optimal engineering schedule automatically and saving two days of planning work per week.

Though it automates the work of experts, it doesn't replace them. As Andy Chun, CIO for the City University of Hong Kong and the designer of the system said, the human planners are rare experts in the field. Their time is never enough. The system "helps relieve them of the scheduling task so that they can focus on tougher issues that require human interactions and negotiations.

C. Natural Language Processing

The Cincinnati Children's Hospital Medical Center, demonstrated that the process of automatically identifying patients eligible for clinical trials, using natural language processing to read free-form clinical notes, and machine learning to refine the list of terms extracted from them, reduced the workload by 92 percent and increased efficiency by 450 percent.

D. Insight

The third category of cognitive technology application is creating insight. Natural language processing techniques, for instance, make it possible to analyze large volumes of unstructured textual information that has not yielded to other techniques. Machine learning can draw conclusions from large, complex data sets and help make high-quality predictions from operational data. Many companies are using cognitive technologies to generate insights that can help reduce costs, improve efficiency, increase revenues, improve effectiveness, or enhance customer service.

Stevia First, a bio-tech start-up that has developed intellectual property covering the production of a naturally derived sugar substitute, is exploring a range of cognitive technologies to generate insights. One application is optimizing its industrial processes.

Rather than explore various production approaches by trial and error, the company uses what it calls "smart search," driven by cognitive algorithms that it is not ready to disclose, to determine the optimal parameters for the volume of raw materials and process time, for instance, to boost the cost efficiency of the production process. The company is evaluating a range of other insight-oriented applications of cognitive technologies, from using natural language processing to automatically read and summarize findings from thousands of biotechnology research papers, to reanalyzing data sets from old research in search of a new gene or a new drug.

Intel is using machine learning to improve sales effectiveness and boost revenue. One approach it takes is automatically classifying customers using a predictive algorithm into categories that are likely to have similar needs or buying patterns. The resulting categories can be used to prioritize sales efforts and tailor promotions. The company expects this strategy to result in $20 million in additional revenue when rolled out globally.

To improve marketing and customer service, BBVA Compass bank uses a social media sentiment monitoring tool

to track and understand what consumers are saying about the bank and its competitors. The tool, which incorporates natural language processing technology, automatically identifies salient topics of consumer chatter and the sentiments surrounding those topics. These insights influence the bank's decisions on setting fees and offering consumer perks, and how customer service representatives should respond to certain customer inquiries about services and fees.

Aetna and GNS Healthcare teamed up to use machine learning and other analytic techniques to improve the health of patients and reduce the cost of caring for them. Their analysis focused on metabolic syndrome, a condition that significantly increases the risk of developing heart disease, stroke, and diabetes. Using claims and biometric data for a population of 37,000 Aetna members, the companies developed models that predicted the risk of developing metabolic syndrome and the probability of developing any of the five conditions associated with the disorder. The models are also able to determine which medical interventions are most likely to improve an individual's health outlook.

VI. THREE VS FOR FRAMEWORK

A. *Viable*

Cognitive technologies have limits that are not widely acknowledged in the business press. They are not truly intelligent in any general sense of the word; they cannot really see, hear, or understand. No robot can excel at tasks that require empathy, emotion, or relatedness. But there is a broad range of problems for which cognitive technologies can provide at least part of a solution. The first step in assessing opportunities for the technology is to understand which applications are viable.

Some tasks that require human or near-human levels of speech recognition or vision can now be performed automatically or semi-automatically by cognitive technologies. Examples include first-tier telephone customer service, processing handwritten forms, and surveillance. Machine learning techniques are enabling organizations to make predictions based on data sets too big to be understood by human experts and too unstructured to be analyzed by traditional analytics. And automated reasoning systems can find solutions to problems with incomplete or uncertain information while satisfying complex and changing constraints. They can automate the decision-making process of experts, such as the engineering managers at the subway system in Hong Kong mentioned earlier.

B. *Valuable*

Just because something can be automated with cognitive technologies does not mean it is worth doing so. In other words, what is viable is not necessarily valuable. Automation features that customers do not care about are obviously not valuable. Tasks performed well by plentiful, low-cost workers are not attractive candidates for automation. Tasks that require scarce expertise may be. Some tasks are performed by experts but don't always require deep expertise. These may be good automation candidates. Accountants who scan hundreds of contracts looking for patterns and anomalies in contract terms, for instance, are using their reading skills more than their accounting skills. It may be valuable in this scenario to use natural language processing techniques to automate the process of reading and extracting the terms from a body of contracts.

C. *Vital*

For certain business problems, cognitive technologies may be more than just viable and valuable. They may be vital. Processes that require human perception at a very high scale may be unworkable without the support of cognitive technologies. The Georgia agency mentioned earlier—which has to process 40,000 campaign finance disclosure forms per month, many of which are handwritten—is an example of this. Another example is Twitter, which uses natural language processing to help advertisers understand when, why, and how its users post comments about television shows and TV advertising; this capability would not be possible without cognitive computing to analyze the language of the tweets. Fraud detection is another application in which the use of machine learning should now be considered vital. Especially in large-scale online businesses but increasingly, we expect, in businesses of all types, the performance of certain functions will depend on the use of cognitive technologies.

VII. UNPREDICTABLE COSTS AND TIMELINES

Cognitive technologies are evolving rapidly. Highly customized or innovative applications, such as automating the screening of patients for clinical trials or the provision of financial advice, are closer to research projects than systems integration projects. These will involve unpredictable costs and timelines. This is not the case for all uses of cognitive technologies, though. Some packaged applications for purposes as diverse as forms processing, email marketing, sales forecasting, and customer service are embedding cognitive technologies, shielding organizations from their complexity while improving functionality and performance.

VIII. APPLICATIONS

The best example of usage of cognitive technology in product offering is the recommendation offered in NETFLIX online movie rental service, which enables machine learning. This aspect has had a major impact on customers use of the service, it accounts for as much as 75 percent of Netflix usage. Another example in Internet business is eBay, which now uses machine translation that enables users to find their exact translation. These two examples have a common aspect of greater usage of service and increases loyality of product.

Even before the self-driving cars came into commercial usage, auto manufacturers were using various computer vision and other cognitive technologies to enhance their products. General Motors, for instance, is planning to make some of its vehicles safer by equipping them with computer vision to completely monitor the driver whether he is distracted, not spending enough time looking at the road ahead, the rear-view mirror.

Audi is integrating speech recognition technology into some cars to enable drivers to engage in more convenient, natural communication with navigation systems. A creator of medical imaging technology aim to make radiologists more effective by using computer vision algorithms to identify areas of breast cancer. The system

automatically analyze mammogram images and outlines guarded areas to clearly point out potential abnormality. Vu COMP, the company that developed the system, cites a clinical study that found radiologists were extensively more effective in judgment cancer and in differentiate cancer from non-cancer when using the system.

The pizza delivery company Dominos introduced a new facility in its mobile app that helps customers to place orders by voice. A virtual character named "Dom" who speaks with a computer-generated voice guide clients through the process. Auto mate the process of ordering pizza by voice is not primarily a cost-cutting move. Rather, the revenue can be increased by making order more convenient. The customers reviews are they wish to place order in online which makes them to spend more and purchase more. The automated voice ordering system makes the easy ordering without the employment of many workers.

Associated Press has implemented a software known as natural language-generation software that has the ability to write corporate earnings stories automatically. Rather than taking the opportunity to reduce staffing levels, AP is using the technology to increase by a factor of 10 the number of such stories it publishes, enabling AP to cover companies of local or regional importance it did not have the resources to cover before and freeing journalists from writing formulaic earnings stories so they can focus on more analytical and exclusive stories.

REFERENCES

[1] Alchourrón, C.E., Gärdenfors, P. and Makinson, D.: On the Logic of Theory Change. Journal of Symbolic Logic 50 (1985), pp. 510 – 530.
[2] Anderson, A. R., Belnap, N. D.: Entailment, volume 1. Princeton University Press, Princeton, 1975.
[3] Fagin, R., Halpern, J. Y., Moses Y. and Vardi, M. Y.: Reasoning about Knowledge. MIT Press, Cambridge (MA), 1995

