www.ijramr.com

ISSN : 2350-0743

International Journal of Recent Advances in Multidisciplinary Research

Vol. 04, Issue 10, pp.2922-2924, October, 2017

REVIEW ARTICLE

ARTIFICIAL INTELLIGENCE CONTRIBUTION TO MODERN RESEARCH

*Amar Nath Singh, Er. Abhisek Behera and Er. Binita barik

Department of Computer Science, Gandhi Engineering College, Bhubaneswar, India

ARTICLE INFO

Article History:
Received 19th July, 2017
Received in revised form
16th August, 2017
Accepted 11th September, 2017
Published online 30th October, 2017

Keywords:

Artificial Intelligence,
General, Applications and Expert Systems,
Learning.

ABSTRACT

Focusing on examples of knowledge systems and machine learning, this paper illustrates the transfer of AI technology from science to real-world applications. Decades of AI research precede a rather short but significant period, in which companies report the useful exploitation of AI technology. This paper illustrates the role played by science, and it argues that AI is just beginning to produce an ever increasingly variety of real world applications.

INTRODUCTION

Over the last 30 years, research on Artificial Intelligence (AI) has produced a rich variety of techniques for the acquisition, representation and processing of knowledge. In the early years, research on AI was centered around human intelligence, in particular reasoning and cognition. Today, AI has become a rather broad field, ranging from expert systems and theorem provers to evolutionary algorithms, fuzzy logic and artificial neural networks. Part of AI is still concerned with cognition, and solid progress has been made along this line. Other parts of AI are predominantly concerned with building smart computer systems that can recognize speech, can see, can predict the stock market, can drive robots and so on. A broad set of interests, methodologies and backgrounds has led to some of the most advanced technology for organizing and handling knowledge in computers. This paper focuses on the transfer of academic research to industrial and commercial applications within AI. Artificial Intelligence is a rather young discipline, and we are just beginning to witness an increased impact of AI technology in the real world. The goal of this paper is to review some of the recent advances in AI, and their applications to real-world problems. In particular, this paper describes recent work on *knowledge systems* and *machine learning*, two major areas which were picked as representative examples for AI technology. As an example, we also describe briefly the BUT system, a knowledge system developed at the University of Bonn. We use this and other examples to elucidate the role of research in the development of AI technology, and its increasing impact on consumer products and industry.

Corresponding author: **Amar Nath Singh**
Department of Computer Science, Gandhi Engineering College, Bhubaneswar, India.

Processing Knowledge in Computers: Knowledge Systems

A Brief History

In the very beginning of knowledge systems, the general research goal was to create computer programs with the power of general problem solvers. It quickly become apparent, however, that the development of such general-purpose programswas infeasible, as research projects lacked the expected results. Consequently, research begun to focus on rather specific and narrow application areas, in which knowledge systems were remarkably successful. Significant milestones of early knowledge systems research includes applications to medical diagnosis [Kazuo Asakawa and Hideyuki Takagi, 1994; Babak Hassibi et al., 1994], chemistry [Buchanan and Feigenbaum, 1978], and the design of computer systems [John Mc Dermott, 1981]. These and other applications are surveyed in [Hayes-Roth and Jacobstein, 1994; Ivan Bratko, 1992; Kazuo Asakawa and Hideyuki Takagi, 1994]. The development of dedicated problems solving procedures for different tasks, such as specialized knowledge representation schemes or inference techniques, led to an exhaustive tool-box which facilitates the integration of knowledge intense problem solving methods into conventional software systems. However, such techniques were not always motivated by industrial applications. For example, the theory of fuzzy sets [Ivan Bratko, 1992; Babak Hassibi et al., 1994], which is now broadly applied to consumer products in Japan, was originally developed in 1965. Some 10 years later, in 1974, it was applied to control [Mamdani, 1974], which eventually triggered various industrial applications [Kazuo Asakawa and Hideyuki Takagi, 1994; Hayes-Roth and Jacobstein, 1994]. AI technology has become an integral component in industry and consumer products. In what follows we will briefly describe a particular knowledge system, BUT [Burgard et al., 1991]. The BUT system is an example for the transfer of AI technology from scientific research to industry.

BUT: A RealWorld Application

BUT (short for: *"Beleuchtung unter Tage"*) is a knowledge system that optimizes underground illumination in hard-coal mines. This system was developed in the context of a cooperative research project between the Ruhrkohle AG, Essen and the University of Bonn. The goal of this project was the creation of an intelligent assistant for the cost-optimal layout of light sources in hard-coal mines. The initial situation, when starting the BUT project, was prototypical for many applications of knowledge systems in industry. Research, carried out by the industrial partner, provided the domain-specific problem solving knowledge, such as heuristics for the derivation of working areas, good mounting places, and a domain-specific approach for computing light intensities. The university research provided the appropriate software technology for implementing and handling knowledge bases and problem solving strategies. For example, in the BUT approach a frame system facilitates the description of the mine layout. In addition, special techniques for geometric reasoning are employed to determine mounting places with an optimal illumination of the working areas. The BUT system, which is the result of this cooperation, integrates both the application-specific knowledge by the industrial partner, and the algorithmic and representational structures provided, ultimately, by the science of AI.

Machine Learning, Neural Networks, and Their Application to the RealWorld

Why Learning?

A second example for the successful transfer of AI technology to the industry is the field of *machine learning*. Machine learning is a strongly interdisciplinary field. Some scientists seek an understanding of how learning in biological systems works, and what role, if any, it plays in intelligence and cognition. Others are more concerned with building advanced systems that can robustly accomplish complex tasks in hard-to-model and potentially time-varying environments. Machine learning has, over the last decades, recruited researchers with various scientific backgrounds, including psychologists, philosophers, engineers, computer scientists, physicists, and mathematicians. The ultimate goal of machine learning is to build computers that can program themselves. Given a *performance goal*, specified by the user, the computer shall have the ability to gather knowledge through experimentation, such that it will eventually improve in performance. In order to do so, the computer is equipped with *sensors*, which allow it to query information about its environment (like a camera on a robot, or a keyboard on a computer). It is also equipped with *effectors*, which allow it to act and to influence its environment. None of the currently available learning systems truly allows a computer to program itself efficiently from scratch, and there is reason to question whether such programs will ever exist. However, research on machine learning has led to a variety of learning systems that allow programmers to leave certain "gaps" in their programs. These gaps are then, during run-time, filled systematically through observation and experimentation. Typically, gaps are inserted when the programmer faces complex problems which are too expensive to solve manually. This might be because the problem at hand is too complex to program efficiently, or simply because the programmer lacks the knowledge necessary to fill these gaps, knowledge which might be very hard to obtain and thus expensive. From an applied standpoint of view, there are two fundamental reasons that motivate the use of learning techniques in computer software. First, machine learning techniques often result in much shorter a design time while offering enhanced flexibility. Second, machine learning techniques sometimes outperform human programmers, and hence may be used to improve the overall performance of a system. Both aspects, short design time and superior performance, have been driving forces in applying machine learning technology in practice. Recently machine learning technology has begun to make its way to real-world applications. It is now being used in a broad spectrum of consumer products and industrial applications. For example, Mangasarian and Street [Olvi et al., 1994] report a learning system which allows to detect breast cancer in a non-invasive way. More specifically, the system is able to detect malign cancer cells in fine needle aspirates by visually inspecting images of cells with close to 100% accuracy. Their system is currently being used in at the University of Wisconsin hospitals, conceivably saving the lives of many women. Another example for a successful implementation may be found in Leech [Leech, 1986]. He reports that a company saves large amounts of money by controlling the processing of fuel using decision tree learning techniques.

From Wetware to Software: Neural Networks

Many of to date's successful real-world applications of machine learning technology can be found in the field of artificial neural networks. Artificial neural networks, in rough analogy to the human brain, consist of a collection of simple and densely interconnected processing units, which process information in a massively parallel manner. This abstract description, in fact, fits what can been found in the brain, although none of the current approaches is powerful enough to account for the phenomenon of intelligence. The long way of academic research to successful real-world application is best illustrated by elucidating the history of artificial neural network research. The roots of formal neural network models can be traced back to early work by McCulloch and Pitts [McCulloch and Pitts, 1943] and Hebb [1949] in the 40's, who established first models of neural processing and plasticity. Minsky [Dana Angluin, 1988; Hayes-Roth and Jacobstein, 1994], in the late 60's, showed some of the limitations of the early methods, which had quite a discouraging effect on the field. At this time there existed virtually no industrial or commercial applications, and the active research community was very small. Finally, in 1986, a book series [Kazuo Asakawa and Hideyuki Takagi, 1994; Burgard et al., 1991] triggered an "explosion" of world-wide activities in this field, which also produced an impressive variety of industrial and commercial applications.

Conclusion

In the last years, AI technology has been applied to a variety of real-world problems. In this paper we have outlined some examples from knowledge systems and machine learning/neural networks, along with some recent applications to industry, business and science.Due to lack of spacewe cannot here expound on other, relevant research areas that also have produced impressive real-world results, such as robotics, vision, speech technology, and evolutionary programming. Indeed, successful ideas and applications that grew out of AI are, once established, often not explicitly recognized as AI technology. The true number of AI applications is unclear, as many companies, like financial forecasting companies or the military, do not publish their techniques and results. In recent years AI has undergone a change. Partially based on funding policies of government agencies and industry , partially due to the maturing field, and partially since today's hardware has grown powerful enough, practical applications have gained in importance. Many of today's applications, however, would have been impossible without the decades of fundamental research carried out mainly at universities and academic institutions. After decades of AI research, we are beginning to witness an ever growing diffusion of AI results into technology, along with the derivation of new products and services. Thus, we firmly believe that a well-defined goal-driven effort in future research is well warranted.

About the author

Prof. Amar Nath Singh is a Reader in the department of Computer Science and Engineering, GEC, Bhubaneswar, Odisha. He received his master degree in the year of 2007 form BPUT, Rourkela, Odisha, India. He is perusing his PhD in the field of Mines area. His research are includes Underground Mines, Artificial Intelligence, Wireless Sensor Network and Expert system, Fuzzy Logic Network, HCL, Algorithm, Web logic, etc.

REFERENCES

Babak Hassibi, David G. Stork and Takahiro Watanabe, 1994. Optimal brain surgeon: Extensions, streamlining and performance comparisons. In *Advances in Neural Information Processing Systems 6*, San Mateo, CA. Morgan Kaufmann.

Buchanan, B.G. and Feigenbaum, E.A. 1978. Dendral and meta-DENDRAL: Their applications dimension. *Artificial Intellicence*, 11:5–24.

Burgard, W., Cremers, A.B., Grebe, J., Grev´e, R., Uttringhaus, S.L., ucher, F.M. and Pl ¨umer, L. 1991. Knowledge based planning of underground lighting in hardcoal mining. In R. Vichnevetsky and J.J.H. Miller, editors, *Proceedings of the 13th IMACS on Computers and Applied Mathematics*, pages 1751–1752.

Clark, P., Cestnik, B., Sammut, C. and Stender, J. 1991. Applications of machine learning: Notes from the panel members. In *Proceedings of the Sixth European Working Session on Machine Learning*. Springer Publisher.

Dana Angluin, 1988. Queries and concept learning. *Machine Learning*, 2(4):319–342.

David J. C. MacKay, 1992. *Bayesian Methods for Adaptive Models*. PhD thesis, California Institute of Technology, Pasadena, California, 1992.

Hayes-Roth, F. and Jacobstein, N. 1994. The state of knowledge-based systems. *Communications of the ACM*, 37(3):27–39, March 1994.

Hebb, D. O. 1949. *The Organization of Behavior*. Wiley, NewYork.

Ivan Bratko, 1992. Applications of machine learning: Toward knowledge synthesis. In *Proceedings of the International Conference on Fifth Generation Computing Systems*, Tokyo, ICOT.

John Laird, Paul Rosenbloom and Allen Newell, 1988. Chunking in SOAR: The anatomy of a general learning mechanism. *Machine Learning*, 1(1):11–46.

John Mc Dermott, 1981. Domain knowledge and the desing process. In *ACM/IEEE 13thDesign Automation Conference Proceedings*.

Kazuo Asakawa and Hideyuki Takagi, 1994. Neural networks in Japan. *Communications of the ACM*,37(3):106–112, March 1994.

Leech, W. J. 1986. A rule-based process control method with feedback. *Advances in Instrumentation*, 41:69–175.

Mamdani, E.H. 1974. Applications of fuzzy algorithms for control of simple dynamic plant. *Proc. IEE*, 121(12):1585–1588.

Minsky, M. and Papert, S. 1969. *Perceptrons*. The MIT Press, Cambridge, Massachusetts.

Olvi, L. and Mangasarian, W. 1943. Nick Street, andWilliamH.Wolberg. Breast cancer diagnosis and prognosis via linear programming. In *AAAI Spring Symposion on AI in Medicine*, Stanford, CA, March 1994. 8

Pat Langley, 1992. Areas of application for machine learning. In *Proceedings of the Fifth International Symposium on Knowledge Engineering*, Sevilla, 1992.

Steven Minton, 1988. *Learning Search Control Knowledge: An Explanation-Based Approach*. Kluwer Academic Publishers.

Tom M. Mitchell, Rich Caruana, Dayne Freitag, John Mc Dermott and David Zabowski, 1994. Experience with a learning personal assistant. *Communications of the ACM*, July 1994. (to appear).

****