Chapter 22

Artificial Intelligence:
Current Issues and Applications

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ABSTRACT

This chapter explains the Artificial Intelligence (AI) techniques in terms of Artificial Neural Networks (ANNs), fuzzy logic, expert systems, machine learning, Genetic Programming (GP), Evolutionary Polynomial Regression (EPR), and Support Vector Machine (SVM); the AI applications in modern education; the AI applications in software engineering development; the AI applications in Content-Based Image Retrieval (CBIR); and the multifaceted applications of AI in the digital age. AI is a branch of science which deals with helping machines find the suitable solutions to complex problems in a more human-like manner. AI technologies bring more complex data-analysis features to the existing applications in various industries and greatly contribute to management's organization, planning, and controlling operations, and will continue to do so with more frequency as programs are refined.

INTRODUCTION

Artificial intelligence (AI) techniques become useful as the alternate approaches to conventional techniques or as the components of integrated systems (Kalogirou, Metaxiotis, & Mellit, 2010). The accuracy of AI methods is superior to that of traditional statistical methods in dealing with financial problems, especially regarding nonlinear patterns (Bahrammirzaee, 2010). AI methods are employed throughout the information retrieval process toward value-added services (Mandl, 2009). Information retrieval has considerably changed with the expansion of the Internet and the advent of inexpensive graphical user interfaces and mass storage devices (Kasemsap, 2017a). AI methods outperform the conventional methods in terms of response time and controllability (Kow, Wong, Rajkumar, & Rajkumar, 2016), and are utilized in various applications, such as automation and process control (Ali, Hussain, Tade, & Zhang, 2015).

The utilization of AI has increased since the middle of the 20th century as recognized in its application in a wide range of engineering and science problems (Yaseen, El-shafie, Jaafar, Afan, & Sayl, 2015). Since the idea of AI with knowledge had been introduced, so many thoughts, theories, and ideas in

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various fields of engineering, science, geology, social study, economics, and management methods have been proposed (Sugiyama, 2013). Examples of the available AI techniques are artificial neural networks (ANNs), genetic programming (GP), evolutionary polynomial regression (EPR), support vector machine (SVM), and k-nearest neighbor algorithm (Elshorbagy, Corzo, Srinivasulu, & Solomatine, 2010).

This chapter is based on a literature review of AI. The extensive literature of AI provides a contribution to practitioners and researchers by explaining the current issues and applications of AI in order to maximize the impact of AI in the digital age.

BACKGROUND

The beginning of modern AI can be traced to the classical philosophers' attempts to describe human thinking as a symbolic system. But the field of AI was not formally founded until 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term "artificial intelligence" was coined. The organizers included John McCarthy, Marvin Minsky, Claude Shannon, Nathaniel Rochester, all of whom went on to greatly contribute to the field. In the years following the Dartmouth Conference, impressive advances were made in AI. Machines were built that could solve school mathematics problems, and a program called Eliza became the world's first chatbot, occasionally fooling users into thinking that it was conscious.

The first "AI winter" lasted from 1974 until around 1980. It was followed in the 1980s by another boom, thanks to the advent of expert systems, and the Japanese fifth generation computer initiative, which adopted massively parallel programming. Expert systems limit themselves to solving narrowly defined problems from single domains of expertise (for instance, litigation) using vast databases. They avoid the messy complications of everyday life, and do not tackle the perennial problem of trying to inculcate common sense. The funding dried up again in the late 1980s because the difficulties of the tasks being addressed was once again underestimated, and also because desktop computers overtook mainframes in speed and power, rendering very expensive legacy machines redundant.

AI has crossed the threshold for the simple reason that it works. AI has provided effective services that make a huge difference in people's lives, toward enabling companies to make a lot of money. A central goal of AI is the design of automated systems that can accomplish a task despite uncertainty (Poupart, 2012). Such systems can be viewed as taking inputs from the environment and producing outputs toward the realization of some goals (Poupart, 2012). Modern intelligent agents approaches should combine methodologies, techniques, and architectures from many areas of computer science, cognitive science, operation research, and cybernetics (Marinagi, Panayiotopoulos, & Spyropoulos, 2005). AI planning is an essential function of intelligence that is necessary in intelligent agents applications (Marinagi et al., 2005).

SIGNIFICANT ASPECTS OF ARTIFICIAL INTELLIGENCE

This section provides the AI techniques in terms of ANNs, fuzzy logic, expert systems, machine learning, GP, EVR, and SVM; the AI applications in modern education; the AI applications in software engineering development; the AI applications in content-based image retrieval (CBIR); and the multifaceted applications of AI in the digital age.

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