Book Review
"Applying Computational Intelligence" by Kordon, Springer
Edward Tsang 2010.01.31

What is this book about?

The aim of this book is to explain how and where computational intelligence techniques can be applied to real-world applications. The book is divided into four parts. Part I explains computational intelligence techniques. Part II explains opportunities that computational intelligence could bring to real-world applications, and obstacles frequently encountered by practitioners. Part III explains how computational intelligence can be applied to real-world problems. Part IV (which contains only one chapter) describes the future.

How this book should be assessed

In order to help industrial practitioners, the concepts introduced must be easy to follow. It does not matter whether the computational techniques that a practitioner adopts are the "optimal" ones, as long as they help to improve his/her applications. It matters to the readers whether the concepts are easy to understand. It matters whether the book clearly and simply states the opportunities that the techniques introduce to the industry. If this book succeeds in bringing computational intelligence to practitioners, the competent industrial practitioners will be able to further study the techniques.

The target readers include managers, industrial researchers, software vendors, entrepreneurs, academics and students. This is rather ambitious. For this book to succeed, it is important that it guides each group of readers to the parts of the book that are relevant to them. For example, practitioners who want to know what computational intelligence techniques are may be particularly interested in Part I. Managers who want to know how computational intelligence could add value to their businesses may be interested in Part II. Practitioners who want to apply computational intelligence techniques to their problems may want to read Chapters 11 and 12 in Part III. Computational intelligence researchers who want to market their techniques to industry may want to read Chapter 13.

Breadth and Depth

The book provides advice on how to apply computational intelligence techniques to real-world applications. Some of these advice could be useful to new partitions. Some of the views are subjective. This is acceptable for industrial readers. However, for research students, the author should clearly distinguish between factual and subjective statements.

The author made it clear that this is not a detailed theoretical description of

computational intelligence. Neither is it meant to be a comprehensive survey of the field. This book would have served its purpose if it describes any subset of computational intelligence techniques that are relevant to industrial applications. This book has succeeded in this sense, as it has covered major techniques in computational intelligence, including fuzzy systems, machine learning, evolutionary computation, swarm intelligence and intelligent agents.

Clarity and accuracy

Chapter 2 describes the strength and weakness of the techniques introduced in later chapters. Some of the views are subjective. Perhaps the idea is to allow the readers to decide which chapter to read, which is quite a good approach. Over-generalization is inevitable, but the main points are agreeable. This is a non-trivial achievement, given that the scope of some of the topics is diverse (e.g. agent technology). Organizing researches in such topics demands hard work as well as insight.

If I want to pick on the book's weaknesses, it is that some of the key points are vague. For example, it is not clear to me what criteria the author uses to measure optimality in the statement "*Support vector machines (SVM) derive solutions with optimal balance between accurately representing the existing data and dealing with unknown data*". Besides, I am not sure if Section 4.2 has succeeded in introducing support vector machines to readers with no prior knowledge. The author did warn the readers that "*explaining SVM is challenging and requires a mathematical background*", but readers do want to learn what SVM is from this book. Following the warning, the author could have explained SVM with the necessary mathematics, which will give readers with a mathematical background a chance to learn this technique; readers without the right mathematical background would have to skip this section.

The heading of Chapter 4 is "machine learning". This chapter covers neural network and support vector machines. This may give the wrong impression that the other techniques in the book, such as evolutionary computation, are not used for machine learning. In fact, evolutionary computation plays a major role in reinforcement learning.

Most of the applications were accurately presented. As a minor note, I should point out that neural network is no longer a popular technique in finance, though it once was (as it was described in Section 4.6).

Presentation

The author emphasized the importance of visualization, in the form of mind-mapping (which simply means to show in drawing form, concepts related to a subject matter) and clip-arts (the choice of clip-art is a matter of taste). The author argued that they were much clearer than the bullet points. An example given was Figures 13.4 vs 13.5. Both figures explained the role of computational intelligence techniques. The author argued that Figure 13.4 gives a clearer picture. I find this unconvincing. Not everyone who looks at Figure 13.4 would get the intended messages conveyed by the author. (Similarly,

when I looked at Figure 13.6, I failed to get the intended message.) I would agree that for someone who has understood what computational intelligence techniques can do, Figure 13.4 makes a good summary.

Artificial Intelligence vs Computational Intelligence

The author started the book by introducing artificial intelligence (AI), and explained its limitations. Then he introduced computational intelligence, which "delivered the missing capabilities of classical AI".

By artificial intelligence, the author referred to four "approaches": "knowledge management", expert systems, case-based reasoning and inference mechanisms. By "knowledge management", the author referred to knowledge acquisition, representation and implementation, which cover all the other three "approaches". So the "four approaches" were not mutually exclusive.

I am not sure how successful the author has been in characterizing and distinguishing between artificial intelligence and computational intelligence. To some, the latter is a continuation of the former. Machine learning, which the author considered unique to computational intelligence, has always been an important subject in artificial intelligence (see "Key Difference #3" in Section 1.3.1). The author suggested that artificial intelligence involves putting experts in the computer, while computational intelligence involves building effective collaboration between human and the computer (Figure 1.5, page 25). This is not necessarily the general view. The author's view of artificial intelligence was partial. Some of the more successful stories in artificial intelligence are missing; some of the remarkable successes (in terms of industry applications) include natural language processing, machine vision and constraint satisfaction.

Verdict
Computational intelligence has gone a long way. Many ideas developed have serious potential for applications. This is a book that brings computational intelligence to practitioners. It is valuable because there is always a danger of academics developing ideas for publications without paying attention to whether such ideas have practical applications. (In fact, some of those publications do not even interest other researchers.)

This is an ambitious project. The book covers a wide range of topics, and attempts to give practical advice to a wide range of readers. I have no doubt that some of the ideas presented in this book are subject to controversy. Such debates will help to clarify viewpoints, which can only be good for the development of the subject. This is a valuable book for computational intelligence.

[End of Review]