

Chapter 2

Overview of Computational Intelligence

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ABSTRACT

This chapter presents an overview of computational intelligence. The chapter starts with an introduction about the issue of computational intelligence. Then, the related methodologies used in the book are discussed in the next section. Right after this, the use of computational intelligence methodologies to deal with various remanufacturing/reverse logistics problems are conducted. Finally, the conclusion drawn in the last section closes this chapter.

INTRODUCTION

Remanufacturing research specifically deals with some central questions of manufacturing (e.g., production planning and control, supply network, and marketing) which have been of concern to researchers over the years. Yet, in (Ferrer & Whybark, 2001; Guide, 2000; Guide, Jayaraman, & Srivastava, 1999; Güngör & Gupta, 1999), the authors pointed out that the activities in remanufacturing can be more complicated from those in traditional manufacturing. For example, uncertain timing and quantity of returns; disassembly of returned products; and need to balance returns with demands. Taking these characteristics into account, researchers tend to consider more efficient way compare with exhaustive research due to the fact that most problem under uncertain conditions. Nowadays, computational intelligence (CI) is a fast-moving and multidisciplinary field. Unlike the exhaustive research, CI has ability to deal with imprecise information, partial truth, and uncertainty (Andina & Pham, 2007). In addition, CI can guarantee to find optimal solutions in polynomial time which is efficiently in practice. Here we want to present an overview of some technological paradigms, under the umbrella of CI. The scope of this chapter will encompass the main algorithms of CI, including artificial neural networks (ANN), fuzzy systems (FS), evolutionary algorithm (EA), multi-agent system (MAS), and swarm intelligence (SI).

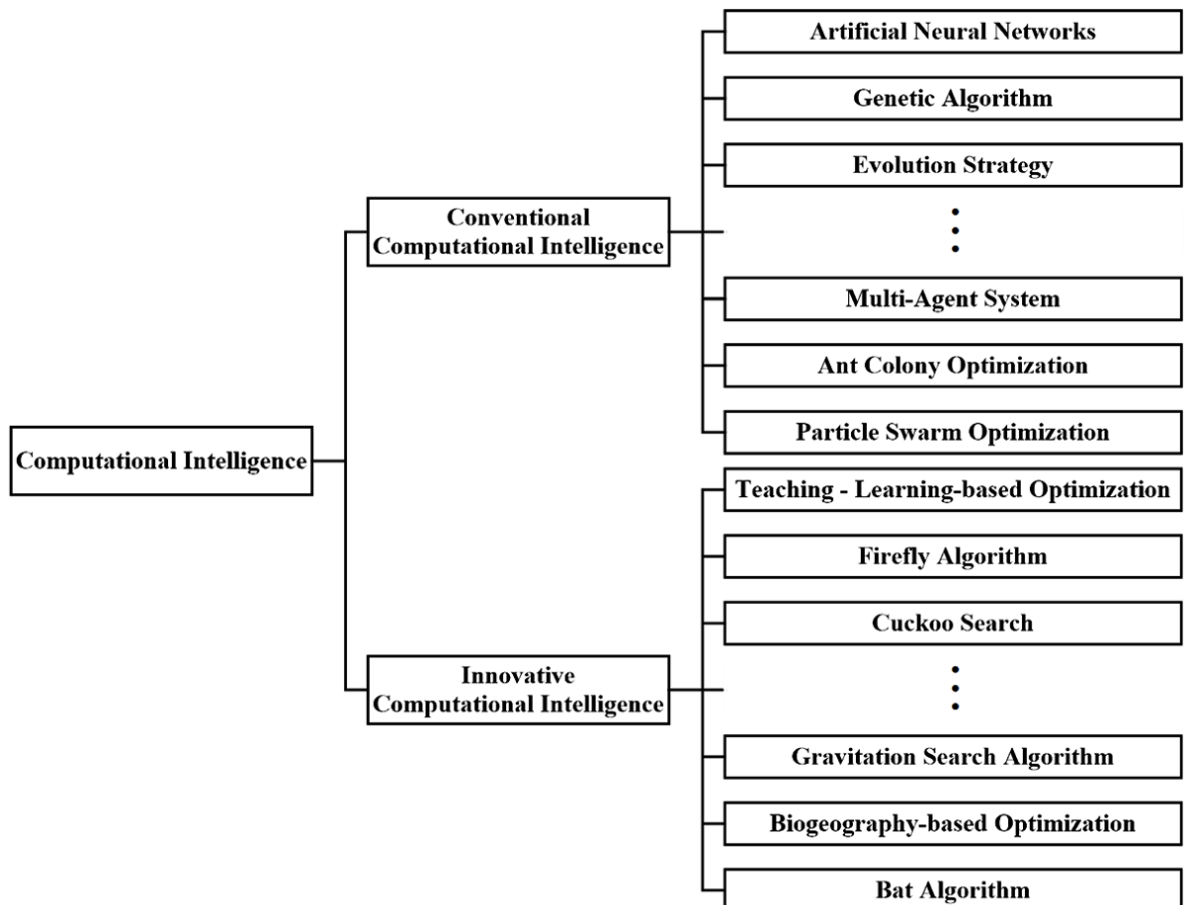
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BACKGROUND

What Is Computational Intelligence?

A major impetus in algorithmic development is to resolve increasingly complicated problems by designing various algorithmic models. Tremendous successes have been achieved through the modelling of biological and natural intelligence, resulting in so-called “computational intelligence (CI)”. In fact, the term “CI” was introduced for the emulation of “intelligent” functions of animal brain by digital electronic computers. It is a fairly new research field, which is still in a process of evolution. At a more general level, CI comprises a set of computing systems with the ability to learn and deal with new events/situations, such that the systems are perceived to have one or more attributes of reason and intelligence (Marwala & Lagazio, 2011). According to the degree of acceptance, we have divided CI into two categories, namely conventional and innovative CI. Some representative techniques under each class are shown in Figure 1.

Figure 1. CI paradigms



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