

Chapter II

Making Decisions with Data: Using Computational Intelligence Within a Business Environment

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ABSTRACT

This chapter identifies important barriers to the successful application of computational intelligence (CI) techniques in a commercial environment and suggests a number of ways in which they may be overcome. It identifies key conceptual, cultural and technical barriers and describes the different ways in which they affect both the business user and the CI practitioner. The chapter does not provide technical detail on how to implement any given technique, rather it discusses the practical consequences for the business user of issues such as non-linearity and extrapolation. For the CI practitioner, we discuss several cultural issues that need to be addressed when seeking to find a commercial application for CI techniques. The authors aim to highlight to technical and business readers how their different expectations can affect the successful outcome of a CI project. The authors hope that by enabling both parties to understand each other's perspective, the true potential of CI can be realized.

INTRODUCTION

Computational intelligence (CI) appears to offer new opportunities to a business that wishes to improve the efficiency of their operations. It appears to provide a view into the future, answering questions such as, “What will my customers

buy?”, “Who is most likely to file a claim on an insurance policy?”, and “What increase in demand will follow an advertising campaign?” It can filter good prospects from bad, the fraudulent from the genuine and the profitable from the loss-making.

These abilities should bring many benefits to a business, yet the adoption of these techniques has been slow. Despite the early promise of expert systems and neural networks, the application of computational intelligence has not become mainstream. This might seem all the more odd when one considers the explosion in data warehousing, loyalty card data collection and online data driven commerce that has accompanied the development of CI techniques (Hoss, 2000).

In this chapter, we discuss some of the reasons why CI has not had the impact on commerce that one might expect, and we offer some recommendations for the reader who is planning to embark on a project that utilizes CI. For the CI practitioner, this chapter should highlight cultural and conceptual business obstacles that they may not have considered. For the business user, this chapter should provide an overview of what a CI system can and cannot do, and in particular the dependence of CI systems on the availability of relevant data.

Given the right environment the technology has been shown to work effectively in a number of fields. These include financial prediction (Kim & Lee, 2004; Trippi & DeSieno, 1992; Tsaih, Hsu, & Lai, 1998), process control (Bhat & McAvoy, 1990; Jazayeri-Rad, 2004; Yu & Gomm, 2002) and bio-informatics (Blazewicz & Kasprzak, 2003). This path to successful application has a number of pitfalls and it is our aim to highlight some of the more common difficulties that occur during the process of applying CI and suggest methods for avoiding them.

BACKGROUND

Computational intelligence is primarily concerned with using an analytical approach to making decisions based on prior data. It normally involves applying one or more computationally intensive techniques to a data set in such a way that meta-information can be extracted from these data.

This meta-information is then used to predict or classify the outcome of new situations that were not present in the original data. Effectively, the power of the CI system derives from its ability to generalize from what it has seen in the past to make sensible judgements about new situations.

A typical example of this scenario would be the use of a computational intelligence technique such as a neural network (Bishop, 1995; Hecht-Neilsen, 1990; Hertz, Krogh, & Palmer, 1991) to predict who might buy a product based on prior sales of the product. A neural network application would process the historical data set containing past purchasing behaviour and build up a set of weighted values which correlate observed input patterns with consequent output patterns. If there was a predictable consistency between a buyer's profile (e.g., age, gender, income) and the products they bought, the neural network would extract the salient aspects of this consistency and store it in the meta-information represented by its internal weights. A prospective customer could then be presented to the neural network which would use these weights to calculate an expected outcome as to whether the prospect is likely to become a customer or not (Law, 1999).

Although neural networks are mentioned above, this process is similar when used with a number of different computational intelligence approaches. Even within the neural network field, there are a large number of different approaches that could be used (Haykin, 1994). The common element in this process is the extraction and use of information from a prior data set. This information extraction process is completely dependent upon the quality and quantity of the available data. Indeed it is not always clear that the available data are actually relevant to the task at hand — a difficult issue within a business environment when a contract has already been signed that promises to deliver a specific result.

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