

Web Components for Development of Computational Methods: Example with Fuzzy Logic Rules

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Abstract: Computational methods (either statistical or non-statistical) for experimental design, data analysis and optimisation are needed to provide information which can be used by a variety of decision makers and for a variety of purposes in the natural sciences research. It is crucial for scientists to keep pace with evolving computational approaches, to comply with specific needs emerging from applied research. Software tools are desirable not only to provide easy access to a large variety of data processing methods but also to grant for continually updating, adding more solutions as well as keeping all the parts up to date as computing software environments change and novel computational methods evolve. Based on that, the Data Analysis 'N' Assessment (DANA) project was approached and meant as platform-independent, integrated repository of statistical and soft-computing procedures for use in applied research. It consists of a core engine and a set of plug-ins sharing an array of functionalities. The core engine is written in Java and integrates a set of libraries (e.g., from the R language for statistical computing) accessible via web services. This is achieved through usage of the object-oriented paradigm and high-level utility functions, hiding much of the complexity of the underlying libraries. The core engine handles data logging, event handling, information and synchronisation between different libraries. All classes implement a defined interface that makes it possible to create derivative works by third parties. A Graphical Users' Interface is dynamically generated via PHP through a set of configuration XML files. The XML Schema Definition below undergoes validation. This paper illustrates the features of DANA through the components used for computation of fuzzy-logic based rules.

Keywords: DANA; Fuzzy logic; Java; Software component; XML.

1. INTRODUCTION

An ever-increasing number of researchers and software developers are attracted towards data processing techniques. Different reasons justify such continuing interest. On one hand, high level quality in scientific work is perceived when a minimum of sophistication in data processing is placed in. A tight correlation is also occurring between the problems that emerge in developing innovative analytical approaches and those typical of other research fields such as, for example, mathematical modelling. Moreover, today's scientific research easily results in the generation of considerable amounts of data. To ensure data quality, accurate analyses, and evaluation tend to be integral parts of the processes conducted by research projects. Creation of a platform to provide for effective management of the data and the associated analyses has therefore become a high priority. Such a platform should ultimately support data handling, processing, visualization, reporting, and knowledge dissemination tools, integrated with robust document tracking and control tools.

Basic and advanced statistical methods are routinely used to support a variety of studies. Complementary approaches are the so-called soft-computing techniques (including neural networks, fuzzy systems, evolutionary computations, etc.) which attempt to study, model

