A Serendipitous Software Framework for Facilitating Collaboration in Computational Intelligence

by

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Abstract

A major flaw in the academic system, particularly pertaining to computer science, is that it rewards specialisation. The highly competitive quest for new scientific developments, or rather the quest for a better reputation and more funding, forces researchers to specialise in their own fields, leaving them little time to properly explore what others are doing, sometimes even within their own field of interest. Even the peer review process, which should provide the necessary balance, fails to achieve much diversity, since reviews are typically performed by persons who are again specialists in the particular field of the work. Further, software implementations are rarely reviewed, having as a consequence the publishing of untenable results. Unfortunately, these factors contribute to an environment which is not conducive to collaboration, a cornerstone of academia — building on the work of others.

This work takes a step back and examines the general landscape of computational intelligence from a broad perspective, drawing on multiple disciplines to formulate a collaborative software platform, which is flexible enough to support the needs of this diverse research community. Interestingly, this project did not set out with these goals in mind, rather it evolved, over time, from something more specialised into the general framework described in this dissertation. Design patterns are studied as a means to manage the complexity of the computational intelligence paradigm in a flexible software implementation. Further, this dissertation demonstrates that releasing research software under an open source license eliminates some of the deficiencies of the academic process, while preserving, and even improving, the ability to build a reputation and pursue funding.

Two software packages have been produced as products of this research: i) CILib, an open source library of computational intelligence algorithms; and ii) CiClops, which

is a virtual laboratory for performing experiments that scale over multiple workstations. Together, these software packages are intended to improve the quality of research output and facilitate collaboration by sharing a repository of simulation data, statistical analysis tools and a single software implementation.

Keywords: Computational Intelligence, Design Patterns, Open Source, CILib, CiClops

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[1] http://cilib.sourceforge.net
[2] http://www.sourceforge.net

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