A Software Suite for Causal Modeling and Discovery

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In the past 25 years, tremendous progress has been made in developing general computational methods for discovering causal knowledge from data based on a representation called causal Bayesian networks. While much progress has been made in the development of these computational methods, they have not been readily available, sufficiently efficient, or easy to use by biomedical scientists, and they have not been designed to exploit Big Data that are increasingly available for analysis.

The Center for Causal Discovery has created a suite of tools that make efficient causal modeling and discovery (CMD) algorithms from Big Data available on a variety of platforms and environments. The suite uses a common set of CMD algorithms implemented as a Java library. We have created software around this library to develop our suite:

Tetrad-lib – a readily imported Java library of CMD algorithms
Tetrad – a desktop application that runs on any Java-enabled computer
Causal-cmd – a command-line application that runs on any Java-enabled computer
Causal-web – an easy-to-use Web-based application that submits causal discovery jobs to an HPC (e.g., three terabyte 64 core nodes at the Pittsburgh Supercomputing Center (PSC) or Amazon EC2)
R-causal – an R library
Py-causal – a Python module
A Docker instance that contains a ready-to-run instance of R-Studio and the R-causal
Causal-REST-API – a RESTful API hosted at 1) the PSC that submits CMD jobs to the Bridges supercomputer and 2) Amazon EC2

All of our software is open source and licensed under the GNU GPL such that it can be modified and incorporated into other software. The software and documentation is freely available from www.ccd.pitt.edu, and the source code is available from github.com/cmu-phil/tetrad and github.com/bd2kccd.

Session to which submitted: Software, Analysis, & Methods Development