Cooperative-Competitive Genetic Programming for Classification

October 19, 2018 (2:30 pm - 3:30 pm)

The ACADIA INSTITUTUE FOR DATA ANALYTICS and the JODREY SCHOOL OF COMPUTER SCIENCE

Present

Cooperative-Competitive Genetic Programming for Classification

Who: Dr. Andy McIntyre

Where: Carnegie Hall, Room 113, Acadia University

When: Friday, October 19th, 2018 from 2:30 – 3:30pm

Abstract:

This talk concerns the design and implementation of learning framework that can be applied to real-world (large-scale and high-complexity) classification or categorization problems with the underlying learning approach having roots in evolutionary computer algorithms (that is, algorithms that are inspired by a neo-Darwinian metaphor for evolution). Specifically, the Genetic Programming (GP) paradigm iteratively builds populations of computer programs (or models) that continually adapt and improve as they experience a training environment. The GP approach in general offers a number of compelling advantages for the end-user including: flexibility of representation, problem-specific definition of cost function and explicit user-specification of credit assignment models. This approach implements a number of critical extensions to the GP algorithm for the supervised learning (classification) context, providing the potential to solve very large, complex learning problems quickly, transparently and automatically. More specifically, in this work we address the scalability, solution modularity and model transparency pathologies of the classification context under the conventional GP algorithm. The design included a novel cooperative / competitive approach to co-evolutionary training that employed local, model-specific information to decompose problems automatically (i.e., teams of cooperating 'specialist' programs were competitively evolved during training and later combined using a voting policy to handle different subsets of the problem). While enabling automatic problem decomposition, the approach remains extremely efficient in terms of hardware requirements (both storage and run time are entirely decoupled from the size of the training data), providing direct support for large (in terms of cardinality as well as dimensionality) and unbalanced data sets, characteristic of many real-world problem domains. A performance benchmark and analysis that considered computational overhead, classification accuracy and solution transparency was conducted over twelve well-known, real-world data sets where the strengths of my framework were established against a suite of state-of-the-art classifiers, including conventional GP.

About the Presenters:

Dr. Andy McIntyre is a Data Scientist at the Acadia Institute for Data Analytics (AIDA) and Adjunct Faculty member at Dalhousie University who received his PhD in Computer Science from Dalhousie University in 2007 and a BSc from Mount Allison University in 2000. Andy has been working in many real-world problem domains since 2007 including medical and gaming applications of Machine Learning, Image Processing / Computer Vision, and Data Analytics systems. Current research interests include evolutionary computing, parallel architectures, reinforcement learning, procedural content generation and predictive systems with model transparency.

Everyone is welcome to attend

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