

# A Hybrid Algorithm for Feature Selection and Classification

R.D. Deranian,<sup>1\*</sup> R.J. Groebner,<sup>2</sup> and D.T. Pham<sup>1</sup>

<sup>1</sup>*Intelligent Systems Research Laboratory, Cardiff University, Wales, UK*

<sup>2</sup>*General Atomics, P.O. Box 85608, San Diego, California 92186-5608 USA*

*\*Present address: General Atomics, P.O. Box 85608, San Diego, California 92186-5608 USA*

*email: deranian@fusion.gat.com, fax: (858) 455-4156*

## Abstract

A new hybrid inductive learning algorithm, the Group Method of Data Handling for Rules (GMDHRULES), which brings together classification capabilities and feature selection, is described. GMDHRULES embeds an inductive learning algorithm into a statistical learning network. Neurons in the statistical learning network store parameter references to data, which the inductive learning algorithm uses to compute models. The feature selection capabilities of GMDHRULES combined with an inductive rule generator allows for iterative improvement of the classification models. New layers of neurons are added to the statistical learning network as long as the classification accuracy of the inductive rules improves. The best models, based on their ability to correctly classify training data, are propagated through the network. The GMDHRULES algorithm was developed to perform feature selection while finding good inductive classifications of certain important plasma states found in nuclear fusion plasmas. Resulting classifications were applied to a set of test data and found to classify this data well.

**Keywords:** GMDH, Inductive Learning, Fusion, Statistical Learning Network, Feature Selection, Classification