

Technical and economic processes are getting constantly more complex. Analytical models are often insufficient to describe and handle this complexity. Data accumulations, on the other hand, are growing at ever increasing speeds, providing a potential source of knowledge and experience to understand and manage these processes.

This work is therefore concerned with the general problem of creating comprehensible computational models from data. To derive such models from data, various different methods like statistical regression, artificial neural nets, and other data-mining based approaches exist. Typically, however, the resulting models are either comprehensible (e.g. rule based approaches) or accurate (e.g. neural nets), referring a tough decision to the user. As in real world applications often both aspects are of high importance, the need for methods providing comprehensible and accurate models arises.

In this work a novel approach which uses fuzzy predicates to create close-to natural language expressions describing the relations in the data under investigation is presented. These expressions are not only easily comprehensible, but can be used for classification and numerical prediction tasks as well. A further application of the proposed methods is the characterization of general patterns in the data (e.g. clusters) using linguistic expressions.

The concepts and methods described in this work have been successfully applied in a number of real world projects and are available within the machine learning framework for Mathematica which has been mainly developed by the author.