Chapter 9

Neural Computation for International Conflict Management

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This chapter reports about the application of pattern recognition methods from the area of "neural computation" exploring their capabilities for finding structure in a data base of conflict management events since 1945 (Confman: Bercovitch and Langley, 1993; see Chapter 6). In particular, the following two methods were tested:

- So-called Multilayer Perceptrons (MLPs) as powerful nonlinear classifiers to predict the outcome of conflict management
- So-called Selforganizing maps (SOM) as a flexible clustering and visualization method enabling structured "browsing" through the data

Two explorations were performed using the previously available version of Confman, containing data from 1945-1995. A thorough analysis of non-linear classification revealed only minor differences as compared to linear classifiers. Yet, classification performance significantly above chance could be reached. Selforganizing maps, on the other hand, proved to be a viable technique for revealing interesting clusters and substructure in the data.

A third exploration was performed with an extended version of Confman, containing data from 1945-2000. Here, the focus was put on evaluating

R. Trappl (ed.), Programming for Peace, 185–225.

whether there are significant differences in the two subsets 1945-1989 and 1990-2000, assuming that 1990 marks the end of the cold war. Results show that this is indeed the case. Conflict management outcome is more predictable after 1989 using an MLP, and the SOM analysis leads to interesting interpretations.

1 INTRODUCTION

Work described in this chapter falls in the category of "intelligent data analysis" in the political sciences (see, e.g., Schrodt, 1991; 2000; Fürnkranz et al., 1997; Wickboldt and Bercovitch, 1996, for examples in literature). In particular, it is an attempt to apply advanced statistical methods to find structure possibly hidden in data collected about political conflicts in the world, in order to support decision makers or political scientists aiming at a deeper insight into such data. The scientific area the mathematical methods are drawn from is also usually called "pattern recognition" and comprises, among others, the following tasks (see, among others, Duda et al., 2000):

- Classification (or sometimes called "discriminant analysis"): This refers to the task of assigning one of several classes to a number of so-called "features" describing a case, by building a classifier based on one set of data (the "training set") and then applying it to new data, thus making predictions about the proper class.
- Regression (or sometimes called "function approximation"): This refers to the task of estimating a numerical variable (e.g. the number of fatalities in a conflict) based on other features describing the data. Again, an estimation (or usually called a "model") is build based on training data, then used to derive estimates for new data cases.
- Clustering (or sometimes called "unsupervised learning"): This refers to the task of finding significant groups of data (i.e. sets of similar cases that are distinctly different from other sets), such as to describe a data set in terms of such clusters.
- Visualization: This refers to the task of depicting high-dimensional data (i.e. data that is described by a high number of features, too high to be simply plotted as points) in a comprehensive manner, such as a low-dimensional "map" depicting cases as points in a 2-dimensional plane. By doing this, the structure of the data set, i.e. how cases relate