Chapter 10

Modeling International Negotiation

Statistical and Machine Learning Approaches

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An earlier study by Druckman et al. (1999) showed that a variety of cases of international negotiation can be distinguished in terms of their objectives. A set of 16 features of negotiation effectively distinguished—by multidimensional scaling (MDS)—among the types of international negotiation objectives proposed by Iklé (1964). The features include aspects of the parties, issues, process, negotiating environment, and outcomes. The statistical analyses performed in that study showed a distinct profile for each of the Iklé categories: innovation, re-distribution, extension, normalization, and side effects. In addition, a sixth category was identified as being different than the others. This category was referred to as multilateral regime negotiations, a form that became prevalent twenty years after Iklés book appeared. These results were further supported by discriminant analysis classifications. When only information about the 16 features were known, 78 % (or 21 of 27 cases) were placed in the correct a priori category. These are impressive results. They provide empirical validation for this well-known typology of negotiation. In this chapter, an attempt is made to extend these analyses in several directions with the help of sophisticated methodological approaches not previously used to interpret data on negotiation.[1]

One direction concerns negotiation outcomes. Of particular interest in the negotiation literature are questions about the relative importance of different

1. These techniques have, however, been used to analyze a large number of historical cases of international mediation. Those cases focus primarily on various dimensions of the mediated interventions rather than on the negotiation process (Trappl et al., 1997).

R. Trappl (ed.), Programming for Peace, 227–250.

kinds of factors—such as relationships, issues, process, and the situation surrounding the talks—on the outcome. Each kind of factor has been shown to influence whether an agreement is achieved and the type of agreement as partial vs. comprehensive or as favoring one or another party (asymmetrical) vs. equal benefits (symmetrical). The question asked is which factor(s) is (are) the best predictors or discriminators of these outcomes? (For answers with laboratory studies see Druckman, 1993; 1994; for an application of these findings, see Druckman al., 2002). These questions are addressed here in the context of cases on international negotiation.

Another direction focuses on the Iklé categories. We want to know whether some features relate more strongly to (or provide better discriminations among) the various types of negotiation than others. Whereas previously we were interested in the profiles of characteristics (the largest set) that distinguish among the types, we are now interested in the smallest sub-set of those characteristics that accurately distinguishes among the Iklé categories. This entails a search for the particular features from the set of 16 that are the strongest discriminators. This is a search for the simplest model of negotiating objectives. It is conducted with the aid of both statistical and machine-learning approaches.

For both these directions—focus on outcomes and on negotiating objectives—we are interested in the extent to which the machine-learning approach adds value to the findings obtained with statistical methods. These approaches can be regarded as being similar in the sense that both model regularities in a dataset. But, there are also differences. Statistical approaches are based on assumptions about the distribution of data (e.g., parametric analyses assume normal distributions) while machine-learning approaches make few assumptions about the distributions. The borders between these approaches can, however, be fuzzy. In a recent paper, Breiman (2001) contrasts the algorithmic modeling of the machine-learning approach to the data-modeling culture of the statistical community. Many machine-learning algorithms are treated in the statistical literature, including decision or classification trees (Breiman et al., 1984; Quinlan, 1986) and inductive rule learning (Fürnkranz, 1999; Friedman and Fisher, 1999). In this chapter, we compare statistical findings, primarily correlational analyses, with two types of machine-learning approaches, decision trees and rule learning. Of interest is the extent to which the findings converge or are mutually reinforcing. As well, we are interested in diverging findings which may be either contradictory or complementary in the sense of added knowledge about the dataset. We return to this issue in the discussion section.

The analyses are conducted on a dataset of 42 cases. In the earlier study, we performed analyses on 30 cases, categorized initially into the five Iklé cat-