Complex Decision Rules in the Form of Decision Trees

Authors : Avinash S. Jagtap, Sharad D. Gore, Rajendra G. Gurao

Abstract : Decision rules become more and more complex as the number of conditions increase. As a consequence, the complexity of the decision rule also influences the time complexity of computer implementation of such a rule. Consider, for example, a decision that depends on four conditions A, B, C and D. For simplicity, suppose each of these four conditions is binary. Even then the decision rule will consist of 16 lines, where each line will be of the form: If A and B and C and D, then action 1. If A and B and C but not D, then action 2 and so on. While executing this decision rule, each of the four conditions will be checked every time until all the four conditions in a line are satisfied. The minimum number of logical comparisons is 4 whereas the maximum number is 64. This paper proposes to present a complex decision rule in the form of a decision tree. A decision tree divides the cases into branches every time a condition is checked. In the form of a decision tree, every branching eliminates half of the cases that do not satisfy the related conditions. As a result, every branch of the decision tree involves only four logical comparisons and hence is significantly simpler than the corresponding complex decision rule. The conclusion of this paper is that every complex decision rule can be represented as a decision tree and the decision tree is mathematically equivalent but computationally much simpler than the original complex decision rule

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