AUTOMATED DIAGNOSIS IN MULTIPHASIC SCREENING

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1. Introduction

While efforts at mathematizing the medical diagnostic process continue [10] the current state of the art appears to be characterized by two observations:

(1) in applications where the "correct" diagnosis can be established (for example, by surgery or autopsy) the accuracy of diagnostic algorithms is comparable but not superior to the performance of experts [14], [16];

(2) different analytical techniques give similar results [6], [7], [9].

One is thus tempted to argue that if experts can effectively compete with Bayes' theorem (at least, with that version which assumes the independence of symptom variables [16]) or if experts can weigh the evidence as effectively as a discriminant function, a good case for the exploration of relatively simple decision schemes can be made. This would seem to apply, in particular, to medical areas in which no confirmation of physicians' diagnoses is routinely available and where the major purpose of "automated" diagnosis is to maximize agreement with "routine clinical diagnosis" rather than agreement with "ultimate authority." The so-called multiphasic screening [3] as practiced in the Kaiser Foundation Medical Care Program, provides a typical example; here responses to a battery of several hundred medical questions are recorded in addition to measurements from a standard series of laboratory tests. At the conclusion of such an examination, the patient sees a clinician who reviews the findings and records diagnostic impressions on a check list containing some two hundred diagnoses. This setting is thus quite different from the typical application area of "computer diagnosis" mentioned above where a relatively small set of variables are considered for a small set of mutually exclusive diagnoses as they can be defined in narrow specialty fields. The magnitude of the task inherent in multiphasic screening would seem to make computational simplicity a feature of extreme virtue.

For these reasons, we continue to be interested in diagnostic schemes involving a limited number of dichotomized variables (YES-NO Questions and/or Tests) such as the likelihood ratio method of Neyman [5], [12], [13] and the simple

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