CHAPTER 6

Computation: The NPMLE

We now consider the computational issues involved in calculating the NPMLE. We will focus on the simplified version of the problem in which there are no auxiliary parameters. The standard strategy to incorporate auxiliary parameters is to alternate between an algorithm for the latent parameters and one for the auxiliary parameters; this section describes only the latent parameter phase of that operation.

We will start with an overview of the algorithmic strategies available, deferring the details to the works of others.

After the overview, we wish to address an important issue that has seen little attention. In most problems, one cannot hope to compute the NPMLE exactly because there is no finite time algorithm that will attain the solution. Thus one must devise strategies that ensure that the computations have gone far enough to give desired statistical accuracy, but have not gone needlessly far. We will offer one strategy for this.

At this point, there is a limited supply of software available for the nonparametric analysis. See Böhning, Schlattman and Lindsay (1992) for a description of C.A.MAN, Ezzet and Davies (1988) for a description of MIXTURE and DerSimonian (1986, 1990) for a published algorithm.

6.1. The convergence issue. We recall that the test for whether a *candidate* latent distribution Q is the nonparametric maximum likelihood estimator $\hat{Q}$ is to check whether the gradient inequality holds:

$$D_Q(\phi) \leq 0 \qquad \forall\, \phi \in \Omega.$$

Unfortunately, in a typical problem one has an iterative algorithm such that one cannot in a finite amount of time attain this inequality. There are two issues here.

First, there are often *infinitely* many inequalities to check, corresponding to all ϕ in Ω. We will later consider the implications of a simple solution to this problem where we assume that there is a chosen finite subset, say Ω_s, of s grid points ϕ_j, where the gradient will be checked. One of our points of interest becomes the appropriate choice for the elements of such a grid.