

Lecture Notes: Mixed Effects Models and Longitudinal Data Analysis

Jiming Jiang
University of California, Davis, U. S. A.

March 2005

1 Linear Mixed Models

1.1 Introduction

The term “mixed model” is sometimes confused with “mixture model”, although the two are not unrelated. The main difference is that, while a mixture model is often defined through conditional distributions, a mixed model almost always involves random effects.

There is no general consensus among mixed-model users on the roles that the random effects play in a mixed model. Some believe that the random effects represent unobserved variables of practical interest, which for good reasons should be considered random. This is what we call the first-type usage. Others use the random effects as ways of modelling the correlations among the observations, but are not interested in the random effects themselves. Such a usage is called the second-type. Robinson (1991) gives a wide-ranging account of the first-type usage of random effects. As for the second-type, one of the fast-developing areas is the analysis of longitudinal data (e.g., Laird and Ware 1982, Diggle *et al.* 1996). Several books have been published on mixed models in general. See, Rao and Kleffe (1988), Searle *et al.* (1992), Khuri *et al.* (1998), McCulloch and Searle (2000), among others.

¹The notes are based on a tutorial lecture series given at the workshops on Semi-parametric Methods for Survival and Longitudinal Data held at the Institute for Mathematical Sciences, National University of Singapore, March 29-30, 2005.