

## **Non-deletion Approach to Detect Discordant Subjects in Repeated Measurements**

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Repeated measurements are found in many fields such as medical research and linguistic research, but diagnostic methods for them are still in their infancy. Some authors have attempted to adjust the standard diagnostic tools in regression to repeated measurements but those modified statistics are mainly based on the change of coefficients. Most diagnostics previously proposed do not generalize well to either random effects or nonlinear models. Often linear or nonlinear mixed effect models are used for repeated measures data.

Repeated measurements contain a certain number of observations per subject and sometimes patterns (or curves) over subjects are more of interest than individual observations. So a potential outlying curve(s) should be dealt in a different manner. Two types of outlying curves are taken into consideration and the proposed technique simultaneously diagnoses the individual curves in more than one sense. The new method re-expresses residual sum of squares at each level and then studentize them. Furthermore, the proposed method can be used to examine the influence of each observation in a given subject, and provides a graphical measure of goodness-of-fit.

This method will be the first to look at two dimensions of the outlier problem at once and promises to reveal more information about the shape and location of outlying pattern. In addition, this method works well for both linear and nonlinear mixed effect models. The performance of the proposed method can be seen in a simulation example and real data from biomedical engineering and orthodontic data.