

# Tolerance intervals in general mixed effects models using small sample asymptotics

Thomas Mathew and Gaurav Sharma

*University of Maryland Baltimore County, USA*

## Abstract

The computation of tolerance intervals in mixed and random effects models has not been satisfactorily addressed in a general setting when the data are unbalanced and/or when covariates are present. In the talk, satisfactory one-sided and two-sided tolerance intervals in such a general scenario will be derived, by applying small sample asymptotic procedures. In the case of one-sided tolerance limits, the problem reduces to the interval estimation of a percentile, and accurate confidence limits are derived using small sample asymptotics. In the case of a two-sided tolerance interval, the problem does not reduce to an interval estimation problem; however, it is possible to derive an approximate margin of error statistic that is an upper confidence limit for a linear combination of the variance components. For the latter problem, small sample asymptotic procedures can once again be used in order to arrive at an accurate upper confidence limit. In the talk, balanced and unbalanced data situations will be treated separately, and computational issues will be briefly addressed. Extensive numerical results show that the tolerance intervals derived based on small sample asymptotics exhibit satisfactory performance regardless of the sample size. The results will be illustrated using examples.