

On Generalized Degrees of Freedom and their Application in Linear Mixed Model Selection

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Abstract: The concept of degrees of freedom plays an important role in statistical modeling and is commonly used for measuring model complexity. We will show that the nominal degrees of freedom, i.e., the number of unknown parameters, may fail to work in some modeling procedures and in particular in linear mixed model situations. Drawing upon existing literature, a new version of the generalized degree of freedom is introduced that measures the complexity of a statistical model. More specifically, our proposed generalized degree of freedom for a linear mixed effects model is derived based on the sum of the sensitivity of the expected fitted values with respect to their underlying true means. We show that this can be simplified to a sum of covariance terms. We will further show that our generalized degree of freedom satisfies some desirable properties. In this presentation, we will briefly describe the derivations of the proposed generalized degree of freedom and highlight the differences to other generalized degrees of freedom. We will also present different methods to estimate our generalized degree of freedom, by using both data perturbation and the residual bootstrap. Finally, we will show how our generalized degree of freedom can be used for linear mixed model selection.

Keywords: Deviance, Information Criterion, Resampling, Bootstrap