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Cui, Jingyu, Ma, Renjun, Hasan, M. Tariqul (2019). Generalized Linear Mixed Model with Crossed Random Effects. 2019 Annual Meeting of the Statistical Society of Canada.

Cui, Jingyu, Ma, Renjun, Hasan, M. Tariqul (2019). Crossed Random Effects Modelling of Binomial Data with Random Cluster Sizes. The Seventh Annual Canadian Statistics Student Conference.

Tweedie Generalized Linear Models with Crossed Random Effects

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Jingyu Cui

in the Department of Mathematics & Statistics

U.N.B., Fredericton, N.B.

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Examining Committee

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Abstract

In educational and medical studies, cross-classified data are very common. In the cross-structured data, the observations corresponding to one level of a random effect could correspond to multiple levels of the other random effect. In this thesis, a Tweedie generalized linear mixed model with crossed random effects is introduced to deal with the cross-structured dataset. Moreover, two random effects are considered as multiplicative rather than additive in the model. The estimates of the random effects are obtained by using orthodox best linear unbiased predictor (BLUP) method. The estimation for the model parameters, involving regression parameters and dispersion parameters, are conducted iteratively until the results converge. Without the necessity of specifying the distributions of random effects and incorporating Tweedie distribution into the model, our method offers a great flexibility to the

distribution of the dataset. Three applications are shown in this thesis to demonstrate how the proposed model fit differently distributed datasets with distribution-free random effects. The simulation studies are also conducted to measure the model performance.