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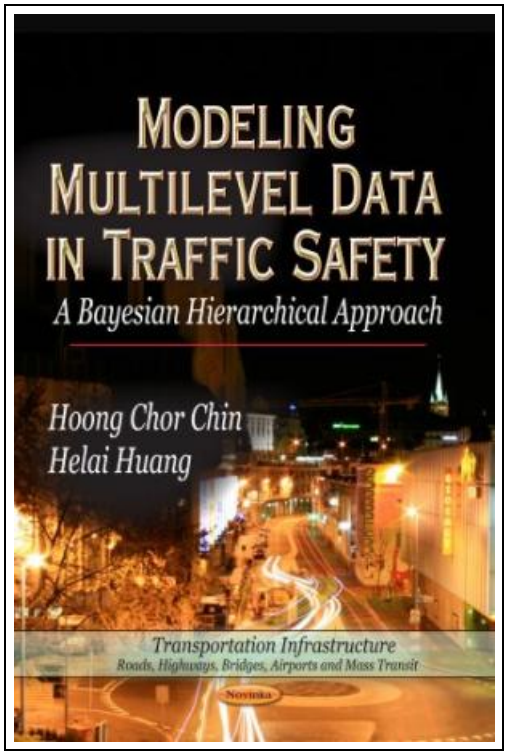

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MODELING MULTILEVEL DATA IN TRAFFIC SAFETY: A BAYESIAN HIERARCHICAL APPROACH

Nova Science Publishers Inc. Paperback. Book Condition: new. BRAND NEW, Modeling Multilevel Data in Traffic Safety: A Bayesian Hierarchical Approach, Hoong Chor Chin, Helai Huang, Background: in the study of traffic system safety, statistical models have been broadly applied to establish the relationships between the traffic crash occurrence and various risk factors. Most of the existing methods, such as the generalised linear regression models, assume that each observation (e.g. a crash or a vehicle involvement) in the estimation procedure corresponds to an individual situation. Hence, the residuals from the models exhibit independence. Problem: However, this 'independence' assumption may often not hold true since multilevel data structures exist extensively because of the data collection and clustering process. Disregarding the possible within-group correlations may lead to production of models with unreliable parameter estimates and statistical inferences. Method: following a literature review of crash prediction models, this book proposes a 5 T-level hierarchy, viz. (Geographic region level, Traffic site level, Traffic crash level, Driver-vehicle unit level, and Vehicle-occupant level) Time level, to establish a general form of multilevel data structure in traffic safety analysis. To model properly the potential between-group heterogeneity due to the multilevel data structure, a framework of hierarchical models that explicitly specify multilevel structure and correctly yield parameter estimates is employed. Bayesian inference using Markov chain Monte Carlo algorithm is developed to calibrate the proposed hierarchical models. Two Bayesian measures, viz. the Deviance Information Criterion and Cross-Validation Predictive Densities, are adapted to establish the model suitability. Illustrations: the proposed method is illustrated using two case studies in Singapore: a crash-frequency prediction model which takes into account Traffic site level and Time level; and a crash-severity prediction model which takes into account Traffic crash level and Driver-vehicle unit level. Conclusion: comparing the predictive abilities of the proposed models against those of...

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