

## **Semiparametric Poisson Regression Model in Clustered Data**

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A semiparametric poisson regression is proposed in modeling spatially clustered count data. The heterogeneous covariate effect across the clusters is formulated in the context of nonparametric regression while the random clustering effect is based on a parametric specification. We propose two estimation procedures: (1) the parametric and nonparametric parts are estimated simultaneously via penalized least squares; and (2) the parametric and nonparametric parts are estimated iteratively via the backfitting algorithm. The simulation study exhibited the advantages of these two methods over ordinary poisson regression and an intrinsically linear model when the aggregate covariate effect is negligible. This happens when sensitivity to the covariate is minimal or the data-generating model is not linear. The two estimation methods are generally more advantageous over the traditional approaches when the linear model fit is poor. In cases where there is a good linear fit, the proposed methods are at par with the traditional methods, but the second approach can still be advantageous when there are several covariates involved since the backfitting algorithm yields computational simplicity in the estimation process.

**Key Words:** Nonparametric regression, backfitting, random effects, generalize additive models