



THE UNIVERSITY OF
CHICAGO

Computational and Applied Mathematics
&
Statistics Student Seminar

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Heterogeneous Dispersion Negative Binomial Modeling with Poisson Process
Augmentation

Friday, October 9, 2026

12:30 PM

Jones 303

ABSTRACT

Negative binomial models are standard statistical tools for modeling count data, as they account for the overdispersion—a variance greater than mean—that is typical of most real count datasets. However, overdispersion is rarely constant across observations in count data, often exhibiting complex patterns depending on covariates, space, and time. We introduce a general framework for inference in any negative binomial model with Gaussian priors on each of the log-mean and log-dispersion. This framework rests on a novel latent-variable representation for the negative binomial in terms of a thinned and marked Poisson process. We show that instantiating parts of this Poisson process enables tractable posterior inference in a wide variety of latent variable models, including for nonparametric regression and spatiotemporal modeling. We demonstrate this approach on transportation and epidemiological case studies.