

**MICHIGAN STATE UNIVERSITY**  
Department of Statistics and Probability

# COLLOQUIUM

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## New Residuals for Regression Models with Noncontinuous Outcomes

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10:20 AM - 11:10 AM [Eastern Time](#)  
C405 Wells Hall, Simulcast on Zoom

### Abstract

Noncontinuous outcomes are found frequently in a wide variety of fields. For example, stages of cancer in medical research (ordinal), the number of offspring of organisms in ecology (count), and rainfall amounts in climate research (semicontinuous with a probability of zero corresponding to no rain). Given the potential detrimental consequences of model misspecification, after fitting a regression model, it is of prime importance to check the adequacy of the model. However, the assessment of regression models with noncontinuous outcomes is challenging and has many fundamental issues. With noncontinuous outcomes, standard regression model assessment tools such as Pearson and deviance residuals do not follow their null distributions under the true model, calling into question the legitimacy of model assessment based on these tools. To bridge this gap, we propose a new type of residuals for noncontinuous outcomes that are applicable to general regression models. The proposed residuals are based on two layers of probability integral transform. When at least one continuous covariate is available, the proposed residuals converge to being uniformly distributed under the correctly specified model. One can construct visualizations such as QQ plots to check the overall fit of a model straightforwardly, and the shape of QQ plots can further help identify possible causes of misspecification such as overdispersion. Through simulation, we demonstrate empirically that the proposed tools outperform commonly used residuals for various model assessment tasks.

Zoom details can be found at: <https://stt.natsci.msu.edu/stt-colloquium-zoom-info/>

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