Exploring Poisson Regression

Midterm Presentation I - Regression

MSSC 6250 - Spring 2025
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Working full-time in roles that involve analyzing count data, we would like to enhance our understanding of Poisson regression to apply it effectively at work. Poisson regression is a valuable tool for modeling count data, and gaining practical experience with it will allow us to expand our analytical toolkit and improve our ability to address real-world problems.

Project Objectives

The primary goal of this project is to explore the Poisson regression and its applications, focusing on understanding when it is most effective compared to linear and logistic regression. Specifically, we aim to:

1. **Understand the theoretical foundation** of Poisson regression and its assumptions.
2. **Compare Poisson regression with linear and its variants like ridge regression**, identifying the conditions under which each method is appropriate.
3. **Analyze different types of datasets**, including:
    a. Standard Poisson-distributed data
    b. Data exhibiting overdispersion
    c. Zero-inflated data

Methodology

We will implement our analysis using R, covering the following steps:

1. **Data**: Find publicly available or generate synthetic datasets that reflect various count data scenarios.
2. **Model Fitting**: Apply Linear, Ridge, and Poisson regression.
3. **Model Performance Evaluation**: Assess and compare the performance of the models tested.
4. **Address Special Cases**: Investigate how overdispersion and zero-inflation affect model performance and mention potential remedies

Conclusion

By the end of this project, we expect to have a deeper understanding of Poisson regression, its limitations, and practical applications. This knowledge will directly benefit our work by enabling us to model and analyze count data more effectively. We also expect to provide our classmates with the intuition to analyze count data.