Group Contribution Report for STATS 451 Final Project

Group Members: Sirui Chen, Yingxi Chen, Jiayu Feng, Qiyun Teng

Project: Methane Emission in Michigan’s Power Plant Sector

Sirui Chen

* Data Collection & Management: Acquired, verified, and integrated missing 2016 data for coal from EPA, and maintained the database integrity throughout the project.
* Data Analysis: Conducted preliminary statistical analyses and interpreted data trends related to methane emissions over the years.
* Model Validation: Assessed the model's predictive performance and validated it against established emission data.
* Figured Out Reason for 2016 Coal’s Decline: Investigated and retrieved the reasons for what happened in 2016 caused coal emissions decreases.

Yingxi Chen

* Data Cleaning & Preprocessing: Rigorously cleaned the dataset to ensure its suitability for analysis, including dealing with outliers and missing values.
* Variable Selection & Justification: Identified and justified the inclusion of relevant variables, refining the model's predictive power.
* Policy Implications Drafting: Drafted the section on policy implications, translating our findings into actionable recommendations.
* Examined Normal Zero One Priors: Conducted robustness checks on the normal zero one priors for all regression coefficients to ascertain their impact on our model's predictions.

Jiayu Feng

* Statistical Modeling: Constructed and calibrated the Bayesian hierarchical models using the STAN software.
* Sensitivity Analysis: Systematically performed sensitivity analyses on prior distributions to validate the robustness of the model.
* Methodology Review: Authored the methodological section of the report, ensuring accurate representation of our statistical approach.
* Justified Variance Parameter Choice: Re-evaluated and justified the prior for the variance parameter choice, strengthening the credibility of our model.

Qiyun Teng

* Correlation Analysis & Interpretation: Delved into the correlation between predictor variables, enhancing the interpretive strength of the model.
* Report Finalization: Played a key role in editing and finalizing the report, ensuring clarity, cohesion, and compliance with academic standards.
* Validated the model by performing additional MCMC simulations after rescaling the predictor variables, providing a detailed rationale for the correlation and its implications on our model.