ABSTRACT

Regression is a statistical model used to measure and explain the relationship between two or more variables. The linear regression model is often referred to as a global regression because the estimated parameters it produces are global in nature. To analyze spatial data, the Geographically Weighted Regression (GWR) model is commonly used, which applies geographically weighted estimations. A more advanced model that incorporates both spatial and temporal dimensions simultaneously is the Geographically and Temporally Weighted Regression (GTWR), which is an extension of the GWR model. This study analyzes the factors influencing the Human Development Index (HDI) in West Sumatra Province by considering spatial and temporal variations using the GTWR model. The predictor variables include the percentage of households with access to proper sanitation, the open unemployment rate, the school participation rate for ages 13–15, and the percentage of people living in poverty. The data used in this study are secondary data obtained from the Central Bureau of Statistics of West Sumatra Province for the period 2020–2023. Model estimation was carried out using the Gaussian kernel weighting function, with optimal spatial-temporal bandwidth selected based on the minimum Cross Validation (CV) criterion. Based on the fitted GTWR model, most regencies and cities in West Sumatra showed consistent patterns of significant parameters over the years. Two regencies, Dharmasraya and Agam, experienced changes in significant variables from 2020 to 2023. A comparison of the R-squared and AIC values across the three models indicates that the GTWR model outperforms the global regression and GWR models in modeling HDI values in West Sumatra during the 2020–2023 period. The GTWR model achieved the highest R-squared value of 91.63% and the lowest AIC value of 303.6234, indicating better model performance than the alternatives.

Keywords: Linear Regression, GWR, GTWR, HDI, Kernel Gaussian, Bandwidth