ABSTRACT

Life Expectancy (LE) is one of the main indicators used to measure the level of welfare and quality of life in a region. In Indonesia, particularly in Central Java Province, LE has shown an increasing trend each year for both males and females. This increase is suspected to be associated with several factors, including the infant mortality rate, the percentage of toddlers receiving complete immunizations, and the number of hospitals. Therefore, further analysis is needed to understand the relationship between these factors and LE. This study employs a nonparametric mixed regression model combining spline and multivariable kernel methods to analyze the relationship between predictor variables and LE. This model was chosen because it has high flexibility in capturing data distribution patterns, some of which are up and down and some of which are random, enabling a more accurate representation of the relationship between the predictor variables and LE. The optimal model is selected based on the smallest *Cross Validation* (CV) value obtained through a series of experiments on knot point and *bandwidth*. This study uses data from 2020 at the district/city level in Central Java. The in-sample data comprises 24 districts/cities, while the out-sample data comprises 11 other districts/cities, both selected at random. Based on the analysis, the best mixed nonparametric regression model using the Gaussian Kernel function is model with 2 knot points and order 3, knot points location and bandwdith that is $\xi_1 = 11.04$, $\xi_2 = 14.52$, $h_1 = 40$, and $h_2 = 2.6$. The combination of knot points and bandwidth has the smallest Cross Validation (CV) value of 1.0347920. The coefficient of determination (R^2) of this model is 0.8102, indicating that 81.02% of the variation in LE can be explained by the predictor variables. The model's performance on the out-sample data, evaluated using the Mean Absolute Percentage Error (MAPE), results in a value of 1.9%, demonstrating excellent predictive accuracy. R^2 value greater than 0.67 and MAPE value less than 10% indicates that the final model is very good. This study is complemented by a Graphical User Interface (GUI) application developed using the R programming language.

Keywords: Life Expectancy, Mixed Nonparametric Regression, Spline *truncated*, Kernel, Cross Validation, R GUI