ABSTRACT

Random blood glucose and age can influence the increase in systolic blood pressure in patients with type 2 diabetes mellitus. The data pattern forms a random pattern, so the modeling uses multivariable kernel nonparametric regression. This study uses the *Nadaraya-Watson* estimator because the calculation is simpler and uses the Gaussian kernel function with *bandwidth* optimization methods are *Generalized Cross-Validation* (GCV) and *Unbiased Risk* (UBR). The model with GCV optimization obtained an R^2 of 99.9713%, while the model with UBR optimization obtained an R^2 of 99.9726%, so the model produced by UBR optimization was the best. The model with UBR optimization revealed that systolic blood pressure in patients with type 2 diabetes mellitus was strongly influenced by random blood glucose and age. Evaluation of the UBR optimization model performance on the testing data yielded an *Symmetric Mean Absolute Percentage Error* (SMAPE) value of 18.05096%. This means that the model performance with UBR optimization has a good ability to predict data.

Keywords: multivariable kernel regression, *Nadaraya-Watson*, *Unbiased Risk, Generalized Cross-Validation*.