ESTIMATING THE HUMAN HEIGHT BASED ON FOOT LENGTH BY USING LEAST SQUARES METHOD, RUNGE KUTTA 4TH ORDER AND CUBIC B SPLINE

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ABSTRACT

This study aims to estimate human height based on foot length using three different methods: Least Squares Method, Runge Kutta 4th Order, and Cubic B-spline. Data from 50 participants were collected through the Google form. The Goodness of Fit metrics, including Mean Squares Error (MSE), Root Mean Square Error (RMSE), R-squared, Adjusted R-squared, Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) were analysed to evaluate the performance of each method. The results indicate that the Runge Kutta 4th Order method consistently outperformed the other two methods across all Goodness of Fit metrics. It achieved the lowest MSE and RMSE values, indicating superior predictive accuracy compared to the Cubic B Spline, which had the highest MSE and RMSE values. The R-squared and adjusted R-squared values for the Runge Kutta algorithm were close to 1, suggesting an excellent fit and capturing a significant proportion of the variance in the data. Furthermore, the AIC and BIC values also favoured the Runge Kutta 4th Order method, with the lowest values, indicating a better trade-off between model fit and complexity. On the other hand, the Cubic B-spline method had the highest AIC and BIC values, suggesting poor model fit or excessive complexity. In conclusion, based on the Goodness of Fit results, the Runge Kutta 4th Order method is recommended for estimating human height based on foot length. Additionally, the analysis revealed a weak positive relationship between foot length and human height, as indicated by Pearson's correlation coefficient.

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