

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**ESTIMATING THE TOTAL MALAYSIAN ROAD ACCIDENTS
AND FATALITIES USING GAUSS-NEWTON METHOD OF
LEAST SQUARES**

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

A road accident can be defined as an undesired event that occurs caused by a loss of driving control until a collision with an object occurs, or a vehicle crash occurs, resulting in property damage, harm to the driver, passengers, and other road users, or both. As for road fatality, any person killed or dying within a certain amount of time affected by a road injury accident is considered a road fatality. The studies that were conducted in Malaysia mostly used the Autoregressive Integrated Moving Average (ARIMA) model, Seasonal Autoregressive Integrated Moving Average model (SARIMA), Time Series Regression (TSA) and Macroscopic Second-Order model, and there is less study done on curve fitting technique in forecasting for road accidents and fatalities. Furthermore, Gauss-Newton method is not commonly used as well. Therefore, the objectives of this study are to determine a function that fits to the Malaysian road accident and fatalities data using Gauss-Newton method. The functions were obtained based on the data trend that fit to the data which are exponential and quadratic models. Hence, both functions were examined for its accuracy and efficiency based on root mean square error (RMSE) and mean absolute percentage error (MAPE) to find the best fit function that will be used to predict the total Malaysian road accident and fatalities for the next five years. The findings revealed that quadratic model is more effective and accurate compared to the exponential model since its error is smaller for both road accident and road fatalities. Hence, the quadratic model will be chosen to predict the total Malaysian road accident and road fatalities for 2022 until 2027. The result shows the road accident cases will be increasing meanwhile the road fatalities cases will decrease from 2022 until 2027. As a recommendation, further researchers can implement other methods in solving nonlinear least square problems, such as the Levenberg-Marquadt method and Broyden's. The iterative process of Broyden's approach is nearly identical to Newton's method. Meanwhile, the Levenberg-Marquadt method uses the gradient descent algorithm, which also has a similar algorithm to the Gauss-Newton method in finding the value for the unknown parameter.