ABSTRACT

Optical telecommunication networks play a vital role in supporting modern communication services that demand high speed and reliability. This study aims to develop a real-time predictive model of optical signal quality using the Logistic Regression method. The model was built using 20 technical parameters.

Data were obtained from the Kaggle platform and processed through stages of cleaning, normalization, and dataset splitting into 80% training and 20% testing data. The logistic regression model produced an intercept value of -3.733, with the highest coefficient found in Optical Amplifier Gain (1.661), followed by Transmission Distance, PMD Coefficient, and BER, each exceeding 1.3. Several variables, such as Fiber Attenuation and Noise, had negative effects on signal quality. These coefficient values indicate the direction and magnitude of each feature's impact on the probability of the optical signal being classified as good.

The model achieved 100% accuracy on the test data, with all predictions matching actual values. The model was implemented in a PyQt5-based desktop application, equipped with technical parameter input, automatic normalization, prediction, result visualization, and Excel export features. Logistic Regression proves effective for predicting optical signal quality and supports efficient network operation decisions.

Keywords: Optical Telecommunication Network, Logistic Regression, PyQt5