

BAB V

CONCLUSIONS AND RECOMMENDATIONS

Bab ini menyajikan rangkuman hasil penelitian yang telah dilakukan mengenai penerapan model Extreme Learning Machine dan Gradient Boost Machine untuk klasifikasi Gizi anak di Rumah Sakit Al-Islam H.M. Mawardi Krian, berdasarkan data rawat inap serta saran yang dapat diberikan untuk pengembangan penelitian selanjutnya.

5.1 Conclusions

Based on the research findings and analysis conducted regarding the application of the Extreme Learning Machine (ELM) and Gradient Boosting Machine (GBM) algorithms for classifying childhood nutritional status at Al-Islam Hospital, Krian, several conclusions can be drawn as follows:

1. The ELM algorithm was implemented utilizing a Single-Hidden Layer Feedforward Neural Network (SLFN) architecture with randomly initialized input weights, enabling highly efficient training through a single linear algebraic calculation to determine the output weights. Conversely, the GBM algorithm was deployed as an ensemble learning method by sequentially constructing 100 decision trees, where each stage aimed to optimize the residual errors of the preceding model using a learning rate of 0.1 to achieve an optimal accuracy rate.
2. The implementation of the Gradient Boosting Machine (GBM) algorithm demonstrated superior performance in classifying nutritional status. This is evidenced by achieving the highest accuracy rate of 0.92 (92%), a precision of 0.80 (80%), a recall of 0.57 (57%), and an F1-score of 0.67. GBM's sequential learning capability (boosting) proved highly effective in minimizing classification errors.
3. The manual implementation of the Extreme Learning Machine (ELM) algorithm yielded competitive performance but remained below that of GBM, achieving an accuracy of 0.90 (90%), a precision of 0.75 (75%), a recall of 0.43 (43%), and an F1-score of 0.55. Although ELM offers a distinct advantage in computational speed due to its analytical output weight computation, the model

still encountered greater difficulty in recognizing patterns within the minority category ('Tidak Baik' / Poor) compared to GBM.

Overall, the application of the Gradient Boosting Machine (GBM) proved to yield superior and more stable performance compared to the Extreme Learning Machine (ELM) in classifying childhood nutritional status. This confirms that boosting-based approaches hold significant potential in supporting healthcare analytical systems utilizing medical record data for the early detection of nutritional issues.

Consequently, it can be concluded that the GBM method represents the most effective approach to enhancing the accuracy and efficiency of the childhood nutritional status classification system at Al-Islam H.M. Mawardi Hospital, Krian. Furthermore, this approach has the potential to serve as a foundation for developing clinical decision support systems aimed at managing childhood malnutrition and obesity with greater precision.

5.2 Recommendations

Based on the research findings obtained, several recommendations can be put forward for consideration in future research, as follows:

1. Incorporating non-physical variables, such as daily dietary patterns, physical activity levels, or history of comorbidities, should be considered to enhance the depth of the nutritional status analysis.
2. For the ELM algorithm, it is recommended to conduct further experiments using variations of activation functions (other than Sigmoid) and automated optimization of the hidden neuron count (using Grid Search) to minimize the margin of error.
3. Given the highly robust accuracy of the GBM model, it could be integrated into hospital information systems (SIMRS) or developed into a mobile application to assist medical staff in performing real-time nutritional screenings.
4. Expanding the data scope to include other hospitals or different regions (outside of Sidoarjo and Surabaya) is advised to provide the model with broader generalization capabilities regarding the variations in childhood growth across Indonesia.

With these recommendations, future studies are expected to develop more adaptive and readily deployable classification models, thereby delivering a more substantial and tangible contribution to improving the nutritional status of school-aged children.