



INTISARI

Preeklampsia merupakan salah satu komplikasi kehamilan yang dapat menyebabkan morbiditas dan mortalitas pada ibu maupun janin apabila tidak dikenali dan ditangani secara dini. Di Indonesia, deteksi preeklampsia umumnya masih bersifat konvensional dan belum didukung oleh sistem berbasis data medis secara optimal. Permasalahan yang diangkat dalam penelitian ini meliputi: identifikasi fitur klinis yang paling berpengaruh terhadap klasifikasi preeklampsia, pemilihan algoritma *machine learning* yang optimal, dan kebutuhan akan sistem rekomendasi yang dapat memberikan intervensi tepat waktu berdasarkan hasil klasifikasi.

Penelitian ini bertujuan untuk mengembangkan sistem klasifikasi tingkat keparahan preeklampsia (normal, ringan, berat) serta sistem rekomendasi klinis berbasis data medis ibu hamil. Metode yang digunakan melibatkan pendekatan *supervised learning* dengan beberapa algoritma *machine learning*, antara lain: *K-Nearest Neighbors*, *Decision Tree*, *Random Forest*, *Support Vector Machine*, *Logistic Regression*, *Gradient Boosting*, dan *LightGBM*. Proses pelatihan dilakukan menggunakan validasi silang Stratified 5-Fold. Selain itu, dilakukan penerapan *ensemble learning* dengan metode *stacking* dalam dua skema: kombinasi seluruh model dasar dan kombinasi empat model terbaik.

Hasil evaluasi menunjukkan bahwa model tunggal terbaik, yaitu SVM, RF, dan LightGBM mampu mencapai akurasi di atas 91%. Model *ensemble stacking* dengan empat *base learner* terbaik menghasilkan performa tertinggi, yaitu akurasi 94,67%, skor F1 91,20%, MCC 90,50%, dan ROC-AUC 98,90%. Sistem rekomendasi yang dikembangkan mengacu pada pedoman Perkumpulan Obstetri dan Ginekologi Indonesia (POGI) dan dirancang untuk mendukung pengambilan keputusan medis secara cepat dan tepat. Penelitian ini memberikan kontribusi nyata dalam pengembangan sistem deteksi dini risiko preeklampsia berbasis data medis ibu hamil di Indonesia.

Kata kunci : Preeklampsia, Klasifikasi Multikelas, Pembelajaran Mesin, *Stacking*



ABSTRACT

Preeclampsia is one of the complications of pregnancy that can cause morbidity and mortality in both mothers and fetuses if not recognized and treated early. In Indonesia, the detection of preeclampsia is generally still conventional and not yet optimally supported by a medical data-based system. The issues addressed in this study include: identifying the most influential clinical features for preeclampsia classification, selecting the optimal machine learning algorithm, and the need for a recommendation system that can provide timely interventions based on classification results.

This study aims to develop a preeclampsia severity classification system (normal, mild, severe) and a clinical recommendation system based on medical data from pregnant women. The methods used involve a supervised learning approach with several machine learning algorithms, including: K-Nearest Neighbors, Decision Tree, Random Forest, Support Vector Machine, Logistic Regression, Gradient Boosting, and LightGBM. The training process was conducted using Stratified 5-Fold cross-validation. Additionally, ensemble learning was applied using the stacking method in two schemes: combining all base models and combining the four best models.

The evaluation results show that the best single models, namely SVM, RF, and LightGBM, are capable of achieving an accuracy of over 91%. The stacking ensemble model with the four best base learners produced the highest performance, with an accuracy of 94.67%, an F1 score of 91.20%, an MCC of 90.50%, and a ROC-AUC of 98.90%. The developed recommendation system is based on the guidelines of the Indonesian Society of Obstetrics and Gynecology (POGI) and is designed to support quick and accurate medical decision-making. This study makes a significant contribution to the development of an early detection system for preeclampsia risk based on medical data of pregnant women in Indonesia.

Keywords : *Preeclampsia, Multiclass Classification, Machine Learning, Stacking*