

Abstrak

Penelitian ini bertujuan mengembangkan model *Deep Learning* berbasis arsitektur *Feature Tokenizer Transformer* (FT-Transformer) untuk klasifikasi penyakit darah menggunakan 103.024 data sekunder retrospektif *Complete Blood Count* (CBC) pasien dari RS Royal Prima Medan. Mekanisme *self-attention* pada model ini diimplementasikan untuk memetakan interaksi kompleks antar-parameter hematologi secara otomatis tanpa memerlukan rekayasa fitur (*feature engineering*) manual. Hasil pengujian menunjukkan bahwa FT-Transformer secara efektif mampu mengatasi tantangan data klinis yang sangat tidak seimbang (*highly imbalanced data*), menghasilkan performa klasifikasi multi-kelas yang superior dan stabil. Hal ini dibuktikan oleh metrik *Accuracy*, *Precision*, *Recall*, dan *F1-Score* yang mencapai angka 0.98 hingga 1.00 pada empat diagnosis utama: Normal, Anemia, Sepsis/Infection, dan Thrombocytopenia. Secara keseluruhan, pendekatan komputasional ini berhasil menghasilkan prototipe *Clinical Decision Support System* (CDSS) yang tangguh dan berpresisi tinggi dalam menginterpretasikan hasil laboratorium tabular.

Kata Kunci : FT-Transformer; *Complete Blood Count* (CBC); Klasifikasi Penyakit Darah; *Deep Learning*; Sistem Pendukung Keputusan Klinis.

Abstract

This study aims to develop a Deep Learning model based on the Feature Tokenizer Transformer (FT-Transformer) architecture for blood disease classification using 103,024 retrospective secondary Complete Blood Count (CBC) patient data from Royal Prima Hospital Medan. The self-attention mechanism in this model is implemented to automatically map complex interactions among hematological parameters without requiring manual feature engineering. Testing results demonstrate that the FT-Transformer effectively overcomes the challenges of highly imbalanced clinical data, yielding superior and stable multi-class classification performance. This is evidenced by Accuracy, Precision, Recall, and F1-Score metrics reaching 0.98 to 1.00 across four main diagnostic categories: Normal, Anemia, Sepsis/Infection, and Thrombocytopenia. Overall, this computational approach successfully produced a robust and high-precision Clinical Decision Support System (CDSS) prototype for interpreting tabular laboratory results.

Keyword : FT-Transformer; Complete Blood Count (CBC); Blood Disease Classification; Deep Learning; Clinical Decision Support System.