

ABSTRAK

Perusahaan manufaktur yang terdaftar di Bursa Efek Indonesia (BEI) menghadapi risiko *financial distress* yang dapat berujung pada *delisting* atau kebangkrutan apabila tidak terdeteksi sejak dini. Pendekatan statistik konvensional seperti Altman Z-Score memiliki keterbatasan dalam menangkap pola non-linear dari data keuangan historis, sementara model *Deep Learning* berkinerja tinggi umumnya bersifat *black-box* sehingga tidak dapat menjelaskan alasan di balik keputusan klasifikasinya. Ketiadaan transparansi ini menjadi hambatan krusial bagi investor, auditor, dan regulator yang membutuhkan dasar analitis yang dapat dipertanggungjawabkan dalam pengambilan keputusan finansial.

Penelitian ini mengembangkan sistem klasifikasi *financial distress* berbasis arsitektur *Gated Recurrent Unit* (GRU) yang diintegrasikan dengan metode *Explainable Artificial Intelligence* melalui *SHapley Additive exPlanations* (SHAP). Data yang digunakan adalah laporan keuangan historis 237 perusahaan manufaktur di BEI periode 2020–2025 yang diekstraksi melalui API Yahoo Finance, dengan empat rasio keuangan sebagai fitur prediktor yaitu *Return on Assets* (ROA), *Debt to Asset Ratio* (DAR), *Current Ratio* (CR), dan *Total Asset Turnover* (TATO). Pelabelan target klasifikasi dilakukan menggunakan formula Altman Z-Score manufaktur dengan ambang batas $Z < 1.81$ sebagai kondisi *distress*. Model GRU dibangun menggunakan pendekatan *sliding window* 3 tahun untuk mengevaluasi dan mengklasifikasikan status *financial distress* pada tahun target dengan optimasi arsitektur melalui Grid Search berbasis *Time Series Cross Validation*, serta penanganan ketidakseimbangan kelas menggunakan strategi *class weighting*.

Hasil pengujian pada testing set yang mencakup 237 sekuens dengan target tahun 2025 menunjukkan bahwa model GRU dengan *class weighting* mencapai *Accuracy* sebesar 90.72%, *Recall* sebesar 86.11%, F1-Score sebesar 84.93%, dan AUC-ROC sebesar 94.36%, dengan keberhasilan mendeteksi 62 dari 72 perusahaan yang secara aktual mengalami *distress*. Analisis SHAP pada level global mengungkap bahwa Return On Asset (ROA) merupakan indikator paling dominan (Mean |SHAP| = 0.04870), diikuti Total Asset Turnover (TATO) (0.043859), DAR (0.042685), dan CR (0.027531), menunjukkan bahwa tingkat profitabilitas perusahaan merupakan indikator evaluasi risiko paling responsif pada sektor manufaktur. Pada level lokal, interpretasi terhadap PT SLJ Global Tbk (SULI) membuktikan bahwa SHAP mampu mengurai kontribusi spesifik setiap rasio secara individual, menjadikan sistem klasifikasi ini tidak hanya akurat secara komputasi tetapi juga transparan dan dapat dipertanggungjawabkan secara finansial.

Kata Kunci: *Financial Distress, Gated Recurrent Unit, SHAP, Explainable Artificial Intelligence, Bursa Efek Indonesia*

ABSTRACT

Manufacturing companies listed on the Indonesia Stock Exchange (IDX) face the risk of financial distress that can lead to delisting or bankruptcy if left undetected at an early stage. Conventional statistical approaches such as the Altman Z-Score are limited in their ability to capture non-linear patterns from historical financial data, while high-performing Deep Learning models are generally black-box in nature and cannot explain the reasoning behind their classification decisions. This lack of transparency poses a critical barrier for investors, auditors, and regulators who require analytically justifiable foundations for financial decision-making.

This study develops a financial distress classification system based on the Gated Recurrent Unit (GRU) architecture integrated with an Explainable Artificial Intelligence method through SHapley Additive exPlanations (SHAP). The data used consists of historical financial statements from 237 manufacturing companies listed on the IDX for the period 2020–2025, extracted via the Yahoo Finance API, with four financial ratios as predictor features: Return on Assets (ROA), Debt to Asset Ratio (DAR), Current Ratio (CR), and Total Asset Turnover (TATO). Classification target labeling was performed using the manufacturing Altman Z-Score formula with a threshold of $Z < 1.81$ to denote the distress condition. The GRU model was constructed using a 3-year sliding window approach to evaluate and classify the financial distress status for the target year, with architecture optimization through Grid Search based on Time Series Cross Validation and class imbalance handled via a class weighting strategy.

Testing results on a held-out testing set comprising 237 sequences with 2025 as the target year demonstrate that the class-weighted GRU model achieves an Accuracy of 90.72%, Recall of 86.11%, F1-Score of 84.93%, and AUC-ROC of 94.36%, successfully detecting 62 out of 72 companies that were actually experiencing distress. Global-level SHAP analysis reveals that Return on Assets (ROA) is the most dominant indicator (Mean $|SHAP| = 0.04870$), followed by Total Asset Turnover (TATO) (0.043859), Debt to Asset Ratio (DAR) (0.042685), and Current Ratio (CR) (0.027531), indicating that the company's profitability level constitutes the most responsive risk evaluation indicator in the manufacturing sector. At the local level, interpretation of PT SLJ Global Tbk (SULI) demonstrates that SHAP is capable of decomposing the specific contribution of each individual ratio, making this classification system not only computationally accurate but also financially transparent and accountable

Keywords: *Financial Distress, Gated Recurrent Unit, SHAP, Explainable Artificial Intelligence, Indonesia Stock Exchange*