ABSTRAK

Prediksi keluaran univariat dari masukan multivariat merupakan tantangan utama dalam pemodelan data karena keragaman distribusi dan kompleksitas hubungan antar variabel. Penelitian ini membandingkan performa tiga algoritma regresi, *Kolmogorov–Arnold Network* (KAN), *Artificial Neural Network* (ANN), dan *Random Forest Regression* (RFR), dalam memprediksi nilai target berbasis data multivariat. Evaluasi dilakukan pada tiga dataset publik dengan karakteristik berbeda: *Student Performance, Superconductor*, dan *Forest Fires*. Kinerja model akan dinilai berdasarkan error (MSE, MAE), efisiensi sumber daya (CPU, GPU, dan memori), serta aspek interpretabilitas model. Hasil eksperimen menunjukkan bahwa Random RFR secara konsisten memberikan hasil terbaik dalam akurasi prediksi. Pada ketiga dataset, RFR mencatat Test MSE dan MAE terendah: *Student Performance* (MSE: 0.194, MAE: 0.249), *Forest Fires* (2.10 / 1.17), dan *Superconductor* (0.145 / 0.253). ANN menampilkan waktu pelatihan tercepat, terutama pada dataset *Superconductor* (5.53 detik), namun dengan error yang bervariasi dan cenderung lebih rendah, seperti pada Test MAE tertinggi (0.407) di dataset tersebut. Sementara itu, KAN menunjukkan keunggulan interpretabilitas dan efisiensi penggunaan GPU, serta performa kompetitif pada dataset dengan struktur matematis. Namun, KAN sangat sensitif terhadap distribusi ekstrem, sebagaimana terlihat dari performa buruk pada *Forest Fires* (MSE: 52.04, MAE: 2.05), akibat overfitting terhadap data yang mengandung banyak outlier dan noise.

Kata Kunci: *Kolmogorov-Arnold Network*, interpretabilitas, *multivariate regression, artificial neural network, random forest.*

ABSTRACT

Predicting univariate outputs from multivariate inputs is a major challenge in data modelling due to the distributions and the complexity of relationships between variables. This study compares the performance of three regression algorithm, Kolmogorov–Arnold Network (KAN), Artificial Neural Network (ANN), and Random Forest Regression (RFR), in predicting target values based on multivariate data. Evaluations were conducted on three public datasets with distinct characteristics: Student Performance, Superconductor, and Forest Fires. Model performance will be assessed based on error metrics (MSE, MAE), resource efficiency (CPU, GPU, and memory), and model interpretability. Results show that Random RFR consistently delivers the best results in prediction accuracy. Across all three datasets, RFR achieved the lowest Test MSE and MAE: Student Performance (MSE: 0.194, MAE: 0.249), Forest Fires (2.10 / 1.17), and Superconductor (0.145 / 0.253). ANN exhibited the fastest training time, especially on the Superconductor dataset (5.53 seconds), with varying and generally lower errors, such as the highest Test MAE (0.407) on said dataset. Meanwhile, KAN demonstrates interpretability and GPU efficiency advantages, as well as competitive performance on datasets with mathematical structures. However, KAN is highly sensitive to extreme distributions, as evidenced by its poor performance on Forest Fires (MSE: 52.04, MAE: 2.05), due to overfitting on data containing many outliers and noise.

Keywords: *Kolmogorov-Arnold Network, interpretability, multivariate regression, artificial neural network, random forest.*