ABSTRAK

PREDIKSI EFISIENSI DAYA PADA PERANCANGAN SISTEM PENGGERAK MOBIL LISTRIK BERBASIS MOTOR BLDC MENGGUNAKAN METODE *ARTIFICIAL NEURAL NETWORK* (ANN)

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Laporan Akhir ini bertujuan untuk merancang dan mengimplementasikan sistem penggerak kendaraan listrik berbasis motor Brushless DC (BLDC) yang mampu mengoptimalkan efisiensi daya, khususnya pada kondisi jalan menurun dengan memanfaatkan gaya gravitasi. Dalam upaya meningkatkan respons adaptif sistem terhadap perubahan medan dan beban kendaraan, digunakan pendekatan *deep learning* melalui metode *Artificial Neural Network* (ANN). Model ANN dibangun dengan input berupa tegangan, arus, daya, dan jenis medan jalan, untuk memprediksi seberapa besar efisiensi daya yang dapat dicapai. Proses pelatihan dilakukan dengan membagi data menjadi data latih dan data uji menggunakan teknik *train-test split*, di mana model dilatih menggunakan fungsi aktivasi ReLU, algoritma optimasi Adam, dan fungsi *loss Mean Squared Error* (MSE). Hasil pengujian menunjukkan bahwa ANN mampu mengenali pola hubungan antarvariabel dan memprediksi efisiensi secara akurat, dengan kesalahan prediksi yang rendah. Sistem yang dirancang tidak hanya efektif dalam memanfaatkan karakteristik medan jalan, tetapi juga menunjukkan potensi integrasi dengan sistem kontrol adaptif dan real-time dalam pengembangan kendaraan listrik yang hemat energi. Dengan demikian, penerapan ANN pada motor BLDC menjadi solusi cerdas untuk mendukung efisiensi dan keberlanjutan dalam teknologi transportasi modern.

Kata Kunci : Motor BLDC, Efisiensi, Baterai, Medan Jalan, *Artificial Neural Network* (ANN).

ABSTRAK

PREDICTION OF POWER EFFICIENCY IN THE DESIGN OF ELECTRIC CAR DRIVE SYSTEMS BASED ON BLDC MOTORS USING THE ARTIFICIAL NEURAL NETWORK (ANN) METHOD

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This Final Report aims to design and implement a Brushless DC (BLDC) motor-based electric vehicle drive system that is able to optimize power efficiency, especially in downhill road conditions by utilizing gravitational force. In an effort to improve the system's adaptive response to changes in terrain and vehicle load, a deep learning approach was used through the Artificial Neural Network (ANN) method. The ANN model is built with inputs such as voltage, current, power, and road terrain type, to predict how much power efficiency can be achieved. The training process was carried out by dividing the data into training data and test data using the train-test split technique, where the model was trained using the ReLU activation function, the Adam optimization algorithm, and the Mean Squared Error (MSE) loss function. The test results showed that ANN was able to recognize patterns of relationships between variables and accurately predict efficiency, with low prediction errors. The designed system is not only effective in taking advantage of the characteristics of the road terrain, but also demonstrates the potential for integration with adaptive and real-time control systems in the development of energy-efficient electric vehicles. Thus, the application of ANN on BLDC motorcycles is a smart solution to support efficiency and sustainability in modern transportation technology.

Keywords: BLDC Motors, Eficiency, Batteries, Road Terrain, Artificial Neural Network (ANN).

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