

**Sistem Pemantauan dan Pengendalian Konsumsi Daya Listrik Berbasis
Internet of Things dengan Algoritma K-Nearest Neighbor (KNN)** (*Electricity
Power Consumption Monitoring and Control System Based on the Internet of
Things Using the K-Nearest Neighbor (KNN) Algorithm*)
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ABSTRACT

Increasing household electricity consumption without adequate monitoring can lead to energy waste and higher electricity costs. This study aims to design and implement an Internet of Things (IoT)-based electricity consumption monitoring and control system using the K-Nearest Neighbor (KNN) algorithm. The system is developed using an ESP32 microcontroller, a PZEM-004T v3.0 sensor, Firebase Realtime Database, a Flutter-based mobile application, and a Flask- and scikit-learn-based backend system to run the KNN model. The dataset was collected from three rooms over a period of seven days with a three-minute sampling interval. The data were labeled using a quantile-based classification method, resulting in three consumption categories: Normal, Warning, and Wasteful. The KNN model was trained using voltage and current features, with 70% of the data used for training and 30% for testing. The experimental results achieved classification accuracies of 97.30% in the kitchen, 98.43% in the living room, and 97.16% in the bedroom. The system successfully performs real-time electricity consumption monitoring, sends automatic notifications, and enables remote control of electrical devices. Furthermore, the analysis showed that energy consumption after system implementation was 17.08% lower than before implementation during the observation period. Therefore, the proposed system can assist users in monitoring electricity usage and support household energy-saving efforts.

Key words: *Internet of Things, K-Nearest Neighbor, electricity consumption, ESP32, PZEM-004T.*