ABSTRACT

Biomass, one of the abundant alternative energy sources, can be processed into biogas through an anaerobic fermentation process by microorganisms. This biogas, which consists mainly of methane, has great potential in meeting renewable energy needs. However, managing biogas from household waste requires an effective system to monitor and treat the gas produced. This research develops a biogas treatment tool by integrating Internet of Things (IoT) technology and the Gated Recurrent Unit (GRU) method to improve the efficiency of biogas management. This tool uses IoT to monitor biogas production conditions in real time through a TGS 2611 sensor that measures methane gas content. The collected data is then analyzed with GRU, a deep learning method that allows predicting biogas content based on the temporal information obtained. The results show that this tool is effective in monitoring the biogas production process and has the potential to improve the efficiency of alternative energy management. However, the prediction accuracy of GRU still faces challenges, especially in capturing dynamic patterns from fluctuating time series data. The analysis shows that the quality of sensor data greatly affects the prediction results, so data preprocessing, including cleaning and normalization, plays a crucial role in improving the accuracy of the GRU model. This research makes an important contribution to the development of biogas management technologies that utilize IoT and deep learning for more accurate predictions.

Keywords: Biomass, Biogas, *Internet of Things* (IoT), *Gated Recurrent Unit* (GRU), TGS 2611 Sensor, *Deep Learning.*