

## Abstract

Earthquakes can cause damage to buildings, potentially threatening lives. There are methods to prevent or minimize damage to buildings; the need for an early warning system to aid decision-making in protecting building structures by detecting shifts and analyzing earthquake patterns is evident. This research is aimed at designing, implementing, and evaluating an early warning system using Artificial Neural Network (ANN) to detect shifts and measurable vibrations of earthquake on building structures through simulation. The three main objectives of this research are designing the early warning system, implementing it in simulations, and evaluating the system's performance in detecting and providing warnings for earthquake vibrations. The research methodology includes system design, implementation, and evaluation using a simulation-based approach. The early warning system is designed utilizing accelerometer and piezoelectric sensors, along with a simple building structure simulation model. Implementation is carried out using TensorFlow and Keras technologies in developing the ANN model. The research findings indicate that the designed early warning system successfully detects shifts and measurable earthquake vibrations on building structures with adequate accuracy. Evaluation is conducted through a series of simulation tests showing the system's reliable performance in providing early warnings to users. Moreover, the ANN model used in earthquake classification has an F1 score accuracy of 95%. This research contributes to the development of an effective and efficient early warning system in facing earthquake risks, and these results can serve as a basis for further research in the development of building protection technology from natural disasters.

**Keywords:** shift, vibration, simulation, Artificial Neural Network (ANN), Internet of Things (IoT)