ABSTRACT

Indonesia lies within the Pacific Ring of Fire, a zone that experiences frequent earthquake and tsunami disasters. In the past two decades, the country has experienced a series of earthquakes that have caused tsunamis with fatalities in the hundreds to thousands. The most recent disaster occurred in Palu, Central Sulawesi in 2018, killing 2,113 people. Faced with this serious threat, the development of a Tsunami Early Warning System (TEWS) using deep learning for earthquake phase detection is necessary as a mitigation effort. Earthquake phase detection plays an important role because it can determine the location of the earthquake and the potential tsunami threat that may arise. One deep learning approach to earthquake phase detection is the EQTransformer architecture. This architecture uses a hierarchical attention mechanism that focuses on the start of the earthquake and the arrival times of P-waves and S-waves. This research attempts to implement the EQTransformer architecture on earthquake events in Indonesia. The implementation is done by using pre-processing methods, such as labeling with Gaussian, normalization with z-score, maximum absolute, and robust, as well as the use of pre-trained models. In addition, this research also changes the output layer to focus on detecting the appearance of P-waves and S-waves. The results of the research on earthquake catalog data in Central Java and East Java in 2009-2017 show that the labeling scheme using a Gaussian value of 10 with z-score as a normalization method, and training with a pre-trained model produces a model with the lowest average absolute value difference of 0.0 seconds for P-waves and 0.36 seconds for S-waves.

Keywords *: Phase detection, EQTransformer, Early Warning System, Tsunami, Deep Learning*