Abstract

Based on previous research, ground motion can be amplified in certain direction and show with significant anisotropy. The causes still remain unclear, and different researchers have attributed this phenomenon to several factors, including topographic effect, local geological heterogeneities, wave polarization, wave trapped in fault zone and etc. This phenomenon might have severe impacts on buildings that cause damages, especially in the near-fault area. However, the current seismic design code focus on the perpendicular direction of fault strike only, which is not suitable enough for real situation. The objective of this study will focus on seismic wave directivity in near-fault zone.

A total of 104 earthquake events with basic geological data were collected. Causative factors were selected based on previous research. There are three main causes considered of free field stations, included wave polarization, anisotropic stiffness and forward directivity. The source of earthquake can possibly affect the seismic wave directivity. Data of influence factors were collected accordingly, and Arias Intensity is used to describe the directivity of seismic wave. The deep learning technique was applied to predict Arias Intensity distribution with the given parameters. This research used TensorFlow as the main deep learning tool.

The results of neural network show that, in most cases, there were no obvious directivity in the near-fault site, and the accuracy of non-directional data was higher than the accuracy of directional data. Although, in real situation, non-directional data is the majority, the low accuracy of directional data might suggest the parameters used in this research is not enough to describe seismic wave directivity.

The results suggested that the distance between site and epicenter, focal depth and subduction earthquake are all important factors. In addition, neural network takes in-situ stress, fault strike and fault slip type as main factors. This result will be discussed in this paper.

**Keywords:** Arias Intensity, Forward Directivity, Shear Wave Splitting, Deep Learning, Stress Inversion