



## Testing and Validation of Multiple Decision Trees Models for Rapid Coseismic Landslide Susceptibility Assessment

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Coseismic landslides can result in significant economic loss and casualties. In Taiwan, combined effects of high seismicity, geology and steep topographic relief cause the high susceptibility of landslides associated with earthquakes. In this study, we use Newmark analysis, decision tree (DT) and multivariate decision tree (MDT) algorithm to perform the nowcasting and delivery susceptibility map on website. The strong-motion records with local magnitude larger than 6.0 from 1990 to 2020 are collected and the 175 potential planar failure slopes with similar lithology are selected as the target slopes (TS). We first found the representative station (RS) satisfied the specific thresholds of peak ground acceleration ( $> 196$  gal) and Newmark displacement ( $> 10$  cm), and then hillslopes around the TS associated with the RS with potential failures caused by earthquakes were carefully mapped by satellite images. The classification labels of failure and non-failure are used for the classification and regression trees (CART), C5.0 and multivariate regression trees (MRT). Overall, the accuracy (ACC) and false-negative rates (FNR) of C5.0 model for entire Taiwan were 83.3% and 10.7%, respectively. In advanced, the ACC can reach 95.8% in central Taiwan with merely 5.6% FNR. We use 2022 Hualien Yuli earthquake and 2022 Chishang earthquake to validate the DT model. The ACC is 83.3% with FNR = 0% in Hualien Yuli earthquake and the ACC is 76.9% with FNR = 0% in Chishang earthquake for entire Taiwan C5.0 model, indicates the model has reliable prediction outcomes. However, these two earthquakes didn't cause the coseismic landslide case associate with 175 TS to validate the true positive portion. Additional TS, which are the coseismic landslide caused by 2022 earthquakes, should be added in our training data. Finally, the results in this study have been displayed on the web-based for rapid coseismic landslide susceptibility assessment providing the distribution of risk slopes with traffic lights for emergency response and disaster mitigation.