

Title: Flood hazard potential evaluation using decision tree state-of-the-art models

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Abstract: Floods occur frequently in Romania and throughout the world and are one of the most devastating natural disasters that impact people's lives. Therefore, in order to reduce the potential damages, an accurate identification of surfaces susceptible to flood phenomena is mandatory. In this regard, the quantitative calculation of flood susceptibility has become a very popular practice in the scientific research. With the development of modern computerized methods such as geographic information system and machine learning models, and as a result of the possibility of combining them, the determination of areas susceptible to floods has become increasingly accurate, and the algorithms used are increasingly varied. Some of the most used and highly accurate machine learning algorithms are the decision tree models. Therefore, in the present study focusing on flood susceptibility zonation mapping in the Trotus River basin, the following algorithms were applied: forest by penalizing attribute—weights of evidence (forest-PA-WOE), best first decision tree—WOE, alternating decision tree—WOE, and logistic regression—WOE. The best performant, characterized by a maximum accuracy of 0.981, proved to be forest-PA-WOE, whereas in terms of flood exposure, an area of over 16.22% of the Trotus basin is exposed to high and very high floods susceptibility. The performances applied models in the present work are higher than the models applied in the previous studies in the same study area. Moreover, it should be noted that the accuracy of the models is similar with the accuracies of the decision tree models achieved in the studies focused on other areas across the world. Therefore, we can state that the models applied in the present research can be successfully used in by the researchers in other case studies. The findings of this research may substantially map the flood risk areas and further aid watershed managers in limiting and remediating flood damage in the data-scarce regions. Moreover, the results of this study can be a very useful for the hazard management and planning authorities.

Keywords: Flood susceptibility, Flood zonation mapping, Trotuș River basin, Geographic Information System (GIS), Machine learning, Decision tree models, Forest-PA-WOE

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