EGU2020-12710
https://doi.org/10.5194/egusphere-egu2020-12710
EGU General Assembly 2020

Land degradation risk mapping using novel machine learning algorithms

Ali Torabi Haghighi[1], Hamid Darabi[1], Zahra Karimidastenaei[1], Ali Akbar Davudirad[2], Sajad Rouzbeh[3], Farzaneh Sajedi Hosseini[4], and Björn Klöve[1]

[1]Water, Energy and Environmental Engineering Research unit, University of Oulu, Oulu, Finland (ali.torabihaghighi@oulu.fi)
[2]Agricultural Research, Education & Extension Organization (AREEO), Agricultural and Natural Resources Research and Education Center of Markazi Province, Arak, Iran
[3]Department of Watershed Management, Sari Agriculture Science and Natural Resources University, Sari, Iran.
[4]Department of Reclamation of Arid and Mountainous Regions, Faculty of Natural Resources, University of Tehran, Karaj, Iran

Land degradation (LD) is a complex process affected by both anthropogenic and natural driving variables, and monitoring LD progression in areas under human□induced stresses has become an essential task. In this study, we developed an approach for evaluating and mapping potential LD risks associated with human-induced and biophysical driving variables. We employed machine learning algorithms (Support Vector Machine (SVM), Multivariate Adaptive Regression Splines (MARS), Generalized Linear Model (GLM), and Dragonfly Algorithm (DA)) for LD risk mapping based on topographic (n=7), human-induced (n=5) and geo-environmental (n=6) variables and field measurements of degradation. The performance of different algorithms was assessed using receiver operating characteristic (ROC), Kappa index, and Taylor diagram. An urbanized watershed, Pole-doab in central Iran, was selected as the case study. The performance data indicated that DA (an novel optimized algorithm) was most accurate in LD risk mapping. In LD zone maps produced using SVM, GLM, MARS, and DA, 19.16%, 19.29%, 21.76%, and 22.40%, respectively, of total area in the Pole-doab watershed had a very high degradation risk. In all cases, the LD risk maps indicated that land in the southern part of the Pole-doab watershed is most exposed to degradation of different types.