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Multi-label classification methods for predicting mixed land use change

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Abstract: Current progress on land use highlights the interest of the multi-label concept in predicting land use change. The new concept allows a multi-label class assignment (ML), where a spatial unit may be associated simultaneously with a set of multiple classes. The multi-label concept is different than the commonly used mono-label one (ml: binary or multi-class), in which a spatial unit has only one elementary label at a time. Recently, it has been shown the merit of the ML concept to model mixed land use change. In this paper, we study the multi-label class-assignment by different multi-label classifications models. The well-known classifiers, support vector machine (MLSVM), k-nearest neighbor (MLkNN) and artificial neural network (MLANN), adapted to multi-label learning, were applied to predict the mixed land use changes for the Grand Duchy of Luxembourg. The methods are compared by several established criteria. Results show that the MLANN slightly overcomes other alternatives (MLSVM and MLANN). Findings show that multi-label classification methods perform well in capturing land use patterns in details and complexity and help planners and decision-makers to make better use of them for better urban planning.

Keywords: Land use; Class-assignment; Multi-label concept; Machine learning.